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Understanding waste management behaviour in care settings in South West England: a mixed methods study

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Understanding waste management behaviour in care settings in South-West England: a mixed methods study

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Abstract

Understanding waste management behaviour in care settings in South-West England: a mixed methods study

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Introduction - Health and social care sector activities in the United Kingdom have a considerable carbon footprint which impacts on the natural environment. Waste management is one area of focus for the reduction of this environmental impact. Previous research has studied the quantities and compositions of healthcare waste highlighting the potential for recycling. Limited research to date has investigated both health and social care waste management in a holistic study incorporating the behaviour, composition and systems. The current study aimed to investigate waste management behaviour, systems and compositions at four health and social care sites in the South West of England, then derive a framework of health and social care waste management behaviour incorporating points of intervention for the improvement of waste management practices.

Methods - A mixed methods multi-strategy concurrent triangulation design was used to investigate the waste management at four health and social care sites in the South West of England. This consisted of a management interview sub-study investigating waste management policy, guidance and training. An observational sub-study was used to investigate health and social care employee waste management behaviour. An audit of the clinical and domestic waste streams provided an overview of the waste composition at each site. Finally a self-report questionnaire sub-study of decision making was conducted to investigate the conscious and habitual aspects of waste management decision making. The findings from these four sub-studies were then synthesised through a data triangulation process.

Findings - The domestic waste bins were most commonly used to dispose of waste during the observational sub-study. The waste audit sub-study found the domestic waste stream contained the largest percentage of potentially recyclable waste. The observational sub-study also uncovered twenty unique primary themes influencing the employee waste management behaviour. These themes included aspects internal to the health and social employee such as confusion, and external themes such as equipment. The management interviews highlighted a lack of waste management training and a reliance on the local site waste management policies to guide and monitor employee waste management behaviour.

Discussion - The health and social care waste management behaviour improvement framework (HWMBIF) is presented. The HWMBIF is a novel framework, derived from the triangulated data of the current study, for understanding and improving waste management behaviour at the participating sites. Several interventions based in the HWMBIF and on the study findings are presented. Future research will focus on testing and refining the HWMBIF, the suggested interventions and developing further interventions.

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Authors declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Graduate Committee.

Work submitted for this research degree at the Plymouth University has not formed part of any other degree either at Plymouth University or at another establishment.

Relevant scientific seminars and conferences were regularly attended at which work was often presented. One paper has been accepted for publication in refereed journals.

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Chapter 1

Introduction

1.1 The impact of health and social care on the environment

1.1.1 Healthcare as a source of anthropogenic climate change

A recent report from the Inter-governmental Panel on Climate Change (IPCC 2014) highlighted the link between the rate of climate change and human behaviour. These changes to the environment are likely to have negative consequences for human health, should the current rate of change continue (Nichols et al. 2009). Anthropogenic factors are considered to be among the top contributors to this phenomenon (EU 2014), and anthropogenic climate change factors result from or are associated with human behaviour. Increasing industrialisation across the developed and developing world requires ever greater amounts of raw materials and resources. The consumption of raw materials and other resources on national and global scales releases large quantities of chemicals into the atmosphere which interact to alter the atmospheric composition. This results in what is commonly called the 'greenhouse effect', which prevents solar energy from escaping back into space, thus heating up the atmosphere and raising the average global temperature (Costello et al. 2009; IPCC 2014).

McMichael et al. (2006), Costello et al. (2009) and Frumkin et al. (2008) provide an overview of the health impacts of climate change based on several of the most likely environmental impacts of climatic fluctuations. If extreme weather events such as storms, floods and droughts continue to increase in frequency, the result will likely be an increase in mortality from death and injury. The rise in temperature will also enable the proliferation of microbial organisms, for which the warmer conditions increase their rate of multiplication, resulting in an increased prevalence of food poisoning.

Another effect of climate change is sea level rise as polar and glacial ice around the world melts. This will lead to large numbers of people being displaced as their homes are flooded. Apart from the potential for physical injury during flooding and evacuation, the people affected might suffer negative mental health effects from the trauma of displacement. Public health research has begun suggesting possible plans for the mitigation of and adaptation to the effects of climate change, and the IPCC has released reports and advice for policy makers on these topics (Frumkin et al. 2008).

As healthcare organisations have to deal with the multiple effects of climate change on human health, the current systems of operation will be taxed as demand for healthcare services increases. Currently, healthcare services around the world are part of the problem and contribute to anthropogenic climate change (Richardson et al. 2009). If healthcare service provision is to be increased to deal with the impacts of climate change on human health, then current strategies and practices will only further contribute to the problem of anthropogenic climate change. This increase will put further demand on healthcare services, creating a self-propagating cycle, the result of which is an unsustainable healthcare system that will collapse under the pressure of increased demand. Current healthcare systems and practices need to be redesigned to minimise the impact of healthcare services on the environment, thereby decreasing their contribution to anthropogenic climate change.

1.1.2 Healthcare waste production and carbon footprint

In 2008, the NHS established a sustainable development unit (NHSSDU) which was tasked with guiding the organisation through the process of changing service provision and monitoring that change in the face of modern environmental demands. One of the first tasks undertaken by the department was to calculate the overall carbon footprint of NHS England and to forecast the future carbon footprint using the current service provision model. This was done in relation to the carbon reduction targets as set by The Climate Change Act 2008. In 2009, the carbon footprint of the NHS was estimated to be 18 million tonnes of CO_2 per year (Table 1.1), sixty per cent of which was estimated to be the result of procurement-related activities, which included the management of waste.

In the carbon reduction strategy set out by the NHSSDU in 2009, the Climate Change Act 2009 required NHS England to reduce its carbon footprint by 10% by 2015, 26% by 2020 and 80% by 2050. These are large reductions for one of the largest organisations in the country, which is acknowledged in the strategy "This will require the current level of growth of emissions to not only be curbed, but the trend to be reversed and absolute emissions reduced" (NHSSDU 2009). This report represents a benchmark moment when the enormity of the task ahead of NHS England became clear.

An update to the NHS England carbon reduction strategy, which was published by the NHSSDU in 2010, highlighted a rise in the overall carbon footprint of NHS England by 3 million tonnes of CO_2e per year, increasing the total to 21 million tonnes of of CO_2e per year (Table 1.1). This rise in the carbon footprint was reported to be the result of increased service demand and provision along with changes to the method of carbon footprint reporting used, as all greenhouse gas emissions – not just carbon dioxide – were included in the calculations. Carbon footprint figures that include all greenhouse gas emissions are reported using the unit of measurement CO_2e per year. The 'e' denotes that other greenhouse gas emissions are included in the measurement in addition to carbon dioxide. The 2020 carbon footprint reduction target for NHS England was revised to a 34% reduction in emissions, to meet the Climate Change Act 2008's targets (NHSSDU 2010).

In 2013, the NHSSDU published an update to the NHS England carbon reduction strategy based on the carbon footprint figures from 2012. This report described a third change to the method of calculating the carbon footprint of the organisation, and so the total carbon footprint of NHS England was revised to 25 million tonnes of CO_2e per year (Table 1.1) (NHSSDU 2013). While there was a 4 million tonne increase in the carbon footprint, a reduction of 5.5% since 2007 was recorded, using this revised calculation method which had the effect of reversing the trend in NHS England greenhouse gas emissions even though the estimation of the overall carbon footprint had increased by a total of 7 million tonnes of CO_2e per year since the original calculation was made in 2009 (Table 1.1).

At the beginning of 2014, the NHSSDU published another update on the organisation's 2012

carbon footprint, including social care and public health service figures. This publication used another revised calculation method, the overall carbon footprint of NHS England, including social care and public health services, was estimated to be 32 million tonnes of CO_2e per year (Table 1.1). Seventy-five per cent of this figure was stated to be from NHS England healthcare operations alone, which is 24 million tonnes of CO_2e per year. In this report it was also stated that NHS England had achieved its target of a 10% carbon footprint reduction on the estimation made in 1990 (NHSSDU 2014).

Table 1.1: NHS England carbon footprint 2009 - 2012: NHSSDU (2009, 2010, 2013, 2014)

Year reported on	Publication year	Carbon footprint (Millions of tonnes)	Carbon unit	Services included
2009	2009	18	CO_2	Healthcare
2010	2010	21	CO_2e	Healthcare
2012	2013	25	CO_2e	Healthcare
2012	2014	32	CO_2e	Healthcare social care public health

The 2013 report also included a more detailed breakdown of the activity categories under the broad heading 'procurement', which was the activity type with the largest carbon footprint, 15.16 million tonnes of CO_2e per year (61% of the total). The activity category 'Waste products and recycling' was reported to account for 2% of the procurement carbon footprint, which meant that waste management in NHS England produced approximately 400,000 tonnes of CO_2e per year. When social care and public health services were included in the 2014 report, procurement activities were still the largest producer of greenhouse gas emissions at 18.81 million tonnes of CO_2e per year (57% of the total). The activity category 'Waste products and recycling' again accounted for 2% of the procurement carbon footprint, which meant the overall carbon footprint of waste management activities across all NHS England services was 500,000 tonnes of CO_2e per year (NHSSDU 2013).

In 2002, Cootes produced a report for the King's Fund, assessing the economic cost of various activities to the NHS. This report stated that NHS England was producing 600,000 tonnes of waste per year which cost £42 million to dispose of. Without accounting for inflation or any

changes in waste disposal costs over time, this implies that NHS England in 2012 was spending £28 million on the disposal of waste from healthcare activities and £35 million on the disposal of waste from all NHS England activities. These amounts indicate that between 2002 and 2012 there has been a large decrease in the amount of waste produced by NHS England and in their spending on waste management activities.

The carbon footprint of NHS England has been monitored and calculated for seven years. Every time a new report has been published a revised carbon footprint calculation method has been used, which has made it difficult to be certain of the reliability and validity of the data over time. It is only since 2013 that the NHSSDU has included the carbon footprint of waste management activities in its public reports. Continued, consistent measurement and reporting of this data will aid the monitoring of changes to the NHS England waste management carbon footprint over time.

The waste output and cost of waste disposal from NHS activities were calculated once in 2002, and since then these figures have been available through the NHS Estates and Facilities Management website. Each healthcare site is supposed to report their annual waste amounts for the clinical, domestic and more recently recycling waste streams along with the overall cost for the disposal of the waste. These datasets unfortunately contain a large amount of missing and inaccurate data. Even when organised, the missing data accounted for and the inaccurate data removed, they provide only a rough estimate of the true totals. All of these figures will be necessary for the continued monitoring and improvement of healthcare services and particularly waste management. While there may be inconsistencies in the the measurement, calculation and reporting of these data, three basic but important conclusions about waste management can be drawn:

1) Overall, NHS England activities have a large carbon footprint attached to them.

2) The carbon footprint of NHS England's waste management is between 400,000 and 500,000 tonnes of CO_2e per year.

3) It costs the NHS millions of pounds every year to dispose of waste products.

1.1.3 Social care waste production and carbon footprint

The carbon footprint of social care activities in the UK has received less attention than the carbon footprint of healthcare activities. As mentioned in the previous section, NHS England began reporting the carbon footprint of its social care activities in 2014. The 2014 update on the NHS England carbon reduction strategy from the NHSSDU reported that 22% of the total greenhouse gas emissions from NHS England were the result of social care-related activities. Although exact figures are not provided, it can be inferred that NHS social care in 2012 had a carbon footprint of 7.04 million tonnes of CO_2e per year. In this report the activity breakdown for the carbon footprints of NHS England healthcare, social care and public health are amalgamated, so separate quantities are not provided for social care. Procurement activities are reported to account for 57% (18.81 million tonnes of CO_2e per year) of the combined carbon footprint. Now, assuming that the carbon footprint of social care procurement is relative to the overall social care carbon footprint, the carbon footprint of NHS England social care can be estimated to be 4.14 million tonnes of CO_2e per year and that of NHS social care waste management activities to be 110,000 tonnes of CO_2e per year (NHSSDU 2014).

These figures are only estimates, but they indicate nonetheless that NHS England social care activities currently have a considerably lower carbon footprint than the organisation's healthcare activities. The UK has an increasingly elderly population, which will put greater demand on social care services (Evans et al. 2012). If current policies and practices are maintained, it is likely that the need for and provision of more social care services will only serve to increase the carbon footprint of NHS social care services (Naylor and Appleby 2013), the increasing demand for which makes it an important topic of research, because it is often neglected in healthcare and NHS research.

1.1.4 Legislation governing health and social care waste management: recent changes requiring changes to practice

Since 2000, there have been a number of changes to European Union (EU) and national legislation in the UK governing the management of health and social care waste. In 2000, the EU launched the European Waste Catalogue 2000 (EWC), which sought to classify all types of

waste while also prescribing appropriate handling and disposal methods. As part of the EU, the European Waste Catalogue set the waste standards for the UK's national legislation regarding waste management, which resulted in a number of changes to UK legislation.

The separation of waste was first legislated for in the National Health Service Social Care Act 1990. The Controlled Waste Regulations SI 1992 No. 588, were then introduced in 1992. Associated with the disposal of wastes from the health and social care setting is The Control of Substances Hazardous to Health Regulations SI 2002 No. 2677 which was introduced in 2002. In 2005, the UK then released two connected sets of legislation The Hazardous Waste (England and Wales) Regulations SI 2005 No. 894 and The List of Wastes (England) Regulations SI 2005 No. 895. These two sets of legislation closely resemble the European Waste Catalogue 2000 and provide the currently used definitions for waste found in health and social care settings.

Category 18 of The List of Wastes England Regulations 2005 contains the definitions of "Wastes from human or animal healthcare and/or related research (except kitchen and restaurant wastes not arising from immediate healthcare)". These definitions cover most of the waste types found in health and social care settings.

Clinical waste is classified as hazardous due to its potential to harbour harmful infectious materials, which are defined under category 18 01 03 as "wastes whose collection and disposal is subject to special requirements in order to prevent infection."

Clinical waste classified as offensive waste and suitable for treatment and disposal by alternative methods such as autoclave or pyrolysis in-place of incineration are defined under category 18 01 04 as "wastes whose collection and disposal is not subject to special requirements in order to prevent infection (for example dressings, plaster casts, linen, disposable clothing, diapers)."

These changes to the legislation allowed UK health and social care organisations more opportunity to segregate their waste. Previously, under The National Health Service Social Care Act 1990, no distinction was made between infectious and non-infectious waste arising from direct patient care. This meant that all waste within the clinical setting was disposed of as infectious waste in a yellow bag, regardless of what it was used for. A used sheet of paper on the nurses' station was treated the same as a blood-soaked bandage from a patient who was HIV positive.

Following 2005 and these legislative changes, domestic waste bins started to be introduced to health and social settings, to take all waste similar to that found in the household setting and not classified as hazardous under category 18 01 03 of The List of Wastes England Regulations 2005. The interpretation of this change in legislation also included a new waste category of offensive waste, defined under category 18 01 04 and coded as orange to differentiate it from infectious waste, which was coded yellow. While the offensive waste classification was integrated into national and local waste management policies, it was not integrated into practice until further legislative changes were made.

In 2008, the UK signed up to the Climate Change Act, which required a commitment to reduce green house gas emissions in line with specified targets (Section 1.1.2). This commitment to reduce greenhouse gas emissions, especially in the public and private sectors, resulted in an amendment being made to The Hazardous Waste (England and Wales) Regulations 2005 in 2009. In 2011, The Waste (England and Wales) Regulations SI 2011 No. 988 were implemented. These new pieces of legislation required all public and private organisations to have a strategy for reducing and make a commitment to reducing their overall carbon footprint. It also required them to make yearly reports on their carbon footprint to the Government so the national total could be calculated and tracked.

The NHS established the NHSSDU in 2008, to guide the organisation through this process. Since 2011, more health and social care sites have been integrating the offensive and domestic waste streams into practice in an attempt to reduce the carbon footprint associated with incinerating infectious clinical waste. This also occurred alongside the economic crisis in Europe and the resulting budget cuts for public sector organisations. Incineration was the most expensive disposal method, so health and social care sites were able to reduce their waste disposal costs by adopting the less expensive offensive and domestic waste streams.

What has become apparent to health and social care organisations is that waste management provides a relatively easy entry point at which to reduce their carbon footprint. This is because waste does not have a direct impact on patient care, which minimises the risk of any changes to waste management having a negative impact on the patients' well-being (Brown et al. 2012).

There have also been a number of studies demonstrating that transferring inappropriately disposed of waste from carbon-intense waste streams, such as infectious clinical waste into the domestic waste stream, can reduce the cost of waste management (Daschner and Dettenkofer 1997).

Studies have highlighted that going one step further and transferring inappropriately disposed of waste in offensive and domestic waste streams into a recycling waste stream can further reduce their carbon footprint and waste management-related costs (Tudor et al. 2008a; Grose et al. 2012; Richardson et al. 2012). The remainder of this chapter will discuss the potential for and potential barriers to recycling in health and social care as well as examine research on the integration of recycling into health and social care settings.

1.2 Waste management practices in health and social care

1.2.1 How current health and social care waste management practices are impacting on waste amounts and emissions

Some critics of the changes made to the waste management legislation relating to health and social care (Subsection 1.1.4) suggest that these changes endanger public health (Blenkharn 2008). The reason for this criticism has two important aspects. Firstly, Blenkharn (2008) focused on the lack of scientific evidence on which the changes to the legislation were made. This is a recurring theme throughout policy-making, and especially on the topic of waste management. There is little financial support for health and social care waste management research, and where the evidence is available it may not be considered or may be disregarded in the context of policy-making, possibly for financial or logistical reasons (Mechanic 2008). The use of policy not based on sound empirical evidence could have negative consequences for patient care and public health.

Secondly, it appears that the Blenkharn (2006, 2008) papers demonstrate bias in the risk perception observed in healthcare employees (Ferreira and Teixeira 2010). Blenkharn (2006) argued that the transfer of waste normally disposed of in the clinical infectious waste stream to a lower grade waste stream, such as offensive, domestic or recycling, contravenes the US Centers for

Disease Control and Prevention's (CDC) Universal Precautions for the prevention of the transmission of HIV and other blood-borne infections. It is possible that such an opinion arises from an inflated risk perception of waste from the health and social care environments, which in turn leads to the biased belief that all waste in the healthcare setting potentially contains infectious material. The most powerful evidence to contradict this belief comes from Jager et al. (1989); Mose and Reinthaler (1985); Rutala and Mayhall (1992), who found that domestic household waste contains more blood-borne contaminants than clinical waste in the healthcare setting.

The phenomenon of inflated waste risk perception in healthcare employees was observed by Ferreira and Teixeira (2010), who suggested that it is influenced by previous legislation. Whereas prior legislation classified all waste generated in the healthcare environment as hazardous, and determined that it should be disposed of as such, this became the standard response for healthcare employees. The influence of general societal attitudes towards waste and its management has also been suggested as a potential mechanism for the risk perception bias (Tudor et al. 2005; Hutchins and White 2009). It is possible that an individual's own perception of waste and the influence of the actual or perceived societal perception thereof may influence the waste disposal behaviour of healthcare employees, which could be one barrier to making changes in health and social care waste management practices.

Other barriers to changing health and social care waste management practice have been identified in the literature. In addition to societal attitudes, Hutchins and White (2009) suggested that legal barriers and logistical/institutional barriers might prevent changes to practice. Since the introduction of The Waste (England and Wales) Regulations (2011), many of the legal barriers to implementing greater segregation of waste for recycling in the health and social care settings have been removed. The major legal barriers to encouraging recycling in health and social care from 2014 onwards consider making recycling a legal requirement, not just a legal possibility. The drafting of such legislation will have to have been done with care, to ensure that waste which is contaminated with infectious material is not disposed of inappropriately and becomes a danger to public health.

During interviews with senior managers on the topic of sustainable procurement in the NHS,

Grose and Richardson (2013) made the observation that contradictions in the legislation were confusing for those managers and prevented them from implementing sustainable procurement practices. The use of evidence from research, to help prevent contradictions in new legislation and to prevent negative behavioural reactions to any changes in legislation that may endanger public health, will be critical in overcoming the sentiment of Blenkharn (2008) that science and regulation are "uneasy bed fellows."

Grose and Richardson (2013) also found that uncertainty about how to achieve changes in procurement practice for greater sustainability was a further barrier to change. When faced with uncertainty in the face of perceived risk, as was the case with waste management in the procurement chain, inaction may seem like the only viable option. Uncertainty when dealing with waste management at an organisational or institutional level could be the result of factors such as a lack of viable markets for recyclable materials or problems with residual contaminants in recyclable waste items (Tudor et al. 2005).

Linked to uncertainty, Botelho (2012) demonstrated that education and training about waste management could be used to improve knowledge and compliance with waste management policy in the healthcare setting. Botelho (2012) found that employees at healthcare sites that did not provide waste management training felt they had insufficient knowledge on which to act. Engaging employees and creating a culture of change within an organisation was suggested by Naylor and Appleby (2013) as a method for improving healthcare practices towards greater sustainability. In the context of waste management, engaging with employees would mean providing them with education and training regarding the potential for change within current legislation and asking them to think critically about their own practices, in order to design more effective ways of doing things. Creating a culture for change would require not only employees to engage with the process but also management to change local policy and lead the implementation of the new practices.

Whereas there exists employee enthusiasm for improvements in waste management practice, the implementation of such changes is not always practical. Nichols and Manzi (2014) found that the physical healthcare environment can itself be a barrier to change – the example of a

neo-natal intensive care ward was given in this study. A lack of space, which was already impinging on the employees' ability to care for their patients, was also preventing the site from implementing a recycling system on this ward. Where the physical environment is a barrier to change, the design of the modern hospital should be reconsidered. Innovation in the design of the waste management system could be another path to change, in order to overcome the spatial needs of already pressurised healthcare environments.

1.2.2 The potential for improved waste management in health and social care

Many non-scientific reports have stated the potential for reducing the amounts of clinical and domestic waste in the UK, but prior to 2005 these were educated guesses. While such estimates were useful in trying to make the case for supporting research into health and social care waste management in the UK, several scientific peer-reviewed studies were subsequently published. Although still few in number, these objective primary investigations make a stronger case for the waste reduction potential in UK health and social care services.

In 2003, Muhlich et al. published a comparison of the amounts of clinical and domestic waste generated by five hospitals from five different European countries. A hospital in Nottingham, UK, participated in this study and was shown to produce the second highest percentage of clinical waste in respect to the other four hospitals. Forty per cent of the waste produced at the Nottingham hospital was clinical waste and the remaining sixty per cent was domestic waste. This study indicated that in relation to other European healthcare organisations, the UK was producing a large proportion of clinical waste. As the legislation began to change in 2005 with the implementation of The Hazardous Waste (England and Wales) Regulations (2005) and The List of Wastes England Regulations (2005), a series of studies was conducted to investigate the composition of healthcare waste by using waste bin analyses in the south-west of England. The first of these studies, by Tudor et al. (2005), determined that the amount of waste being sent to landfill by the participating healthcare sites could be reduced by 20-30%, resulting in a cost reduction of 25-30%.

While studying the impact of activity and department type on healthcare waste amounts and compositions, Tudor (2007) found some dramatic differences – overall clinical and domes-

tic waste amounts varied greatly by department. The general wards were producing 32.6 kg/person/month of domestic waste and 80 kg/person/month of clinical waste. At the opposite end of the scale, minor injury units (MIUs) were producing only 0.01 kg/person/month of domestic waste and 0.1 kg/person/month of clinical waste. Similar figures were also replicated during a second study by Tudor et al. (2008b). These studies demonstrated not only how department and activity type impact on waste generation amounts, but also that large quantities of clinical and domestic wastes are being produced – and often in specific departments. By carrying out such waste audits it should be possible for sites to target any interventions in the departments producing the greatest amounts of waste.

Tudor et al. (2008a) carried out an intervention study in which basic changes to the type and location of waste management equipment were made, along with the introduction of waste management education for employees and the monitoring of waste disposal practices. This was a large-scale study involving 72 healthcare sites. After the intervention period, an average reduction in the domestic waste amount of 14.8% (range: 1.6-33.4%) was reported. For the clinical waste streams a reduction of 15.7% (range: 1.8-38.3%) was reported. Tudor et al. estimated that the reported waste reduction rates resulted in a potential net cost saving of $25,000.

Tudor et al. estimated that the implementation of recycling at the healthcare sites involved in the study could eventually result in a 60-80% reduction in waste being disposed of in clinical and domestic waste bins. This figure was four times that observed by Tudor et al. (2008a) during the intervention study. Given the considerably cheaper disposal cost of recyclable wastes in comparison to clinical and domestic waste, one would expect to see net cost savings in excess of $100,000 from what is a relatively small number of healthcare sites. While no exact figures have been provided, it is also likely that the reduction in waste being disposed of into landfill and incineration would produce a relative reduction in the carbon footprint of waste management at the participating sites. This would be due to the lower greenhouse gas emissions associated with recycling, the prevention of end-of-life material landfill and decreases in the demand for new landfill space.

1.3 The theoretical perspective on waste management behaviour

1.3.1 The use of theory to understand health and social care waste management behaviour

There have been very few studies of pro-environmental behaviour in the health and social care setting (Steg and Vlek 2009). One recent programme of work that aimed at addressing this knowledge gap, though, was the Low Carbon at Work (LOCAW) project. Although the LOCAW project did not study health and social care waste management behaviour, it nevertheless did provide some useful insights into why pro-environmental behaviours are not performed in the workplace. Ruepert et al. (2013) proposes that people create a place identity in the workplace that is distinct from the place identity they have at home. They theorise that the values attached to a person's workplace identity differ from those attached to their home identity, in that value contained in the home identity must be of sufficient strength to cross over to the workplace identity. This is one possible explanation why people who perform recycling and other pro-environmental behaviours at home may not do so in the workplace.

The findings from Ruepert et al. (2013) also highlight issues in the workplace such as structural barriers and knowledge. When in a shared workspace, if people were not told to perform pro-environmental behaviours, such as adjusting the thermostat or turning off their computer, they did not do so. This was because they might not have known where the thermostat was or if other people would want it to be changed. People would leave their computers on because they did not know they were supposed to turn them off or they were not concerned about increasing their employer's electricity consumption.

What was clear from the LOCAW reports was that a person's behaviour in the workplace is different from their behaviour in their own home. The LOCAW project began to identify a number of factors influencing these differences in behaviour and leading to a lack of pro-environmental behaviour in the workplace. The LOCAW project findings will be discussed further in the context of the findings from the current project in Chapter 10.

Only the theory of planned behaviour (TPB) (Ajzen 1991) has been used as a theoretical basis

for the study of healthcare waste management behaviour Tudor et al. (2007). The TPB uses the hypothetical constructs of 'attitudes', 'subjective norms' and 'perceived behavioural control' as predictive variables for an individual's intention to perform a specific behaviour. As stated by Tudor et al., the theory of planned behaviour has been highly criticised on a number of points: over-simplification, not all variables predict intentions, other variables were added (Ajzen 2001) and these variables were often not predictive of intention. This has led to people questioning not just the validity of the predictor variables but also the entire model.

One of the most damning and consistent findings about the theory of planned behaviour has been its inability to predict actual behaviours, which has become known as the 'intention behaviour gap'. Although this finding might be negative for the TPB, it highlights an important observation about behaviour – although someone might intend to carry out a behaviour, this does not necessarily lead to action. When Tudor et al. (2007) applied the TPB to healthcare waste management behaviour they found that only the predictor variables 'attitude' and 'belief' were predictive of waste management intentions. 'Subjective norms' and 'perceived behavioural control', however, did not sufficiently predict waste management intentions. The lack of predictive power for the constructs of the TPB implied that either attitudes and beliefs were the only psychological constructs influencing waste management intentions in the healthcare setting, or the theory was not sufficient to describe the phenomenon.

This was an important finding, and Tudor et al. (2007) did tentatively state in the paper that this was an expected outcome. What was more important in this study was trying to understand the link between intention and behaviour, whereby intentions were not significantly predictive of pro-environmental waste management behaviour. Tudor et al. conclude that this might have been due to employees not seeing any benefit in performing pro-environmental waste management behaviour and the perception that environment related issues were not their problem.

1.3.2 A contrastive evaluation of two theoretical frameworks for understanding health and social care waste management behaviour

In 2008, Tudor et al. published a framework of the major determinants of sustainable waste management behaviour in the Cornwall NHS (Figure 1.1). This was the first and currently only

theoretical framework that sought to understand the key influences on healthcare employee waste management behaviour, and it was based on the theory of planned behaviour (TPB) (Ajzen 1991) which, as discussed in Section 1.3.1, had previously been used to study the behavioural antecedents of healthcare waste management behaviour by Tudor et al. (2007). The TPB uses 'attitudes', 'subjective norms' and 'perceived behavioural control' (PBC) to predict behavioural intentions, which people can then chose whether or not to act upon.

The factors described in the framework by Tudor et al. centre on the three TPB predictor variables. The variable 'attitudes' is clearly labelled in Figure 1.1. 'Organisational culture' represents the subjective norms of the individual and PBC is represented by the terms 'NHS focus and policies' and 'organisational structure'. The behaviour intention gap described in the TPB is also present and is shown in the framework as stated versus actual behaviour. This is the mediating factor between the three predictor variables and the actual behaviour that is performed.

Recently, Young et al. (2013) published a modified version of the framework by Tudor et al. (2008b). Young et al. carried out a systematic literature review of pro-environmental behaviour change studies conducted in the workplace setting and modified the Tudor et al. (2008b) framework to reflect the findings from the literature. The framework by Tudor et al. (2008b) was specific to the situation of healthcare waste management in the Cornwall NHS, and Young et al. (2013) sought to extend this to workplace settings in general. The systematic literature review carried out by Young et al. included 17 articles that used direct empirical measurements of environmental performance. Young et al. excluded from the systematic review those studies that used self-reporting measures of environmental performance, because of their questionable validity in relation to measuring environmental performance, due to social desirability and response bias.

There is, however, a contradiction in the removal of studies using self-reporting measures of environmental performance from this review. The framework of Tudor et al. (2008b), on which the modified Young et al. (2013) framework was based, was constructed largely using data collected from self-reporting methods. While Young et al. sought to remove this validity issue

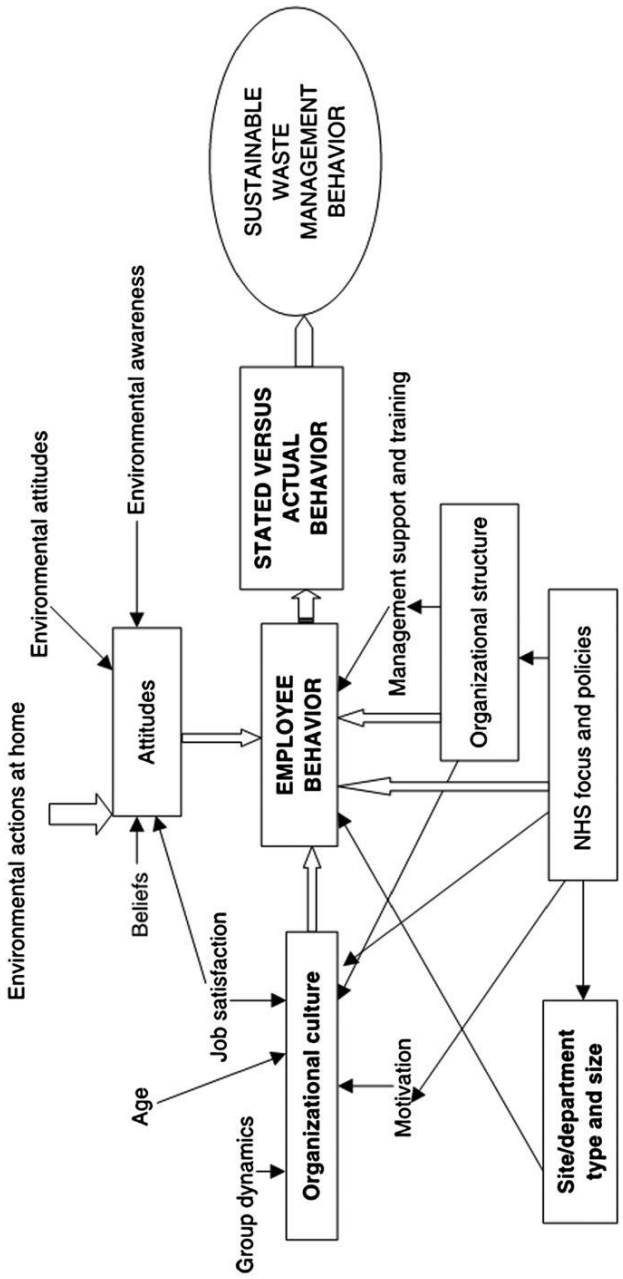

Figure 1.1: The Major Determinants for Sustainable Waste Management Behavior in the Cornwall NHS source Tudor et al. (2008b)

from their framework, they based it on the Tudor et al. (2008b) framework which was derived from self-reporting data. Though there are methodological issues with the assumptions made by Young et al. (2013), a comparison of the two frameworks does provide useful insights into the factors potentially influencing health and social care waste management behaviour. The employee pro-environmental behaviour (e-PEB) framework published by Young et al. (2013) is presented in Figure 1.2. Summary tables of the structural and factor differences between the Tudor et al. (2008b) framework and the Young et al. (2013) e-PEB framework can be found in Appendix A and B.

Structural differences between the frameworks

Sideways links between factors

The first differences to note between the two frameworks are structural in nature, i.e. there are no sideways links between the four main factor groups ('individual', 'external', 'group' and 'organisational factors') or the sub-factors in the e-PEB framework. This implies that one set of factors does not interact with or influence another set of factors. In the Tudor et al. (2008b) framework sideways interactions between the factors are present prior to them being amalgamated into behavioural intention, which is a weakness of the e-PEB framework because behavioural factors are rarely singular in purpose and lead to this framework likely being an over-simplification of the phenomenon. Such an oversimplification, however, is partly justified due to a potential lack of data that Young et al. had available on which to base any sideways links between the factors.

Removal of behavioural intentions

The second structural difference between the two frameworks is the removal of 'behavioural intentions' as a mediating variable between the determinant behavioural factors and the actual behaviour performed by the individual. Although no explicit explanation has been provided by Young et al., this has may have resulted from the inclusion of studies that only used direct measures of environmental performance. When using direct measures of performance the researcher might assume that the behaviour the participants performed was the behaviour they intended to perform, though this may have been an inappropriate assumption because intentions

Figure 1.2: Process framework of macro-determinants for employee pro-environmental behaviour (e-PEB) Young et al. (2013)

have been shown to be different to actual behaviours, while Young et al. omitted the intention behaviour gap.

The removal of 'behavioural intentions' from the e-PEB model could also be explained by the author wanting to only model a change from previous behaviours to pro-environmental behaviour, regardless of the individual's intentions. Whether a person holds pro-environmentally congruent or in-congruent intentions is not considered of importance to the desired behavioural change and outcome. A final explanation for the omission of 'behavioural intentions' from the e-PEB model might be a lack of data from the literature review from which to justify their inclusion. The variables 'attitude', 'subjective norms' and 'perceived behavioural control' are difficult constructs to measure, due their hypothetical nature, which means that they cannot be observed directly, and like 'behavioural intentions' they rely on the use of self-reporting measurement methods. If all studies using self-reporting methods were excluded from the study, any data supporting the existence of 'behavioural intentions' would also most likely have been excluded.

Differences in the determining factors of behaviour included in the frameworks

There are considerable differences between the main and sub-factors included in the two frameworks and the importance attributed to them in determining behaviour. The framework by Tudor et al. (2008b) uses five main factors as the determinants of healthcare waste management behaviour, namely 'attitudes', 'organisational culture', 'organisational structure', 'NHS focus and policies', and 'site department type and size'.

Attitudes

'Attitudes' is a main factor in the TPB and is considered of importance in the Tudor et al. (2008b) framework. Young et al. (2013), however, did not attribute much importance to 'attitudes' and said that a change in 'attitudes' was not necessary for behavioural change to occur. Due to the exclusion of self-reporting measures by Young et al., it is possible that any evidence for the influence of 'attitudes' on pro-environmental behaviours was also excluded, as 'attitudes' would most likely be measured using a self-reporting method.

Organisational factors

'Organisational culture', 'organisational structure' and 'focus and policies' were highlighted as important determinants of behaviour by Tudor et al., but they are grouped under 'organisational factors' in the e-PEB framework and given less relative importance than other 'organisational factors'. Young et al. (2013) views these factors as having a role in the communication of information to the employee, but they are superseded by the management support and training factors. 'Management support and training' is a factor that also appears in the Tudor et al. (2008b) framework, but the roles of these organisational factors are reversed: 'culture', 'structure' and 'focus and policies' are seen as more important. It is possible that this difference in priority attributed to the factors by the two research teams is a matter of definition.

Tudor et al. (2008b) saw management support in terms of the attitude of management towards the implementation of environmental initiatives and sustainable practice. Young et al. (2013), however, was more specific and said that it was the role of management to set an example to their employees and effectively communicate the necessary information. For Young et al., a manager should increase an employee's self-efficacy about the behaviour, by helping them to believe that they can perform the behaviour and make a difference. All four factors appear to be about the type of information being provided, its quality and the effective communication of that information. A study by Botelho (2012) highlights how waste management education and training can improve employee waste management performance over a protracted period of time, which appears to be an area where more research is required to resolve these discrepancies.

Site/department type and size

'Site/department type and size' was one factor that was important to the Tudor et al. framework, but it was absent in the e-PEB framework. This factor was shown in multiple studies to impact on waste management behaviour, hence its inclusion in the original (Tudor et al. 2005; Tudor 2007; Tudor et al. 2008b) framework. At first glance this factor may seem to be specific to a healthcare environment with diverse departments and sites of all different sizes. This might have been an oversight on the part of Young et al. (2013) in excluding this factor from the e-PEB framework, because with further consideration it is clear that many organisations consist of different departments, across different sites and often performing different activities.

In previous work, most notably Tudor et al. (2008a), ensuring the equipment, physical environment and spatial layout was conducive to the desired waste management practice was considered an important factor. A factor representing these variables was not included in the Tudor et al. (2008b) framework, though it does appear in the e-PEB framework under 'environmental infrastructure'. This term is used to capture all of the physical factors that the organisation should provide for the employee to use. 'Environmental infrastructure' in the e-PEB framework is associated with the organisation providing the correct equipment in the right areas, along with situational cues that aid the employee in using the equipment appropriately. From the previous research (Tudor et al. 2005; Tudor 2007; Tudor et al. 2008b) and the e-PEB framework by Young et al. (2013) it is clear that both authors view this as an important factor in determining waste management/pro-environmental behaviour.

Group factors

'Group factors' is a category found in the e-PEB model but is only mentioned as 'group dynamics' in the Tudor et al. (2008b) framework. 'Group factors' and 'group dynamics' are representative of the normal day-to-day interactions within and between employees and management. This is classed as a factor of relatively low importance in the Tudor et al. (2008b) framework, but Young et al. (2013) gives it relatively high importance in the e-PEB framework. The general factor is expanded to include two sub-factors not found in the Tudor et al. (2008b) framework.

The first of these sub-factors is 'financial incentives'. Young et al. draws on a single example of the successful use of financial incentives in the context of pro-environmental behaviour change. This example comes from the construction industry in Hong Kong. There is a large body of literature around the use of financial incentives to change behaviour which does agree that while financial incentives are being provided, behaviour can be changed. However, behaviour becomes contingent on receipt of the monetary gain, and once the financial incentive is removed, the old and undesirable behaviour reasserts itself. From this notion it can be concluded that using financial incentives for improving pro-environmental behaviours is not a preferred option.

'Feedback' is the second group factor in the e-PEB framework and is similar to the sub-factor 'feedback' found in the 'individual factors' category. Both individual- and group-level feedback

provides people with a way to monitor their performance overall and in relation to other people or groups. Young et al. explains that specific environmental performance feedback can be more effective than general feedback and acts as a motivational tool. While this may be true, there are a number of considerations to be made before using feedback as a behavioural change tool. Feedback requires the collection of data on performance, and if these data are not currently being collected, somebody will have to collect them – taking up their time in doing so. If somebody has gone through the trouble of collecting the data, any feedback must be visible for all employees and their attention directed to it accordingly. When providing comparative feedback it must be remembered that there will always be an individual or a group that is last. This can demotivate people and reduce their self-efficacy, though, so care must be taken when providing performance feedback, to ensure nobody is targeted in a way that makes them vulnerable, the reasons for poor performance identified and effective support provided for rectifying the issue.

Three factors in the Tudor et al. (2008b) framework were linked to organisational culture but did not appear in the e-PEB framework. These were 'age', 'job satisfaction' and 'motivation'. All of these factors are derived from self-reported data, and due to the exclusion criteria used by Young et al. (2013) during their systematic review, they might have been excluded.

Factor similarities

Four factors were used in similar ways in both of the frameworks. The factor 'beliefs' was linked to 'attitudes' in both of the frameworks, as was 'environmental attitudes' and 'environmental awareness'. These are all difficult constructs to define, because they are multifaceted, transient and hypothetical, which consequently makes them difficult to measure. It will require further research to break them down into their constituent components. Although these components will still likely be hypothetical, they will be easier to define.

The fourth factor was 'environmental actions at home'. The frequency of past behaviours is often used in an attempt to predict future behaviours. However, this is problematic, as it suggests people are incapable of change. It is possible that some form of habitual behaviour or behavioural heuristic is used by people when performing tasks they have previously performed (Aarts and Dijksterhuis 2000). Past actions should be treated with care as a determining fac-

tor of pro-environmental behaviour, because it is an over-simplification. Past behaviour is most likely made up of all the factors determining an individual's current behaviour, albeit with inputs from the historical time frame.

Both the Tudor et al. (2008b) framework and Young et al. (2013) e-PEB framework identify a wide array of factors, both environmental and psychological, that need to be considered when studying health and social care waste management behaviour. The management of waste in the workplace may seem like a simple behaviour at first, but in trying to understand it the behaviour is revealed as far more complex. The inability of the frameworks to agree also highlights the lack of literature and knowledge about pro-environmental behaviour in the workplace, especially the health and social care setting.

1.4 The necessity of the current project, its aim and its objectives

1.4.1 The necessity of the current project

Health and social care contributes to anthropogenic climate change. Seventy-five per cent of the NHS England carbon footprint is due to healthcare-related activities, and 22% is attributed to social care activities. Waste management in the NHS is responsible for producing hundreds of thousands of tonnes of greenhouse gas emissions every year, and these figures do not include private healthcare and social care organisations in the UK. With the addition of these amounts they can be safely assumed to increase the overall carbon footprint for health and social care activities in the UK far beyond the estimations for the NHS alone.

It has been estimated that between 60 and 80 per cent of healthcare waste is potentially recyclable (Tudor et al. 2008a). The introduction of recycling into health and social care organisations across the UK would result in a dramatic reduction in greenhouse gas emissions created through disposal methods such as incineration and landfill. Associated with the carbon footprint of waste management is the financial cost of disposing of the waste. This is a key factor that health and social care management must account for when devising organisational strategy (Epstein and Roy 2001). When seeking to reduce the carbon footprint cost savings will also be sought and if financial savings cannot be made sustainable practices may not be adopted.

The reduction of waste amounts and using more sustainable disposal methods such as recycling appears to reduce both the financial cost and carbon footprint of NHS organisations. As discussed in 1.1.2 such reductions have already been observed with a reduction of up to £14 million between 2002 and 2012. The financial savings from more sustainable waste management practices, could enable additional reinvestment into improving patient services. In an indirect way the reduction of greenhouse gas emissions from health and social care organisations would also contribute towards reducing the progress of anthropogenic climate change. Reducing the negative health-related impacts associated with climate change and the increased demand on health and social care services this would produce is a longer term plan to reduce financial pressure on health and social care services.

Legislation is in place in the UK to facilitate the implementation of recycling in health and social care settings. The number of health and social care organisations which have successfully implemented recycling schemes in the UK, however, remains low. A number of barriers to the implementation of sustainable practices, such as recycling in the health and social care setting, have been identified and educated guesses at how to overcome these barriers have been suggested. Through the iterative literature search undertaken during the current study it was determined that there is a lack of research into the implementation of recycling systems in UK healthcare settings, and limited research on waste management systems in the social care setting currently exists. Health and social care settings are complex, in that they are governed by strict legislation, regulation and policy. The process of improving behaviour is also complex and varies from context to context, which means that research carried out outside of the health and social care settings can only be tentatively applied to these settings.

Two theoretical frameworks, one a modified version of the other, have been suggested to understand the behavioural determinants of health and social care waste management. Such frameworks will be required to aid the design of effective interventions for implementing recycling and other sustainable practices in health and social care settings. It is difficult to apply theory to real-world situations, and the two suggested frameworks are based on a theory that has issues of validity and reliability. The two theories differ on many levels, and even where the factors

are the same they sometimes differ on definition and relative importance.

The research discussed in this chapter has highlighted a number of potential factors that may be influencing health and social care waste management. A greater level of detail about current waste management practices in the health and social care setting will be required, in order to identify which factors are influential and at which points in the process they are acting. A greater level of detail and insight into current health and social care waste management practices will not only add to the body of literature, but also build on the work of Tudor et al. (2008b) and Young et al. (2013) to provide a theoretical basis for the development of interventions for the improvement of health and social care waste management practices and behaviour in the future.

A broader understanding of the health and social care waste management process is also required, especially with regard to employee behaviour. Much of the current literature has focused on the composition of healthcare waste, with little information being proffered about the behaviour of the employees who are producing the waste. A different research approach is therefore required to begin to understand this complex phenomenon, and it needs to be both detailed and sufficiently broad enough to provide enough information for a theoretical basis for future research, in order to develop behaviour interventions for the improvement of health and social care waste management.

1.4.2 The organisational context of the current study

The organisations involved in this study were a private healthcare organisation and a publicly funded social care organisation. Both organisations did not have sustainability as a main focus in terms of their publicly expressed aims or values. The private healthcare organisation did however have a focus on innovation and ownership. Their participation in this research study highlighted a commitment to innovation. Ownership is an important value in relation to sustainability, employee ownership of a workplace may lead to a greater feeling of responsibility for that space and willingness to improve it. The social care organisation orientated its focus towards the care of the individual and treating their patients as individuals in a person centered manner.

Both organisations had local management teams who were responsible for the operation of their

particular site and they in turn were managed by a more senior management team located at a head office. In the social care organisation each site was responsible for tendering and securing their own waste management contract with support from the head office. Waste management at the private healthcare organisation was tendered and managed by the central head office not by the site in question. The tendering process was carried out by a third party consultancy organisation who dealt with the individual waste contractors. Any changes that the local site wanted to make had to be approved by the head office.

The structure of the private healthcare organisation and the social care organisation are different due to the scale of their operations but in many ways adhere to a similar outline structure. The private healthcare organisation is much larger and operate globally compared to the social care organisation which only operates in the South West of England. Both organisations have a Board of Directors, in the social care organisation the general managers sit and under them are the individual site managers. The private healthcare organisation has a higher level of management who report to the Chief Executive Officer and the Board of Directors. This includes the Chief Executive Officer for the country, Group Chief Operating Officer, Group Chief of Staff, the Chief Financial Officer and Group Head of People and Culture. There is then the national management team who sit above the local site management team. The organisational structure of the social care organisation appears to imply greater autonomy at the local site level and greater centralised management at the private healthcare organisation.

The study will be conducted at three sites operated by the social care organisation and one site operated by the private healthcare organisation. Little is known about the waste management behaviour of the employees at the sites prior to the commencement of the study, both organisations were not aware of exactly how their employees were disposing of waste adding to the importance of this study. Further details about the individual sites will be provided in Chapter 2, Section 2.5.2.

1.4.3 Aims and objectives of the current study

Aim

This study will explore the waste management behaviour at four health and social care sites in

the South West of England. These findings will be used to develop a theoretical framework of waste management behaviour at these four sites which can be used as a basis for understanding and improving waste management practices at these sites.

In order to achieve the aim of this study the following objectives have been devised. Objectives 1 to 4 form the aims of the four sub-studies which comprise this study of waste management at four health and social care sites. These aims and individual sub-study objectives are presented in Chapter 2, Section 2.5 alongside a description of the overall study design.

Objectives

1. To use observational methods to gain insight into the role of the employee and the impact of the physical environment on waste management behaviour at the participating health and social care sites while also capturing a quantitative description of health and social care waste management behaviour.

2. To describe and compare the composition and recycling potential of the clinical and domestic waste streams of the four participating health and social care sites.

3. To conduct a questionnaire pilot sub-study of the role of conscious and habitual decision making in health and social care waste management.

4. To assess the role of management in the implementation and maintenance of the respective health and social care waste management systems.

5. Through the process of triangulation produce a description of the factors influencing employee waste management behaviour at the four participating sites and identify potential points of intervention to improve waste management behaviour.

Outline of the thesis

Chapter 2 – discusses the novel research design that was used to achieve the aims and objectives of the current study.

In the subsequent chapters the four sub-studies and their respective findings are presented:

Chapter 3 – The quantitative methods and findings from the observational sub-study will be presented in this chapter.

Chapter 4 – The qualitative methods and findings from the observational sub-study will be

presented in this chapter.

Chapter 5 – The waste audit sub-study will be presented in this chapter.

Chapter 6 – The decision making questionnaires sub-study will be presented in this chapter.

Chapter 7 – The management interviews sub-study will be presented in this chapter.

Once all of the findings from the individual sub-studies have been presented, the triangulation process, theoretical framework, suggested interventions and conclusions shall be presented in the following chapters:

Chapter 8 – brings together the findings from the individual sub-studies through the process of data triangulation.

Chapter 9 – presents a novel theoretical framework, developed from the study findings, for understanding health and social care waste management behaviour is presented. Suggestions for the improvement of health and social care waste management practice based on the project findings and the theoretical framework will also be presented in this chapter.

Chapter 10 – presents a summary of the main findings from the project, the implications of these findings and suggestions for future research.

Chapter 2

Methodology

2.1 Introduction

This chapter will provide a description of the research methodology employed in the current study to achieve the aim of this study and fulfill the research objectives posed in Chapter 1, Section 1.4.3. The description of the research methodology requires the philosophical approach adopted by the current project to be discussed and justified. This will accompany a discussion and justification for the choice of research strategy and research design. The discussion of the philosophical approach to this project is necessary, due to the use of a mixed methods approach and the arguments about the nature of scientific knowledge that arise from the dualistic view of knowledge.

Figure 2.1 provides an outline of the methodology used in this study. The overall approach was mixed methods through a multi-strategy approach. The use of the term 'multi-strategy' refers to the use of qualitative and quantitative research methods within the project design as opposed to a mono-strategy approach, where only qualitative or quantitative methods are employed. The study to be conducted under the multi-strategy approach is of a concurrent triangulation design, where individual sub-studies are carried out simultaneously. Four sub-studies were conducted concurrently during the course of the current study: a management interview sub-study, an observational sub-study, a waste audit and an investigation of decision making within health and social care.

The methodological considerations of this study are complex, thus making it necessary to explain clearly various aspects of the methodology and to provide a clear rationale for each of the choices made. A rationale for the philosophical position supporting the use of mixed methods

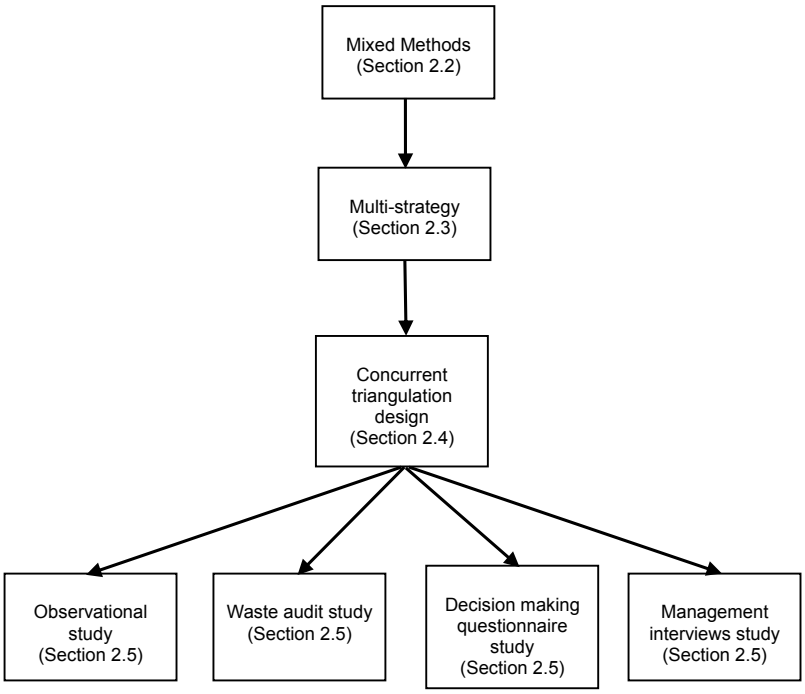

Figure 2.1: A diagrammatic representation of the project methodology

will be provided first (Section 2.2), as this determined the research methods that could be used and the type of knowledge that could be gained through scientific inquiry. A rationale for the use of a multi-strategy approach to mixed methods is then provided (Section 2.3) and focuses on the practical aspects of conducting mixed methods research, by explaining why a multi-strategy approach was selected over other research methods such as action research, grounded theory and ethnography. The concurrent triangulation research design is then explained and its use justified. This is complemented by the rationale behind including the four sub-studies in the concurrent triangulation design (Section 2.5).

2.2 The philosophical approach to mixed methods

This section outlines the mixed methods approach to research, provides a rationale for its use and introduces the philosophical issues raised by this approach. An explanation and rationale for the philosophical paradigm under which this study was conducted is then provided, along with an explanation of why an alternative philosophical paradigm was not adopted. Together this will provide an evaluation of the philosophical underpinnings of mixed methods research

in relation to the current study.

The mixed methods movement began with the development of the mixed method-multi-trait matrix by Campbell and Fiske (1959), who developed the mono-methods approach to mixed methods (Tashakkori and Teddlie 1998), an approach that uses one or more quantitative or qualitative research methods in the study design, but not a combination of qualitative and quantitative methods. The methods used in the mono-methods approach were easily justifiable, due to all of the research methods coming from the same research strategy and hence the same philosophical paradigm. In the case of quantitative research methods this is most commonly the post-positivist paradigm, from the objectivist school of thought (Creswell 2009). Conversely, qualitative research methods stem from the constructivist school of thought and commonly fall under the humanist, phenomenological or social constructivist paradigms (Creswell 2009; Tashakkori and Teddlie 1998).

The combination of quantitative and qualitative research methods in a single research design is described as a multi-strategy approach (Bryman et al. 2004) and provides a philosophical dilemma for the researcher, as quantitative and qualitative research methods are based in philosophically opposed paradigms (Bryman 2012). Quantitative research methods operate under the ontological assumption that knowledge is independent of the mind. Under post-positivism, objective empirical evidence is required, in order to refute hypotheses. This use of deductive logic provides a reductionist form of knowledge that seeks generalisable trends in the subject under observation. Qualitative research methods under constructivism take the opposite ontological stance that knowledge exists internally in the mind. They assume that knowledge is subjective, it is the individual who impresses meaning on their experience. These methods use inductive logic to investigate specific interpretations of experience (Bryman 2012; Creswell 2009).

It was (and in some scientific circles still is) thought that the quantitative and qualitative approaches to scientific research comprise two distinct paradigms whose differences cannot be resolved (Gray 2009). This dualistic view of knowledge – whether it exists independently of or within the mind – as expressed by constructivists and objectivists holds the quantitative and qualitative research methods apart. A different philosophy of science is required in order to

reconcile these differences.

The philosophical approach adopted in this study is a product of the realist school of thought. The epistemological claims of the quantitative and qualitative research methods require some form of explanatory link between them to make the multi-strategy approach to mixed methods philosophically sound. Olsen (2010), in an overview of realism and mixed methods research, explains that realism can resolve the issue of the dualistic nature of knowledge, as it holds both quantitatively and qualitatively gathered data with an equal level of importance in respect to one another. While both types of data are attributed equal levels of importance, they are not defined as the same; rather, they are different methods of generating knowledge about the same phenomena, in order to provide a fuller description and understanding of those phenomena under investigation.

The ontology of transcendental realism, described by Bhaskar (1975), allows the researcher to assume that both transitive and intransitive knowledge can exist simultaneously. Transitive knowledge refers to that which requires a human observer in order to exist. This is similar to the meaning that is impressed on experience by the individual, which is often investigated using qualitative methods. Intransitive knowledge refers to knowledge of things that would exist without a human observer being present. This is similar to the quantitative methods seeking generalised trends through falsification.

The importance of this epistemological position is the possibility that any given phenomenon can have both intransitive and transitive properties which are equally important for a more complete knowledge of the phenomenon. If qualitative or quantitative research methods are employed exclusively, knowledge about the phenomenon will be more incomplete than if they had both been used in cooperation.

The decision about the methodological approach to the investigation of a research question should be determined by the research question itself. The mixed methods approach is applicable to those situations where there is an interaction between a human individual and a physical system. The current study seeks to capture a broad picture of health and social care waste management while including detail about the phenomenon in a setting that contains interac-

tions between human individuals (health and social care employees) and a physical system (the workplace waste management system).

The use of the mixed methods multi-strategy approach provided the researcher with the ability to capture general information about the system and behavioural trends using quantitative methods while gaining insights into the psychological underpinnings of these general behaviours from the individuals performing the behaviour, by using qualitative methods. If only one of these approaches had been employed, the depth and breadth of knowledge available to the researcher would have been reduced, thereby resulting in the research question being less well-answered. By adopting a realist approach the researcher was able to begin answering the research question.

The realist paradigm also encourages the development of ideas and theory (Bryman et al. 2004; Bryman 2012; Tashakkori and Teddlie 1998). Realism attempts to represent the real world, and this is often explained through theoretical frameworks which can be constructed from quantitative and qualitative data through triangulation (Bryman 2012). This is where the findings from quantitative data and qualitative data are interpreted in the context of one another. Triangulation leads not only to convergent findings but also disparate findings that may not be uncovered through a mono-method research strategy (Olsen 2010; Creswell 2009). Disparate findings must then be assessed on a case-by-case basis to identify the differences they represent. Such cases may include differences between the subjectively and objectively perceived realities or differences between the independent subjectively perceived realities of the participant and the researcher.

Pragmatism is a philosophical approach that is also removed from the dualistic argument of knowledge separating the positivist and constructivist paradigms (Tashakkori and Teddlie 1998). Under the pragmatist paradigm the researcher may use whatever research method is most appropriate for solving the problem posed by the research question (Creswell 2009; Rossman and Wilson 1985). While this provides justification for the use of a multi-strategy approach, it nonetheless leaves the researcher with the inability to utilise their findings beyond the moment of data collection. Data cannot be used to generate theory, as they are not generalisable beyond

the context of the observation in terms of the physical environment and the temporal context. The findings are not a consistent state associated with an individual – they are specific only to the observed moment. Such an approach is applicable only if the researcher assumes that there are no natural laws governing the Universe or generalisable trends to be found in reality (Cherryholmes 1992). This is a requirement of pragmatism as a result of the lack of an epistemology that describes the nature of knowledge under this paradigm. Pragmatism is not an approach suitable for research seeking to go beyond the immediate description of a given situation, and therefore it cannot be applied to the current study, due to the need to use the data for more than an immediate description of the situation under investigation.

The need for a philosophical rationale for the use of mixed methods is predicated on the arguments posed by dualism and surrounding the nature of knowledge exemplified by the objective and constructivist schools of thought. In the context of this study realism provides a philosophy of science that reconciles this polarised view of knowledge, thus allowing it to exist both independently and within the mind. Such an ontological description allows the researcher to utilise quantitative and qualitative research methods in the same research design. While pragmatism also allows this use of both quantitative and qualitative research methods, its epistemological position does not allow for the development of theory, because under the pragmatic paradigm, knowledge cannot be extended beyond the scope of the immediate situation under investigation. It is under the realist paradigm that the multi-strategy approach to mixed methods can be used most effectively, in order to develop theory appropriate for the fulfilment of the aims and objectives of the current study.

2.3 The multi-strategy approach to mixed methods

Justification for the use of the mixed methods multi-strategy approach will be provided in this section, along with a discussion of how this approach allowed the aims of the study to be fulfilled. Alternative mixed methods and mono-method approaches will be considered and compared to the mixed methods multi-strategy approach, to further highlight the applicability of this approach to the current study.

A multi-strategy approach to this project was chosen for several reasons. There is no formal

theory by which to investigate health and social care waste management. Part of the aim for this study was to generate such a theory on which to base a framework for the improvement of waste management behaviour at the participating sites. This required the generation of ideas from the detailed insight that can be gained through the use of qualitative research methods. The quantitative research methods provided a more general description of the current status of health and social care waste management (Johnson and Onwuegbuzie 2004; Robson 2011). When these methods are used together the findings from one data type can be used to strengthen or challenge the findings of the other. Analysing the data in this manner helped to negate the possibility of errors occurring in the interpretation.

Errors may occur because the researcher generalises quantitative findings where individual differences occur within the sample or assumes qualitative findings to be the result of individual differences where general trends in behaviour occur (Creswell 2009; Robson 2011; Gray 2009). The mixed methods approach also allowed the researcher to investigate multiple aspects of a complex and dynamic situation (Robson 2011). In the case of health and social care waste management, not only does the physical system have to be considered but also the individual and the organisation acting on that system. The system, organisation and individual all have many factors associated with them that may be active in the context of waste management (Grose et al. 2012; Richardson et al. 2012). To facilitate the investigation of the multiple factors potentially present within the complex system, a variety of research methods were considered.

Ethnography was one such method that was considered for application to this study. However, the ethnographic approach would have required the researcher to spend prolonged periods of time working at a single site (Chapman and McNeill 2005; Robson 2011), due to the need for the researcher to immerse themselves in the culture under investigation. This would have restricted the number of sites that could be included in the sample. For reasons of practicality, such as training, contracts and integration into the workforce, it is likely the study would only have been conducted at one site.

When using the ethnographic approach, what is observed by the researcher is context-specific, which limits the findings to the culture under observation. A theory of the site waste manage-

ment culture and practice could be developed from the findings, but due to this context specificity it could not be generalised to other similar sites (Gliner et al. 2009). Ethnography in a covert form would require the researcher to deceive the participants by not exposing themselves as a researcher, which would not have been ethically justifiable as the research should be carried out in an overt manner, without compromising the integrity of the data (Gliner et al. 2009; Gray 2009). An overt ethnography could introduce bias such as social desirability and experimenter and observer bias. For these reasons ethnography was rejected as a possible research method for this study.

During the research design process action research was given consideration. The cyclic nature of this approach may appear to be the logical choice for a research study seeking to improve the effectiveness of health and social care waste management, but there were two central issues with using action research as the methodology for this study. The first issue is found at the beginning of the action research process, which involves planning to make a change in the existing situation under investigation (Kemmis and McTaggart 2005).

In the case of health and social care waste management there is not a sufficient amount of research on which to base an initial programme of changes (Richardson et al. 2012), which leads to the second issue with using action research – without sufficient knowledge on which to base a programme of change there is the potential for any changes that would be made to have a negative impact. Moreover, the researcher is ethically bound to minimise the risk of harm to their participants. If waste were incorrectly disposed of as the result of a change made by the researcher, there would be the potential for harm to not only the participants but also workers handling the waste further along the processing line. If sharps waste, for example, was incorrectly disposed of in a clinical waste bag rather than a sharps bin, due to the intervention, there is the potential for needle-stick injuries to occur. There was also the potential for damage to the environment should clinical or pharmaceutical waste be disposed of in the domestic waste bin and end up in landfill. To overcome the lack of research on health and social care waste management, an exploratory study would have to precede the implementation of any changes in the applied setting. Such a study would have to be large enough to provide a sufficient amount

of detail, and this is what the current study was able to achieve.

Both the ethnographic and action research approaches allow for the application of a multi-strategy approach, to some extent. In an overt ethnography the researcher can not only make observations and conduct interviews but also use questionnaires and potentially even record systematic data (Chapman and McNeill 2005). This approach, as previously discussed, introduces potential sources of bias and lacks generalisability. Action research allows for the use of any research method under the pragmatist paradigm to be applied to the evaluation stage of the research cycle. When the pragmatist paradigm is applied, however, it does not allow for any assessment of causality or generalisability (Cherryholmes 1992); similar criticisms may be made of other research methods such as grounded theory.

Approaches such as grounded theory, interpretive phenomenological analysis and case studies all represent sound frameworks for the collection of qualitative data. From the data collected through such methods, ideas and even abstract theory can be inferred. These approaches, however, lack the philosophical basis for the application of any quantitative methods, as they are routed primarily in the constructivist approach (Creswell 2009). While qualitative approaches provide a level of detail and insight into the experience of the individual that is not accessible to quantitative approaches, they lack the ability of mathematics to describe concisely generalised patterns.

Using a purely quantitative approach to this project would have ignored the potential insight that can be gained from the individual and their personal perspective of waste management (Gray 2009). Questionnaires can provide a quantitative method of descriptive exploration, but the level of detail that can be gained is limited as a result of the use of closed questions that are required for such an analysis. The application of active experimentation would narrow the scope of the study to focus on specific aspects of behaviour that the currently limited body of knowledge could not guarantee would be appropriate to measure. Such an approach would also be impractical to implement in the applied setting, due to the lack of experimental control.

A number of other research methods could have been applied to this study, but none would have achieved the expressed aims of this project as fully as the mixed methods approach. Ethnog-

raphy and action research were both impractical to implement in the applied context of waste management at the participating health and social care sites with the current understanding of the research situation – ethnography because in a covert form it would have required the researcher to deceive the participants, while action research was not appropriate because it had the potential to produce negative consequences for the employees and their parent organisation.

The use of a solely quantitative approach would not have provided a sufficiently detailed understanding of the phenomena under investigation and a solely qualitative approach a sufficiently generalised knowledge of health and social care waste management. The mixed methods approach satisfied the broad requirements of the current study, which should lead to both detailed and generalised understanding and knowledge of health and social care waste management. This provided a sound basis for the development of a theory and a behaviour improvement framework using an inductive approach.

2.4 The concurrent triangulation design

The multi-strategy concurrent triangulation study design will be discussed in this section. This research design will be explained in general terms and in the following section applied to the current study.

The multi-strategy approach used to investigate the current status of waste management at the participating health and social care sites was a concurrent triangulation design (Creswell 2009). In a multi-strategy concurrent triangulation design all of the sub-studies are conducted at the same time over the same time period. The data from each sub-study is then analysed in isolation. The findings from all of the sub-studies are then interpreted in the context of one another – the process of triangulation, which seeks to improve the validity of the data by using one data type to support or explain the findings from the other data type through cross validation (Creswell 2009; Gray 2009; Robson 2011).

The use of this research design was appropriate for the current study, because it allows for the generation of ideas (Gray 2009; Olsen 2010). The aspects of the situation described by the data could be specific when qualitative methods were used or broad when quantitative methods were

used. This helped the researcher to account for a large variety of potentially influential factors in this dynamic real-world situation Robson (2011). The concurrent data collection method was selected for two reasons. Firstly, it helped to ensure that the data were not dramatically affected by temporal changes in the sample. An extreme example of this is the entire workforce changing either in terms of personnel or behaviour, due to an unaccounted for aspect of the situation. The second reason was the practicality of the data collection. The health and social care setting is a busy environment, so consolidating data collection into as short a time frame as possible minimised the inconvenience of the researcher being present (Creswell 2009).

The concurrent triangulation design of this study sought to investigate at the participating health and social care sites the three aspects of waste management identified in the literature. The first aspect was the study of the organisation responsible for the implementation and maintenance of the waste management system (Tudor et al. 2007). The second aspect was the individual, or in this instance the employee who acts on the waste management system under the guidance of the management (McCartney et al. 2008), and the third aspect was the physical waste management system (Tudor et al. 2005; Tudor 2007). These three elements were assumed to be interdependent and not acting independently of one another.

2.5 The current study design

An overview of the study will be provided in this section, this will include; the sample of sites where the study took place, the context in which the study took place, a brief description of each sub-study and a rationale for its inclusion in the overall research design. A detailed description of the methods for each sub-study will precede the findings of the sub-study when presented in the subsequent chapters.

2.5.1 The design of the study

This study used the multi-strategy concurrent triangulation approach to the research design. Figure 2.2 depicts the collection of data for the sub-studies concurrently during the same three month time frame, the analysis of the data from the four sub-studies and then the triangulation of the findings progressing over time. Four sub-studies were conducted over the same three month

period from May 2012 to July 2012 (inclusive). The four sub-studies sought to investigate different and yet related aspects of waste management practice at the sample of health and social care sites included in the study. The specific design of each sub-study, the findings and discussion of those findings are presented individually in Chapters 3, 4, 5, 6 and 7. In Chapter 8 the triangulation process and the triangulation of the findings from all four sub-studies is presented. The sub-studies and a rationale for their inclusion in the study and the individual aims and objectives of each sub-study are discussed below.

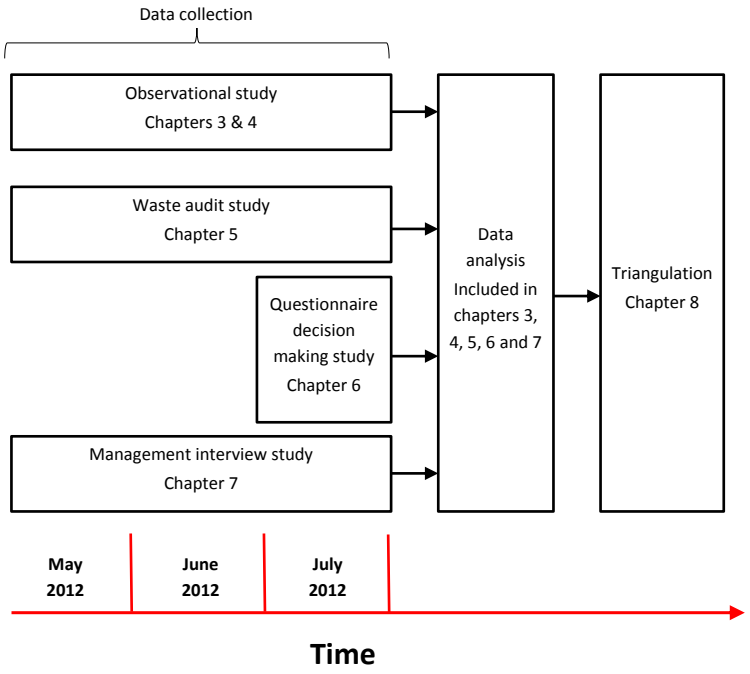

Figure 2.2: The concurrent triangulation design of the study described in relation to time.

The observational sub-study

The observational sub-study utilised both qualitative and quantitative research methods, which allowed the researcher to capture simultaneously descriptive information regarding the waste disposal practices of the employees and detail about their perceptions of waste management.

This sub-study focused primarily on the interdependency between the individual and the system through the observation of individuals' interactions with the system. It also investigated more

indirectly interactions between the individual and the organisation, because it is the organisation which operates the waste management system while providing guidance and training to its employees. The ability of the individual to use this system and act on the training and guidance provided to them gave the researcher an insight into the level of effectiveness the organisation had achieved in providing a system that facilitated effective waste management.

The aim of this sub-study was to provide insight into the role of the employee and the impact of the physical environment on waste management behaviour at the participating health and social care sites while also capturing a quantitative description of health and social care waste management behaviour. This led to the following sub-study objectives:

Sub-study objectives

1. To observe waste disposal events in a health and social care setting.
2. To gain insight into the factors influencing the waste management behaviour of the individual employee.
3. To provide a description of the factors potentially influencing employee waste management behaviour at the site level and overall.
4. To describe the waste disposal practices of employees with regard to employee type, waste bin type, material type and appropriateness of the disposal behaviour.
5. To describe the waste disposal practices within each of the four sites, overall and then make a comparison thereof.

The methods and findings from the observational sub-study are presented in two parts. The quantitative findings are reported in Chapter 3 and these findings relate to objectives 1, 4 and 5. The qualitative findings from this sub-study are presented in Chapter 4, these findings relate to objectives 1, 2 and 3.

The waste audit sub-study

The waste audit provided a quantitative description of the composition of the clinical and domestic waste streams at the participating sites, which subsequently gave the researcher a more general account of the waste disposal behaviour occurring across the entire site. This contrasted with the observational sub-study, which was limited to providing a description of the observa-

tion locations that may or may not have been representative of the waste composition for the entire site.

The waste audit sub-study sought not only to investigate the waste stream composition of a single site but also to make a comparison between different sites, which in turn led to the development of the following four objectives.

Sub-study objectives

1. To describe the waste composition of the participating health and social care sites.
2. To compare the waste compositions of the participating health and social care sites.
3. To compare the compositions of the clinical and domestic waste streams of the participating health and social care sites.
4. To assess the potential for increasing recycling at the participating health and social care sites.

In Chapter 5 the methods, findings and discussion of the waste audit sub-study are presented.

The questionnaire sub-study of employee decision making

This sub-study focused on the investigation of health and social care employee decision making. An investigation of the decision-making process employed by the individual when performing waste management behaviour was necessary to aid the researcher in determining the theory to be applied to the behaviour change framework that resulted from this study. If the aim is to alter a behaviour, it is useful to know how the actor decides to perform that behaviour in the first place. An intervention, of a communicative type, attempting to modify a conscious behaviour is likely to try to change the information the actor considers during the conscious deliberation process. An intervention seeking to modify an unconscious behaviour, however, would first have to take steps to make the actor aware of the behaviour they are performing, thus making the deliberative process conscious, before reinforcing the desired behaviour and allowing the modified habitual sequence to form.

This exploratory pilot sub-study sought to clarify whether waste disposal decisions are the result of unconscious/habitual decision making, conscious decision making, a combination of

both strategies or neither strategy. Therefore, the aim of this sub-study was to compare self-reported waste disposal decision making using a theory of habitual decision making – automatic goal-directed behaviour measured using the self-report habit index (SRHI) – and a theory of conscious decision making, i.e. the theory of planned behaviour (TPB). The objectives of this sub-study were:

Sub-study objectives

1. To make a comparison of the relative strengths, and therefore influence, of habit and conscious decision making on employee waste management behaviour.
2. To see if there is evidence of the SRHI and TPB measuring distinct facets of waste management decision making at the participating health and social care sites.
3. To investigate the influence of gender, age, job role, time spent working in health and social care and the time spent working in the most current job role on both habitual and conscious decision making.

The research methods, findings and discussion of the sub-study findings for the questionnaire sub-study of employee decision making are presented in Chapter 6.

The management interview sub-study

The management interview sub-study was designed to investigate how the participating sites' managers develop and operate their waste management systems. This sub-study highlighted links between management and the waste management system as well as management and the individual. How management develop and review their waste management policy was one area of investigation. Such a policy details how the waste management system is structured and the manner in which waste disposal behaviours are expected to be carried out in accordance with the relevant legislation (e.g. Hazardous Waste (England and Wales) Regulations 2005, Environment Protection Duty of Care Regulations 1991). The waste management policy of a health or social care site is a way through which interactions between management and the system can be investigated.

This sub-study also investigated the interdependency of management and the individual through the guidance and training provided by the organisation to their employees regarding waste man-

agement and any feedback pathways that were present for the employee to influence practice. Indirect insights were also available into the interaction between the individual and the waste management system. The waste management policy, training and guidance received by the individual should have informed the waste management behaviour carried out by employees.

The management interview sub-study was conducted qualitatively, due to the need to gain insights not only into the normal operations of the organisation but also the perspective of management-level employees about why they were using their current approach to waste management. The use of a qualitative survey method allowed for the collection of both descriptive data and the perspective of the management level employee responsible for waste management at the participating sites. The subjective meaning found in the behaviour of site management was investigated using a qualitative research method similar to the method used by Grose et al. (2012). This sub-study therefore sought to assess the role of the site management in the implementation and maintenance of the respective health and social care waste management systems.

Sub-study objectives

The study objectives were:

1. To explore, using interview techniques, how the waste management systems of the participating organisations are implemented and maintained.

2. To explore the role of management in the construction, review and dissemination of waste management policy.

3. To explore the role of management in the provision of guidance for employees.

4. To explore how training is provided to employees.

It is in Chapter 7 that the individual sub-study design, findings, and discussion are presented.

2.5.2 The health and social care sites

All four of the sub-studies were carried out at four sites in the south-west of England.To maintain the anonymity of the participating health and social care sites pseudonyms have been used throughout the text. The Oak was a private healthcare site and The Maple, The Beeches and The Pine were publicly funded social care sites. The Maple, The Beeches and The Pine were all managed by one organisation and The Oak was managed by another separate organisation.

The Maple was a 40 bedroom residential care home that had recently changed to a nursing care home. The Beeches was a 42 bedroom residential care home and The Pine was a 53 bedroom nursing care home.

The Oak was a private hospital offering a wide range of inpatient and outpatient treatments including; x-ray, MRI, physiotherapy and cosmetic surgery. The hospital contained 27 inpatient beds, 11 outpatient consulting rooms and a minor treatment room. These sites were chosen because they represented a cross-section of each organisation's facilities and were willing to participate in the study.

All four sites had domestic, clinical and recycling waste streams in place. The length of time that each of these systems had been in place varied from site to site. As an example the domestic waste stream had only been in place a few years at The Oak and the recycling waste stream only a few months at this site. At The Maple the recycling waste stream had been in place for over three years. The types of waste that were generated at each site were also different due to their varying activities. At the social care sites more sanitary clinical waste was produced due to their emphasis on the care of the elderly. At the private hospital more theatre and medical treatment waste was produced due to their emphasis on the treatment of a range of acute medical conditions. These differences in the types of waste and waste generating activities are explored further during this study.

2.5.3 The study schedule

The observational and waste audit sub-studies were conducted according to a predetermined schedule between May 2012 and July 2012. The monthly schedules are shown in Figures 2.3, 2.4 and 2.5. This schedule was designed to ensure that the observational sub-study was conducted at each site on each day of the working week (Monday to Friday) with the observation sessions spread across the three months as evenly as possible. The schedule also ensured the waste audit was conducted at each site once each month on a day where the maximum amounts of both clinical and domestic wastes were present at each site.

The questionnaire sub-study of decision making was conducted during July, questionnaires were distributed to employees during this time. This occurred because at this point in the

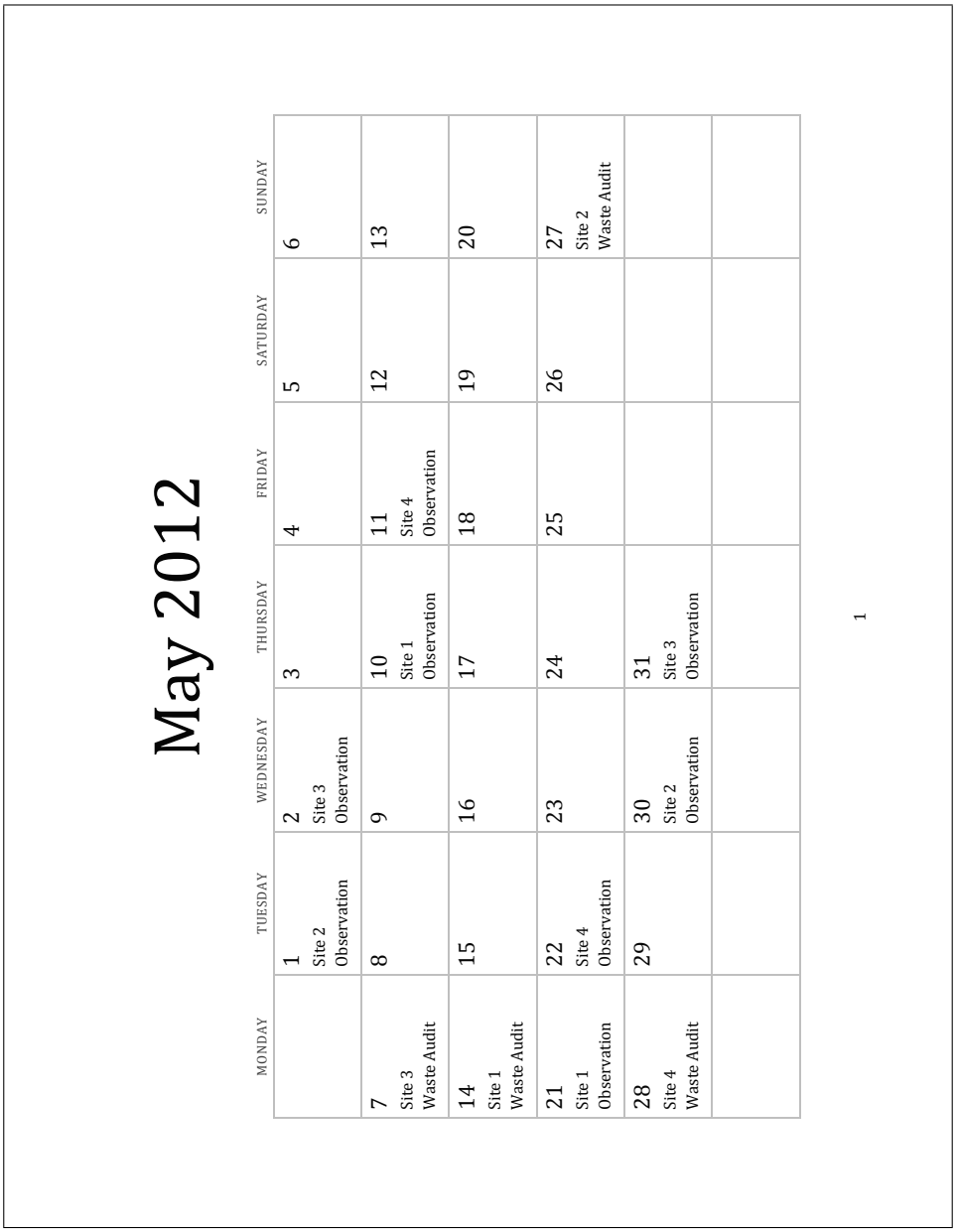

Figure 2.3: Observational sub-study and waste audit sub-study data collection schedule for the month of May 2012

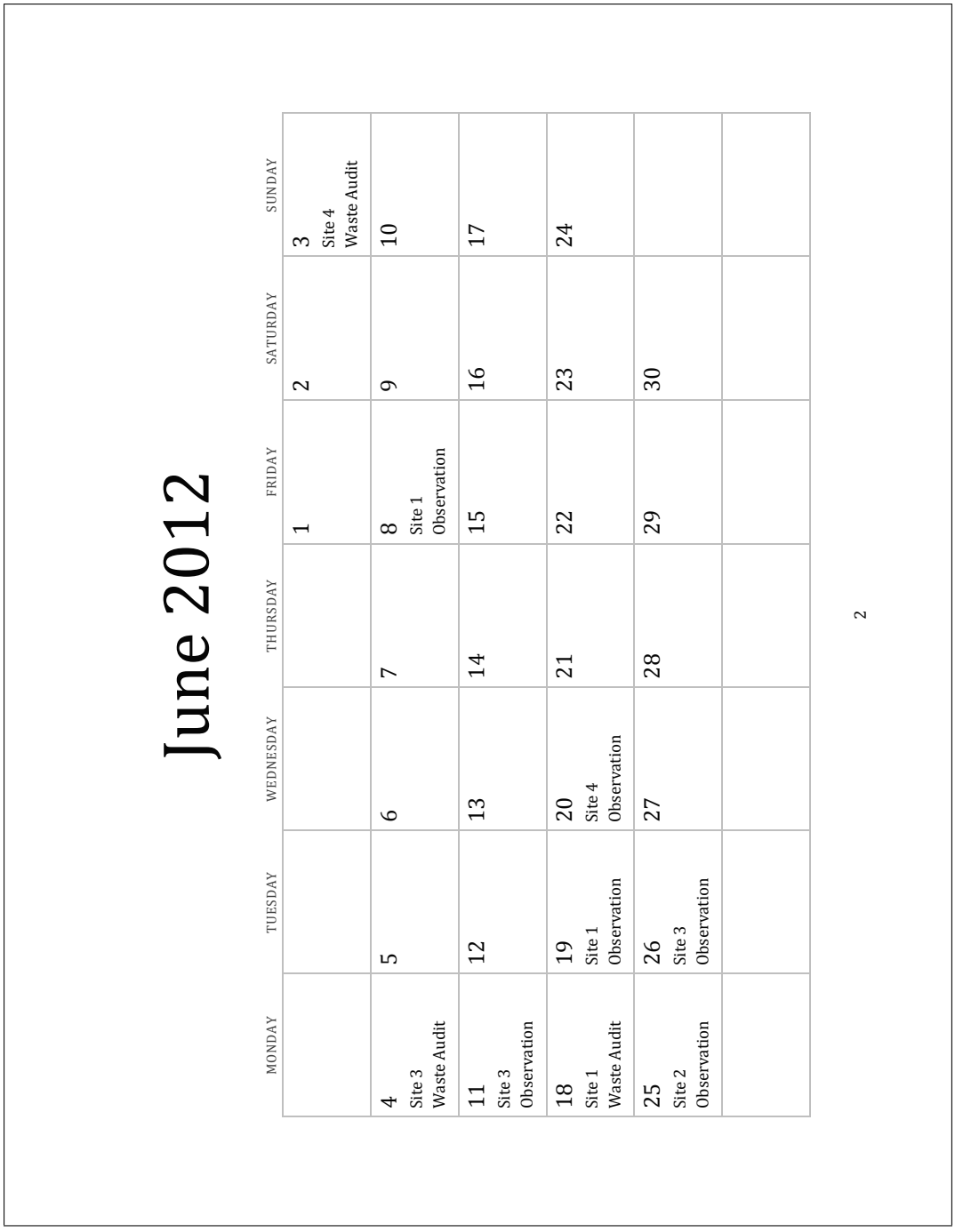

Figure 2.4: Observational sub-study and waste audit sub-study data collection schedule for the month of June 2012

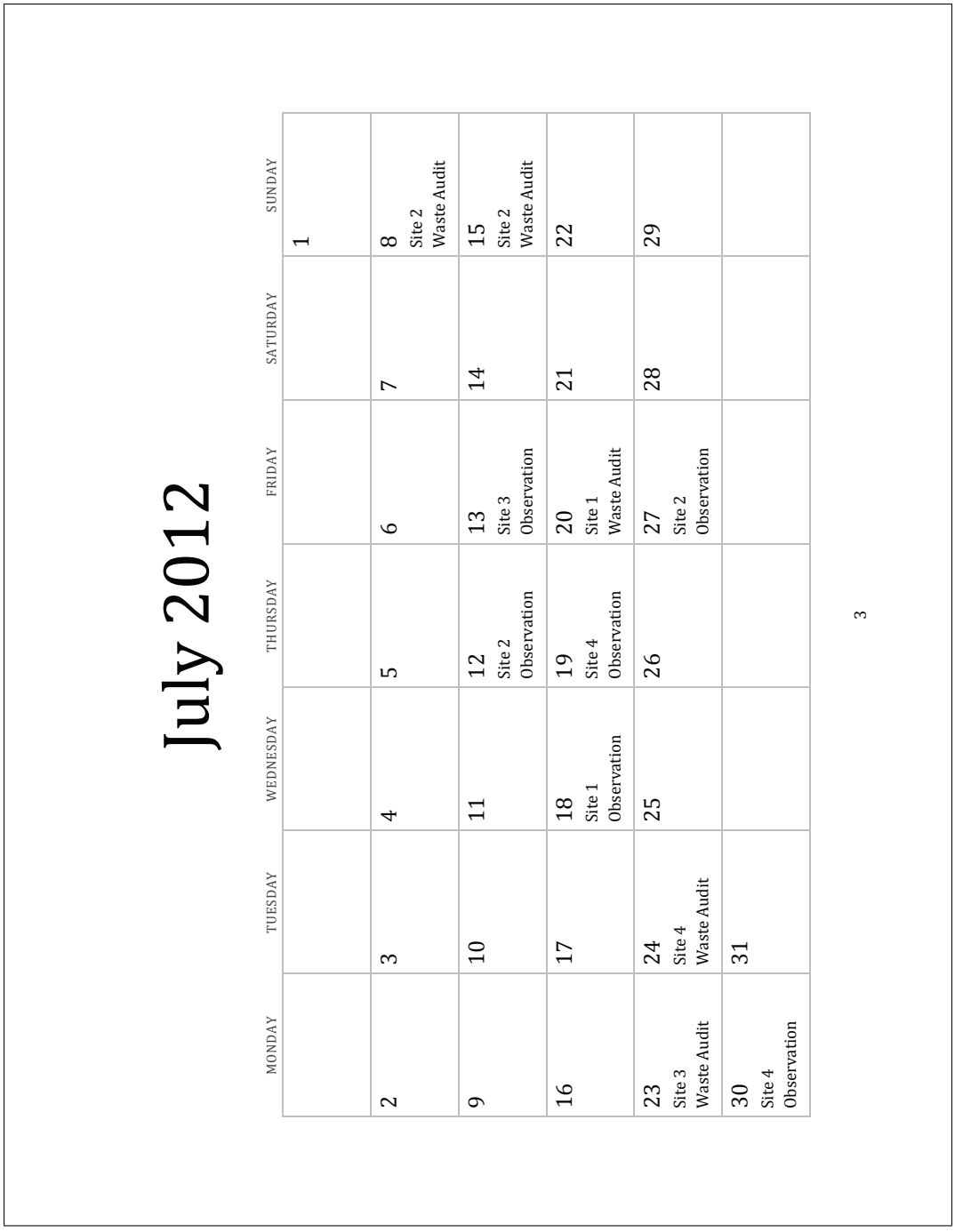

Figure 2.5: Observational sub-study and waste audit sub-study data collection schedule for the month of July2012

data collection process the researcher had the time capacity to distribute and monitor the questionnaire completion process. The management interview sub-study was conducted with the two members of the management team responsible for waste management in their respective organisations when they were available during the time period of May to July 2012.

2.5.4 The novel use of the research design for the investigation of health and social care waste management

This combination of research methods has not been applied before to the study of health and social care waste management. The mixed methods approach has been applied to health services research (Morgan 1998), but not using this combination of research methods in looking at waste management. The result of such a research design is a novel set of findings furthering knowledge regarding health and social care waste management and providing an original contribution to knowledge.

The concurrent triangulation design described in this section provides the researcher with a way to investigate both the stable (intransitive) and subjective (transitive) nature of health and social care waste management while accounting for three main aspects thereof: the system, the organisation and the individual. Using four sub-studies, each of which focuses on different elements of health and social care waste management, these three aspects can be investigated individually while still allowing for their interdependent nature. The concurrent triangulation design finishes with a triangulation or comparison of the data. The findings from each individual sub-study were compared with the other sub-studies to find complementary and contradictory findings as well as providing an overall description of health and social care waste management.

The study described above has been designed with the triangulation process in mind. Each sub-study adds a different but not unconnected perspective of waste management to the study and acts as a building block upon which a theoretical framework was constructed to inform practice and further research. The multi-strategy approach to the research design has resulted in a novel combination of research methods that provided original and useful insights into health and social care waste management.

2.6 Ethical considerations and approval for the project

2.6.1 Ethical considerations

Informed consent

A consent pack was sent to the manager of The Maple, The Beeches and The Pine and to the department managers at The Oak. The consent pack contained; A consent process information sheet, a letter to the site manager, the participant information sheet and participant consent form. An example consent pack is available in Appendix C All employees were asked to sign a consent form giving valid consent to participate in the study. All of the consent forms were collected and held confidentially only by members of the research team. The researcher conducting the observations made themselves available to answer any questions the employees had about the study. If informed consent could not be gained from an employee, the researcher did not collect any data based directly on those employee's actions.

Openness and honesty

Openness and honesty were maintained throughout the study. There was no attempt by the researcher to deceive the participants.

Right to withdraw

The participant information sheet made it clear that the participants had the right to withdraw at any point during the study or once it had finished.

Protection from harm

All necessary and reasonable precautions were taken to ensure that no physical or psychological harm befell any visitor, patient or employee as a result of this study. If any sub-optimal behaviour or unsafe practice was witnessed by the observer whilst on site, the observer intervened to prevent any physical harm and reported the behaviour to the relevant site representative.

The intervention of the observer when instances of sub-optimal behaviour or unsafe practices were observed was ethically necessary to prevent the cross contamination of waste and physical harm to either people or the environment along the chain of disposal. During the observational

sub-study it was necessary for the observer to intervene and provide information about appropriate waste management practices to the employees being observed at the participating sites. This intervention by the observer had implications for the data that was collected during the observational study. The implications of the observers intervention during the observational sub-study will be discussed further in the methods sections of the observational sub-study (Chapter 3 Section 3.2.2 and Chapter 4 Section 4.2.2).

Debriefing

Upon completion of the study a full debrief was provided to all of the heads of the healthcare departments where observations occurred, for dissemination to their employees (Appendix D). The researcher was once again available to answer any questions the participants may have had.

Confidentiality

All of the data collected during the study have been held in accordance with university policy. They remained in a locked filing cabinet and/or on a password-protected computer while the study was active, and this will continue for ten years after the study has been completed. Names are not used in any published material, and individuals are not identifiable. All sites and departments in which the observations take place are identifiable only through pseudonyms in any published material, so complete anonymity will be maintained at all times.

Photography was used as a method of data collection during this study. To ensure complete confidentiality no photographs were taken of employees or patients. Photographs were only taken of objects that were of direct interest to the study within the locations where observations were carried out. Photographs were not taken of any company logos to maintain the anonymity of the organisations participating in this study.

Ethical approval

Ethical approval for this study and all of the sub-studies carried out within the study was granted by Plymouth University's Faculty of Health, Education and Society Ethics Committee. The full ethics application is available in Appendix E and the approval letter is available in Appendix F.

2.7 Conclusion

Summary of the study methodology The mixed methods approach is a complex but incredibly powerful methodology. Operating under a realist paradigm the researcher can investigate the research question in a holistic manner, thereby accounting for the transitive and intransitive nature of knowledge. The search for ideas begins with this philosophical underpinning and is continued in the use of the multi-strategy approach. Using qualitative and quantitative research methods enabled knowledge, understanding and meaning to be generated from the dataset. By focusing on three interdependent aspects of health and social care waste management, the concurrent triangulation design was used to investigate the broad subject of health and social care waste management in a concise and controlled manner. The careful design of the individual sub-studies ensured they investigated different but not independent aspects of health and social care waste management. The research design supported the triangulation process to which the data from the sub-studies were subjected. This original application of a mixed methods multi-strategy concurrent triangulation design yielded not only novel findings but also useful, insightful and descriptive data which formed a solid foundation for the development of a theoretical framework for behavioural change, to improve the effectiveness of waste management at the participating health and social care sites.

Chapter 3

The Observational Sub-Study - Quantitative Findings

3.1 Introduction

The literature highlighted that a more direct measure of health and social care waste management was required (Grose et al. 2012). To that end, a non-participant observational sub-study was designed, to capture the actual waste disposal behaviours being performed, details about the context in which those behaviours were carried out and the individual carrying out those behaviours. The quantitative approach allowed for the collection of systematic data about the waste disposal behaviours being performed at the participating health and social care sites. This chapter provides a report of the quantitative findings from the observational sub-study, while the qualitative findings will be reported in Chapter 4.

In this chapter the quantitative observational research methods will be explained first. This will be followed by the quantitative data analysis, where the analysis methods, findings and a summary of the findings will be presented. A final summary and discussion of the quantitative observational findings will be presented at the end of the chapter.

3.2 Method

3.2.1 Sampling

The quantitative observational sub-study was carried out at all four of the study sites in the south-west of England. To ensure a fair and representative sample, observations were made at two locations at each site (location A and location B), which were identified by purposive

sampling, through the particular site's management and employees, as locations regularly used for the disposal of waste.

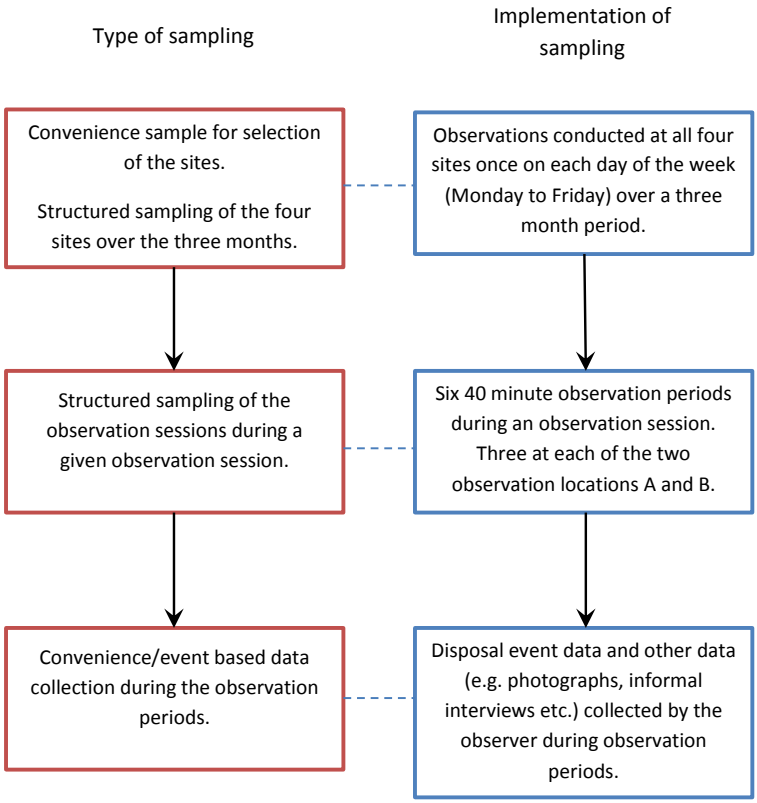

Figure 3.1: Sampling methods and application to the observational sub-study

Figure 3.1 shows the type of sampling applied to the observational study and how that was carried out within the sub-study. Each site was sampled on each day of the week, Monday through to Friday, and these were designated observation sessions (Chapter 2, Section 2.5.3, Figure 2.3, 2.4 and 2.5 for the observation session schedule). The observation sessions took place during the months of May through to July 2012 (inclusive). Every observation session contained six observation periods of 40 minutes. The observation periods were conducted at predetermined times according to the observation period schedule (Appendix H), and three of the observation periods took place at location A and three at location B. Six observation periods of 40 minutes was used to ensure even and fair sampling across the sites, to allow breaks for the

observer and for the observer to travel to and from the sites which varied in distance from the observers home location. The structure of the observation sessions and length of the observation periods were designed to allow the maximum amount of data to be collected while the researcher was on site during the hours of peak activity; this was a purposive sampling method.

3.2.2 Data collection

The observation was overt, so the observer was present and visible in the observation environment. Data were collected every time a waste disposal event occurred within the observation location where the observer was present. A disposal event was defined as 'any action to remove an object from general use for collection by an external party'. Every time a waste disposal event occurred in the presence of the observer, the following data were systematically recorded: the bin in which a piece of waste was disposed of, the type of employee that disposed of the waste, the material the waste was comprised of and whether or not the waste disposal behaviour was appropriate. The appropriateness of a disposal event was defined as being within the context of national and local site waste management policy with specific regard to the facilities available at the particular site. All of the data were tracked using an activity log (Appendix I) in which the site, location, date, time and event were recorded.

Each disposal event was identified by site (The Maple, The Oak, The Beeches or The Pine) and then by location (A or B) with the respective data for the variables – bin type, employee type, material and appropriateness – attached. The categories for each variable were defined as follows:

Bin type: The bin types common to each site were clinical waste bins, domestic (municipal) waste bins and recycling bins. Any bins used to dispose of waste other than these three were included in the 'other' category.

Employee type: The categories in the dependent variable of employee type were care staff, catering staff, housekeeping staff and nursing staff. Employee types other than the four previously mentioned did not occur regularly enough to warrant a distinct category, so they were all included in a category labelled 'other'.

Material: Eleven material categories were found. These were general categories; for example,

the category of plastic includes all types of plastic such as PET, HDPE, PS, etc. The category of 'mixed' materials waste refers to those waste objects comprising more than one material, such as foiled plastic crisp packets and incontinence pads, which are made of multiple fabrics and materials including cotton, plastic and elastic.

Appropriateness: The variable of appropriateness has three categories: appropriate, inappropriate and uncertain. The 'uncertain' category refers to the researcher being unable to ascertain whether the disposal behaviour was correct or incorrect for any reason. This category was most often used when the contamination of a waste with hazardous materials could not be confirmed. Appropriateness was judged based on the availability of bins at a site and the contamination status of the waste.

The categories for each variable were deliberately defined to be simple generalisations which would be easily visually identifiable. They were defined in this way to minimise the possibility of the observer making a mistake and, conversely, to increase the possibility of the observer correctly identifying the data for all four variables. The easier the waste disposal event could be categorised, the more accurate the data would be. All of the categories had to allow for easy visual identification, due to the speed with which the disposal events took place. The observer was familiar with the national and local site-specific policies as well as the disposal facilities available at each site, thus allowing for informed judgements on the appropriateness of the waste disposal events taking place.

A general protocol for categorising the aforementioned factors was described prior to the observational sub-study taking place; however, a complete list could not be provided due to the unknown composition of the waste streams which this study was aiming to investigate. The list of categories presented above was compiled after the completion of the sub-study, in order to facilitate the communication of the sub-study data.

The influence of the observer on employee waste management behaviour

While the observer was carrying out the non-participant observations that contributed to the observational sub-study there were aspects of the sub-study design and the data collection process that influenced the data that was collected. The employees being observed during this sub-study

were fully aware of reason why the observer was present. The mere presence of the observer may have led some employees to alter their waste management behaviour to the potential detriment of the data. The observer was aware that their presence may influence the behaviour of the employees and made an effort to observe the extent to which their presence may have impacted on the data.

During the observation process the observer witnessed instances where employees did and did not change their behaviour due the presence of the observer. Qualitative and quantitative data were collected concurrently during the observational sub-study providing the observer with the opportunity to record detailed instances when employees may have altered their behaviour. An example of an employee changing their behaviour due to the presence of the observer was found at The Oak. Two employees entered the observation area, one carrying an old bunch of flowers. The employee carrying the flowers walked towards the clinical waste bin to dispose of the flowers in that bin. The second employee recognised this as an inappropriate disposal behaviour and made a noise to get the attention of the employee disposing of the flowers. Realising their mistake the employee disposing of the flowers had to search for the domestic waste bin because they were not familiar with its location. After searching the room and finally locating the domestic waste bin the employee was able to dispose of the flowers. In this instance it was obvious to the observer that the employee had altered their behaviour due to the presence of the observer.

Although this change in behaviour impacted on the quantitative data from the observational sub-study it was not to the detriment of the data. This was the only instance when an item of waste was observed being disposed of in the domestic waste bin at The Oak, all other waste was disposed of in the clinical, recycling and other bins. The change in behaviour was obvious and allowed the observer to witness the influence of one employee on another employees waste management behaviour, this episode enhanced the qualitative data collected during the observational sub-study and the overall study findings.

In Chapter 2 Section 2.6.1 the ethical considerations included the need to ensure protection from harm. In the case of health and social care waste management this meant it was necessary

for the observer to intervene should they witness an employee inappropriately disposing of waste in a manner that may have caused harm along the waste management chain. In the context of the observational sub-study this involved the observer preventing the cross contamination of wastes when clinical waste was about to be disposed of by an employee in a bin other than the clinical waste bin. When the observer had to intervene in this manner the inappropriate waste disposal behaviour that the employee was about to perform was recorded by observer. The waste disposal behaviour was recorded in this way because had the observer not been present the inappropriate waste disposal behaviour would have been performed by the employee. The observer did not intervene if the behaviour posed no potential harm to people or the environment through cross contamination or unsafe disposal of waste. This topic will be discussed further in Chapter 4 Section 4.2.2.

3.2.3 Analysis method

In order to describe the waste disposal behaviour of the participating sites, frequency data were first calculated for each variable and then converted to percentages for the location, site and overall total for that particular variable, to allow comparisons to be made between and within the participating sites. Cross-tabulation and Pearson's Chi squared (χ^2) were then used to assess the relationships between independent and dependent variables at the levels between and within all four sites. Interactions between the dependent variables at the levels of across, between and within all four sites were also analysed using cross-tabulation and χ^2. Cramer's V was used as the post-test for the χ^2 tests, on matrices larger than 2x2, as a measure of the effect size. Where the cross-tabulation matrix was of the 2x2 size, the phi coefficient was calculated as the measure of effect size. These post-tests were required to check the reliability of the χ^2 tests and to avoid the incorrect suggestion of a significant relationship where there was no such event. The alpha level for all Pearson Chi squared tests and phi coefficient calculations was set at $p<.05$. The effect size for Cramer's V test was judged using the parameters described by Cohen (1988).

3.3 Results

3.3.1 Overall findings

Bin use for the disposal of waste overall

The most commonly used bin across all four sites ($N = 387$) was the domestic waste bin, with 51% of all waste during the observation being disposed of in this bin. Similar proportions of waste were disposed of in the recycling and clinical waste bins (22% and 20%, respectively). Waste was disposed of in other bins only 7% of the time, accounting for only a small proportion of the total disposal events.

Employee types disposing of waste overall

Across all four sites (N=379) housekeeping staff were observed to perform the most disposal behaviours (32%), closely followed by care staff and nurses (29% and 26%, respectively). Catering staff performed 11% of all observed disposal behaviours and other staff the remaining 2%.

Material composition of the disposed waste overall

In Table 3.1 the percentage of material composition is described inclusive of the waste disposal events across all four sites. Paper was the most commonly observed material being disposed of across the four sites, followed by organic and plastic waste. Mixed material waste and cardboard were less often observed being disposed of than paper, plastic and organic waste. Glass, latex, metal, nitrile, rubber and detergent wipes contributed only a small proportion to the overall waste amount.

Appropriateness of waste disposal behaviour overall

Fifty-five per cent of disposal behaviours performed across all four sites were appropriate and 42% were inappropriate. The observer was unable to verify the appropriateness of 3% of the disposal behaviours performed by employees (N=385).

Table 3.1: Across all four sites the percentage of materials disposed of overall (%) N=385

	Cardboard	Glass	Latex	Metal	Mixed	Nitrile	Organic	Paper	Plastic	Rubber	Wipe
Percentage	9	1	5	1	14	3	19	26	19	0	1

Bin type used to dispose of waste by employee type overall

For the disposal events across all four sites there was a significant relationship between the bin in which waste was disposed of and the employee type disposing of the waste at $\chi^2(12, N = 379) = 152, p < .001$. The effect size, according to Cramer's V, is large at .37. A greater than expected proportion of the disposal events performed by nurses resulted in the waste being disposed of in the clinical and recycling bins. Nurses were less likely to dispose of waste in the domestic waste bin. Care staff were observed to dispose of more waste in the domestic waste bin and to dispose of a smaller than expected proportion of their waste in the recycling bin. The 'other' bins were used by housekeeping staff to dispose of a larger proportion of waste than expected. Clinical waste bins were not observed to be used by catering staff in this respect.

Bin type in which different waste materials were disposed of overall

The distribution of materials being disposed of differed significantly by bin type for the disposal events across all four sites at $\chi^2(30, N = 385) = 315.89, p < .001$. The effect size, Cramer's V, is large at .52. Less paper and organic waste than expected was disposed of in the clinical waste bins, while latex, nitrile, mixed waste and detergent wipes constituted a greater proportion than expected. At the domestic waste bins smaller proportions of cardboard and nitrile were disposed of than expected, and larger amounts of paper were observed. Cardboard and glass waste were more often disposed of in the recycling bins than expected and organic waste less often. More organic waste was observed being disposed of in the 'other' bins.

Appropriateness of the waste disposal by the bin type overall

A significant relationship was found between the appropriateness of the waste disposal behaviour and the bin in which the waste was disposed of for the disposal events across all four sites at $\chi^2(6, N = 385) = 167.34, p < .001$, and according to Cramer's V, the effect size is large at .47. Higher proportions of appropriate disposal behaviours were performed at the clinical, recycling and other waste bins, while a higher proportion of inappropriate disposal behaviours was performed at the domestic waste bins.

Material type disposed of by employee type overall

There was a significant difference in the distributions of the materials disposed of by various employee types across the four sites at $\chi^2(40, N = 377) = 146.74, p < .001$. Cramer's V gave a large effect size at .31. Nurses disposed of the largest proportions of cardboard and glass, along with a smaller than expected proportion of organic waste. Care staff disposed of more organic waste than expected and less cardboard waste. More organic and latex waste was disposed of by housekeeping staff than expected, along with less mixed material, metal and nitrile waste. A larger than expected proportion of plastic, metal and rubber waste was disposed of by catering staff. Other staff disposed of a larger proportion of cardboard waste and a smaller proportion of organic waste than was expected.

Appropriateness of waste disposal by employee type overall

For disposal events across all four sites there was a significant relationship between the appropriateness of the disposal behaviour and the employee performing the disposal behaviour at $\chi^2(8, N = 377) = 36.69, p < .001$. Cramer's V gave an effect size that was moderate at .22. Nurses performed more correct than incorrect disposal behaviours, while care, housekeeping, catering and other staff performed similar proportions of correct and incorrect disposal behaviours. Nurses also performed the largest proportion of disposal behaviours where the appropriateness could not be ascertained.

Appropriateness of the waste disposal by material type overall

There was a significant relationship between the appropriateness of the disposal event and the material being disposed of for the disposal event from all four sites at $\chi^2(20, N = 385) = 229.34, p < .001$. The effect size, Cramer's V, was large at .55. Plastic and paper waste was more often disposed of incorrectly than correctly. Cardboard, organic, mixed, latex and nitrile, however, were more often disposed of correctly than incorrectly, while glass waste was categorised as 'uncertain' appropriateness.

Overall findings summary

Overall – Domestic waste bins received the greatest proportion of waste, followed by the recycling bins, then the clinical waste bins and finally the 'other' bins. The high frequency of domestic bin use at the social care sites makes it the most commonly used bin. The levels of recycling occurring at The Maple and The Oak are responsible for the recycling bin being the second most commonly used bin. With clinical waste being disposed of at all four sites it was expected that the clinical waste bins might be the most commonly used, but in this instance it was only the third most commonly used bin. This is an important finding, as any intervention in health and social care waste management should prioritise the transfer of waste out of the domestic waste stream and into the recycling waste stream, in order to have the greatest impact on recycling rates.

Housekeeping staff were found to be disposing of the largest proportion of the overall waste amount, followed by care staff and then nursing staff. The three most commonly disposed of materials were paper, organic waste and plastic. All three of these materials are highly recyclable, which adds further weight to the argument that health and social care organisations can and should be recycling wherever possible. Waste disposal behaviours were found to be performed appropriately more often than inappropriately overall, and this figure was likely increased due to the higher level of appropriate waste disposal taking place at The Oak.

Relationships between variables – There was a significant relationship overall between the bin in which waste was disposed of and the employee type disposing of the waste. As might be expected nursing staff disposed of more waste in the clinical and recycling bins while disposing of less waste in the domestic waste bins. Care staff conversely disposed of more waste in the domestic waste bins than expected and less in the recycling bins, while housekeeping staff were found to dispose of more waste in the 'other' waste bins than the other staff types.

Different types of material were more commonly disposed of in some bins than others. Latex, mixed waste, nitrile and wet wipes were more often disposed of in the clinical waste bin and paper was more often disposed of in the domestic waste bin than was expected, while cardboard and nitrile were less often disposed of in this bin type. The 'other' bins received more organic

waste than was expected, and the recycling bins were observed to have more glass and cardboard than expected.

It was at the clinical, recycling and 'other' bins that a greater proportion of appropriate waste disposal behaviours was observed and at the domestic waste bins a greater proportion of inappropriate disposal behaviours.

The types of material that were observed being disposed of varied by employee type overall. Nursing staff more often disposed cardboard and glass while disposing of less organic waste. Care staff were found to dispose of more organic waste and less cardboard than other material types. Housekeeping staff also disposed of more organic waste than expected but also disposed of more latex waste while disposing of less mixed, metal and nitrile waste. Plastic, metal and rubber waste was disposed of in larger proportions than expected by catering staff, while 'other' staff were found to have disposed of more cardboard but less organic waste than expected.

Nursing staff were found, overall, to have performed more appropriately than inappropriately regarding disposal behaviours. Care, housekeeping, catering and 'other' staff all displayed a similar pattern, performing equitable proportions of appropriate and inappropriate disposal behaviours.

Some materials were disposed of with different levels of appropriateness. Plastic and paper waste was more often than expected disposed of inappropriately, while cardboard, organic, mixed, latex and nitrile waste was more often observed being disposed of appropriately.

3.3.2 Comparison between the sites

Comparison between the sites of the bin use for the disposal of waste

The distributions of the bin type used to dispose of waste were significantly different between the sites at $\chi^2(9, N = 387) = 209.7, p < .001$. The effect size for this finding, Cramer's V, was moderate, .26. At The Maple, The Beeches and The Pine, the social care sites, waste was most often disposed of in the domestic waste bin (61%, 57% and 82% respectively). This is consistent with the finding for the total bin use across all four sites. The healthcare site, The Oak, differed, in that the largest proportion of the waste was observed to be disposed of in the

recycling bin (63%) and the least in the domestic waste bin (2%). Disposal in the recycling bins at The Beeches and The Pine accounted for the lowest proportions of waste being disposed of (4% and 1%, respectively). At The Maple the recycling bins were the second most common disposal point, accounting for 15% of the waste disposed of at that site. The clinical waste bins were the second most common disposal point at The Oak, The Beeches and The Pine (34%, 35% and 14%, respectively) but the least common disposal point at The Maple (10%). No waste was observed to be disposed of in other bin types at The Oak. At sites The Maple, The Beeches and The Pine other bins were used to dispose of waste 13%, 4% and 3% of the time, respectively.

Comparison between the sites of the employee types disposing of waste

The distribution of the employee types performing disposal behaviours differed significantly across the four sites at $\chi^2(12, N = 379) = 416.17, p < .001$, and the effect size, Cramer's V, was large at .61. Waste disposal behaviours at The Maple were most often performed by housekeeping staff (55%). At The Oak housekeeping staff performed only 9% of waste disposal behaviours. The proportions of housekeeping staff performing disposal behaviours at The Beeches and The Pine were similar (28% and 22%, respectively). It was care staff who performed the most waste disposal behaviours at The Beeches and The Pine (73% and 64%, respectively), and at The Maple they performed only 11% of waste disposal behaviours. At The Oak nurses performed the largest proportion of waste disposal behaviours (89%), while at The Maple they performed 26% of disposal behaviours and only 11% at The Pine. Other staff performed the lowest proportion of waste disposal behaviours at The Maple, The Oak and The Pine (4%, 2% and 3%) and none at The Beeches.

Comparison between the sites of the materials comprising the disposed of waste

The data in Table 3.2 show the percentage of materials disposed of at each of the four sites. The most often disposed of material at The Maple, The Oak and The Pine was paper. Organic waste was also disposed of most often at The Pine and was the most often disposed of material at The Beeches. The second most commonly disposed of material at The Oak was cardboard. Plastic and mixed material waste accounted for considerable proportions of the waste disposed

Table 3.2: The percentage of materials disposed of by site (%) The Maple N=148, The Oak N=93, The Beeches N=51 and The Pine N=93

	Cardboard	Glass	Latex	Metal	Mixed	Nitrile	Organic	Paper	Plastic	Rubber	Wipe
The Maple	6	0	6	3	10	0	23	26	25	1	0
The Oak	25	3	1	0	15	7	1	27	16	0	4
The Beeches	0	0	6	0	20	10	23	22	18	0	2
The Pine	4	0	7	1	15	1	29	29	13	0	0

at all four sites. The materials being disposed of at each of the four sites formed significantly different distributions at $\chi^2(30, N = 385) = 110.03, p < .001$, while the effect size, Cramer's V, was large at .31. These differences were mainly due to a larger than expected proportion of the waste at The Maple being composed of plastic. More cardboard than expected was disposed of at The Oak and less at The Beeches and The Pine. Very little organic waste was disposed of at The Oak and more than expected at The Pine. The largest proportion of metal was disposed of at The Oak. A smaller proportion of latex was disposed of at The Oak than any of the other three sites. Larger proportions of nitrile were disposed of at The Oak and The Beeches, while a smaller than expected proportion of this material was disposed of at The Maple. Finally, glass was only observed being disposed of at The Oak, and more detergent wipes than expected were observed being disposed of at The Oak.

Comparison between the sites of the appropriateness of waste disposal behaviour

The distribution of the appropriateness of disposal behaviour varied significantly by site at $\chi^2(6, N = 385) = 52.32, p < .001$. According to Cramer's V, the effect size was moderate at .26. At The Maple 51% of the disposal behaviours observed were inappropriate and 49% were appropriate. The observer was unable to establish the appropriateness for 1% of the disposal behaviours. A similar pattern was observed at The Beeches, where more inappropriate (57%) than appropriate (43%) disposal behaviours were observed. The Pine produced equal amounts of appropriate and inappropriate disposal behaviours, 49.5% for each category. One per cent of the disposal events at this site was classified as uncertain. In contrast to The Maple, The Beeches and The Pine, there were more appropriate (77%) than inappropriate (14%) disposal behaviours observed at The Oak, and the observer was unable to classify 9% of the disposal events.

Summary of the comparison between the sites

The domestic waste bin was the most commonly used bin for waste disposal at The Maple, The Beeches and The Pine but the least often used bin at The Oak. At The Oak the most often used bin for the disposal of waste was the recycling bin, and conversely at The Beeches and The Pine the recycling bin was the least often used. As discussed in the previous sections of this chapter

the novelty of the recycling system at The Oak may have increased the salience of recycling and the use of the bins for the employees, thus increasing their use of this bin type. The recycling systems at The Maple, The Beeches and The Pine had been in place for a longer period of time. It is possible that some form of adaptation to the recycling system at these sites resulted in their being less frequently and effectively used. The clinical waste bin was the second most commonly used bin at The Oak, The Beeches and The Pine but received the smallest proportion of waste at The Maple.

Differences were found between the sites for the type of employee responsible for disposing of the largest proportions of waste. At The Maple housekeeping staff disposed of more waste than the other employee types, at The Oak it was nursing staff who were observed disposing of the largest proportion of waste and at The Beeches and The Pine care staff accounted for this action. It would appear that one employee type is responsible for performing more waste disposal behaviours than the other employee types, but employee type does vary between the sites. This variation between the sites could possibly be due to the individual organisation of employee work roles at a given site and the health/social care activities occurring.

The most commonly disposed of material at The Maple and The Oak was paper, at The Beeches it was organic waste and at The Pine both paper and organic waste. The waste at The Maple comprised a larger proportion of plastic than the other three sites. The Oak was found to have a larger proportion of cardboard waste than the other sites, and at The Pine a larger proportion of the total waste amount was organic. While the exact distribution of the materials disposed of at each site did vary, the most commonly disposed of materials were similar across the four sites. Paper and organic waste are highly recyclable, which indicates that there are large amounts of recyclable waste being produced at all four sites and that improved recycling would be beneficial.

At The Maple, The Beeches and The Pine a similar pattern in relation to the appropriateness of waste disposal behaviours was found, whereby approximately equal amounts of appropriate and inappropriate behaviours were performed. At The Oak this pattern was not found, and more disposal behaviours were classified as appropriate than as inappropriate. The difference

in the appropriateness of the disposal behaviours between the social care and the health care site may be due to the recency with which the recycling system had been implemented. It might also arise from a number of other differences which have been identified and will be discussed during the presentation of the qualitative findings from the observational sub-study in Chapter 4 and further discussed at the data triangulation phase in Chapter 8.

3.4 Discussion

3.4.1 Bin Use

At the social care sites the domestic waste bins were most commonly used by employees to dispose of waste. A large amount of the daily activity at the social care sites centred around the food preparation areas, which is why they were chosen as observation locations at The Maple, The Beeches and The Pine. Clinical waste bins were not present in the food preparation areas, and only at The Maple was a plastics recycling bin present. At The Beeches and The Pine the employees stored the waste they intended to recycle on the worktops and then took it to a central recycling point on site. The easy accessibility of domestic waste bins and the food preparation activities carried out at one of the observation locations would account for the high frequency with which waste disposal events took place at the domestic waste bins at The Maple, The Beeches and The Pine.

Inappropriate waste disposal events occurred at the domestic waste bins of The Maple, The Beeches and The Pine because recyclable waste was being disposed of in the domestic waste bins. Improved accessibility to recycling bins would possibly improve recycling rates at the social care sites. This would alter employee behaviour, by allowing them to dispose of recyclable waste in a nearby recycling bin instead of the domestic waste bin, which was observed to be the easiest behaviour for them to perform.

The recycling bins were the most commonly used bin type at The Oak, where the recycling system had only recently been introduced prior to the start of the study. This recency may have introduced an element of novelty for the employees, in that if the recycling bins were new, they might have been more interested in using them. The types of bin that were present in

the observation locations at The Oak may also have impacted on the employees' waste disposal behaviour. At one location only a clinical waste bin and recycling bins were present, while at the other observation location a domestic waste bin was present but it was obscured under a worktop behind other equipment. It would have been useful in this study to use observation locations where domestic waste bins were both present and prominent, as this would have provided a more accurate representation of employee use of domestic waste bins at this site. This limitation is partially mitigated by the inclusion of a waste audit in this study which includes an assessment of the domestic waste composition at The Oak (5).

The findings of this sub-study showed variations in the use of recycling between the three social care sites. At The Maple the recycling bins were the second most commonly used bin type, but at The Beeches and The Pine they were the least commonly used. This finding appears to be linked to the finding that the clinical waste bins were the least commonly used bin type at The Maple and the second most commonly used bin type at The Beeches and The Pine. The Maple, The Beeches and The Pine were operated by the same organisation, but the physical layout and the operational structure of the sites were different.

At The Beeches and The Pine clinical and domestic waste bins were present in the immediate working area of the employee, but as mentioned above they had to take their recyclable waste to a central recycling point away from their immediate work area. Due to the nature of the work the employees could not leave their working area to dispose of recyclable waste at the central disposal area unless another employee was present to monitor the residents under their care. The lack of recycling facilities in the immediate vicinity of the employee therefore required them to store recyclable waste on the worktops. As will discussed in the presentation of the qualitative findings from the observational sub-study in Chapter 4, employees at The Beeches and The Pine were reluctant to store recyclable waste in this manner, because they believed it made their work area look messy and it took up space.

At The Maple, because all food preparation and disposal took place in the central kitchen, there were some recycling facilities immediately available to the employees, which most likely increased the rate of recycling at this site. The central recycling point for The Maple was at

the other observation location. These facilities were used by housekeeping staff to dispose of recyclable waste that had been collected at other points around the site and transported to the recycling bins. The findings indicate that the care staff at The Maple dealt mainly with clinical waste, while it was the housekeeping and catering staff who dealt with domestic, recycling and other waste. At The Beeches and The Pine, due to the segregated dining arrangements and placement of the bins, care staff were required to dispose of clinical, domestic and recyclable waste. Considering the activities and organisation of employee duties would help increase recycling rates when implementing a waste management system. Consideration of these factors would also inform site management about the requirements for the placements of the various bin types.

The clinical waste bins were the second most commonly used bin type at The Oak. This finding, together with the findings that the recycling bins were the most commonly used bin type and domestic waste bins the least commonly used bin type, indicate that domestic waste bins are not essential in the health and possibly social care settings, as they are only required for the disposal of non-recyclable waste. If all equipment and packaging is manufactured from recyclable materials, and if it is not contaminated with potential infectious material, it could be disposed of in a recycling bin. If the equipment is contaminated with potentially infectious material, it would be disposed of in a clinical waste bin. Should the procurement of equipment be carried out with higher priority consideration given to the recyclability and general disposal of the equipment after use, then the domestic waste bin could be removed from the health and social care settings.

3.4.2 Who was disposing of the waste?

The proportions of waste disposed by the different employee types at The Maple and The Oak varied between the sites. At The Beeches and The Pine the opposite was found to be happening, whereby the proportions of waste disposed by the different employee types was similar between the two sites. As mentioned in the section above, the physical and organisational structures of The Beeches and The Pine were similar to each other. The finding that the employees disposing of waste at The Maple and The Oak was significantly different to The Beeches and The Pine indicates that the physical and organisational structure will influence the way in which waste is

disposed of in health and social care settings.

Differences in waste disposal, depending on the activities being performed in a certain department and the employees disposing of waste in those areas, have implications for employee waste management training. If different employees dispose of different waste in different areas, they will require waste management training that is tailored to the waste disposal tasks they are performing. Different employee types were also found to be disposing of different material types and using some bin types more regularly than others. These findings further confirm that different employees dispose of different types of waste in different proportions. This variability in waste management behaviour should be accounted for by the health and social care site when implementing a waste management system and waste management training. Tailoring employee waste management training will also provide the employee with information specific to their employment role and the types of waste management decisions they face on a daily basis, thereby increasing the chance of appropriate waste disposal being performed.

3.4.3 The disposal of different materials

The material compositions of the waste did vary across all four sites. The most commonly disposed of materials were similar across all four sites and were also the most recyclable material types: paper, cardboard, plastics and organic waste. This finding demonstrates the high potential for recycling in health and social care settings. Recycling is a worthwhile process for health and social care organisations to adopt because it targets the most abundant types of waste being produced. These findings show that effective waste management that includes recycling has the potential to reduce dramatically the amount of waste being disposed of through other financially and environmentally more expensive waste streams.

The need for effective waste management is highlighted by the finding that the most commonly disposed of material types were also most often disposed of inappropriately. There appeared to be an issue with the knowledge employees had about recycling in the workplace, particularly knowing what to recycle and when to recycle it. A common issue that was observed was with the disposal of paper hand towels. These were often disposed of in the clinical waste bins or domestic waste bins. Paper hand towels are normally recyclable, but employees were not aware

of this and many thought that they had to be disposed of in clinical waste bins. Plastic waste, such as milk cartons and food containers, was also often disposed of in the domestic waste bins. These items were highly recyclable, but employees did not appear to be aware of the need to recycle them at all. This inappropriate waste disposal behaviour may have resulted from the employees' uncertainty about the recyclability of the waste or a lack of concern about the need to recycle. Factors influencing the disposal of the waste that relate to the employee will be discussed further in the presentation of the qualitative findings from the observational sub-study in Chapter 4 and successive chapters.

3.4.4 The appropriateness of the waste disposal behaviour

The appropriateness of the waste disposal behaviour was a novel measure used in this sub-study. This observational method enabled the researcher to assess the context in which the disposal of waste was performed, thus allowing for an accurate measure of the appropriateness of the disposal behaviour to be used.

Employees at sites The Maple, The Oak and The Beeches performed similar amounts of appropriate and inappropriate waste disposal behaviours, and this finding was consistent across the three sites. There appeared to be a lack of accurate knowledge amongst the employees about what waste could be recycled and little information provided in the form of guidance notices at the point of disposal. These findings highlight the need for the waste management training and the continued provision of information through guidance at the point of disposal. Putting a recycling bin in the health and social care settings is not sufficient to elicit appropriate waste management behaviour from employees.

At The Oak more appropriate than inappropriate waste disposal behaviour was observed overall. This might have been due to more information being provided to employees in the form of guidance notices at the point of disposal and the recent introduction of the recycling system making employees more aware of their waste management behaviour. The high levels of appropriate waste disposal behaviour were not consistent across the two observation locations at The Oak. In one location employees were aware of trying to perform appropriate waste disposal behaviour, especially recycling, but at the other location employees made use of the clinical

waste bin for the disposal of domestic waste.

At the observation location, where high amounts of appropriate waste disposal behaviours were observed, employees still demonstrated a high degree of uncertainty about appropriate waste disposal practice. They would go to dispose of waste in the inappropriate bin and the observer had to intervene, or they would ask the observer for advice about how to dispose appropriately of the waste. These scenarios often occurred when the employees were deciding whether or not an item of waste was recyclable. These scenarios and the factors influencing employee waste disposal behaviour are discussed further in the qualitative findings from the observational sub-study (Chapter 4) and successive chapters.

3.4.5 Conclusions

Waste management is a complex system and process to understand, as highlighted by the variability in waste disposal behaviour across sites and departments within the same site. If waste management is to be effective, employees should be able to access the necessary waste bins within close proximity. A better understanding of how to distribute different types of waste bins throughout a site can be gained through consideration of the activities being performed in different areas, how those activities are being performed by different types of employees and the materials being disposed of.

To help improve the effectiveness of health and social care waste management, employees would likely benefit from waste management training, which should be tailored to the activities performed by the different employees and the department in which they work. This tailored training should be based on the types of waste the employee will encounter during their daily workplace activities. Guidance at the point of disposal would help the employee to remember what they were taught during their waste management training and continue to perform effective waste management behaviours during their normal workplace activities.

Chapter 4

The Observational Sub-Study - Qualitative Findings

4.1 Introduction

In addition to the quantitative findings from the observational sub-study (3), which provided direct, systematically collected evidence regarding the disposal behaviour of health and social care employees, a more detailed insight into the perspective of the employee performing that behaviour was required. The qualitative aspects of the observational sub-study were designed to provide this insight into how the health and social care employee thought about waste management, how they acted on their individual perspective and if there were any common factors that applied to the employee-waste management behavioural system. The quantitative part of the observational sub-study sought to uncover generalised patterns of behaviour across the sample, while the qualitative aspects of the observational sub-study sought to complement this by investigating the behaviour and psychology of the individual. Furthermore, this sub-study also aimed at capturing data relating to the influence of the physical environment and the physical waste management system on the behaviour of the employee.

This chapter will begin by reporting on the qualitative methods and the sampling technique used in the observational sub-study. The data analysis method will then be explained and illustrated through the use of examples. The sub-study findings will then be presented individually for each site, which will be followed by a general interpretation of the amalgamated data from all four sites and a discussion of the findings.

4.2 Method

The consolidated criteria for reporting qualitative research (COREQ) 32-item checklist (Tong et al. 2007) was completed for this study and can be found in Appendix G.

4.2.1 Sampling

The qualitative aspect of the observational sub-study took place at all four sites in the south-west of England that participated in this study. One was a private healthcare site (The Oak) and three were publicly-funded social care sites (The Maple, The Beeches and The Pine). They are referred to in this study in the same way as Chapter 3 where the quantitative findings from the observational sub-study were presented. The Maple was a residential care home that had recently changed to a nursing care home. The Beeches was a residential care home and The Pine was a nursing care home. The qualitative side of the observational sub-study was carried out at the same time as the quantitative part of the observational sub-study, so the same site and location sampling schedule was used as that reported in Chapter 3, the observation session schedule is available in Chapter 2, Section 2.5.3, Figure 2.3, 2.4 and 2.5. Observations were again made in the same two locations at each site (location A and location B) as those used for the quantitative part of the observational sub-study. The observation periods were conducted using the same schedule as presented for the quantitative side of the observational sub-study, which can be found in Appendix H.

4.2.2 Data collection

The observation was conducted overtly, with the researcher present in the observation environment and the participants aware of the researcher's presence. The researcher/observer responsible for the data collection and analysis was the author of this thesis. The observer used five methods of data collection during the observational sub-study.

1. The waste disposal event data were included in the analysis of the qualitative data from the observational sub-study. This is the same data as was used for the quantitative analysis. These data were included to provide details about the waste being disposed of by the employ-

ees, which was of particular use when discussions occurred with the employees about the waste being disposed.

2. Informal interviews were conducted with employees during the observation periods, with the aims of gathering additional information regarding specific disposal events and capturing information on the employees' opinions and understanding of waste management at their site and as a general topic. An example interview transcript is available in Appendix J. These informal interviews were recorded using a dictaphone and transcribed by the observer.

3. Diagrammatic sketches of the observation locations were made by the researcher, to provide information regarding the physical environment and specifically the spatial layout of the waste management equipment at any given location. An example diagrammatic sketch can be found in Appendix K.

4. To provide a more detailed account of the observation location, waste management equipment and any related objects of potential interest, the researcher took photographs on an ad hoc basis. An example of such a photograph can be viewed in Appendix L.

5. Any data that could not be captured using the methods described thus far were written down in the form of field notes. An example of the field notes taken during the study can be found in Appendix M.

All of the data were tracked using an activity log (Appendix I) in which the site, location, date, time and event were recorded.

The influence of the observer on employee waste management behaviour

The qualitative data collected during the observational sub-study data was subject to the same potential observer influences as the data, discussed in Chapter 3 Section 3.2.2. The qualitative data from the observation captured more detailed information about health and social care employee waste management behaviour when they changed or attempted to change their behaviour. Some employees did try to change their behaviour and these changes varied in their level of success. There were instances when the employees did not or could not alter their behaviour.

An example of an employee attempting to change their behaviour but being unable to do so was observed during the disposal of a hand sanitiser container. The employee entered the observation location seeking to dispose of an empty hand sanitiser bottle. The employee looked to the observer and asked if the observer knew how the bottle should be disposed of. The employee stated that they were unsure how to dispose of the waste because it might have had hand sanitiser residue inside. The observer responded by saying that the employee should dispose of the waste as they normally would. At this point the employee did not know how to dispose of the waste so they put it on the worktop and said to the observer that if the waste was left their somebody else would dispose of it. In this example the employee questioned their waste management behaviour because of the presence of the observer but did not have sufficient knowledge to be able to carry out the appropriate waste management behaviour.

The example of the employee being unable to dispose of the empty hand sanitiser bottle occurred at the beginning of the data collection period for this sub-study and it left the observer with a dilemma. If employees at the participating sites did not have sufficient waste management knowledge to appropriately dispose of the waste and they sought advice from the observer, the observer had to decide whether or not to provide advice. Providing waste management advice to employees could have altered their behaviour and negatively impacted on the data. However, by not providing waste management advice when asked the observer risked facilitating inappropriate and potentially unsafe waste management behaviour.

The observer decided that the best way to resolve this dilemma was to provide waste management information to employees who requested help disposing of waste. All of the exchanges between employee and observer were recorded through the various data collection methods used during the observational sub-study. By providing waste management information to employees when it was requested, the observer was able to gather data about the gaps employees had in their knowledge about waste management. Choosing to provide waste management information to employees allowed the observer to ensure that waste management practices were carried out in a safe manner and gather additional data about employee waste management knowledge.

4.2.3 Qualitative analysis method

Coding the data for thematic content analysis

The analysis method used in this sub-study was a thematic content analysis. Although thematic content analysis is not a theoretically based analysis method it is useful to explicitly state the epistemology and process carried out during the analysis (Braun and Clarke 2006). The qualitative analysis of the observational data was carried out under the realist epistemology adopted by the current study as outlined in Chapter 2. The data coding and theme development process used to analyse the data is described in the remainder of this section.

The raw data (field notes, photographs, diagrammatic sketches and interview transcripts) were uploaded into the NVivo 9 qualitative data management package. This allowed for practical single-point management of the data and subsequent coding. Table 4.1 shows the number of each type of data collected overall and for each site. The researcher went through the data for each site in chronological order, using the activity logs as a guide and descriptively coding each piece of data. The descriptive codes used by the researcher were designed to reflect the data accurately and concisely.

Table 4.1: Frequency of data types collected at each site

	The Maple	The Oak	The Beeches	The Pine	Total
Field notes	46	78	60	76	260
Informal interviews	27	31	18	22	98
Disposal events	113	72	49	78	312
Photographs	34	73	27	65	199
Diagrammatic sketches	6	2	11	13	32
Site total	226	256	165	254	901

Example 1 is taken from a conversation the researcher had with an employee regarding the procedure for the re-use of medication cups. The employee stated that they hoped the procedure had not changed in the short period of time they had been away. The descriptive code applied to this statement reflects the fact that the employee knew what the procedure had been before they went away but was uncertain whether or not it had changed in the two-week absence period.

Example 1

"I know I've been away for two weeks, but that's what we were doing. So I hope that's what we're still doing."

Descriptive code

'staff member expresses uncertainty about procedure change while [they have] been away for two weeks'

Extract from Tran_A6_Site 1_S2

Over two thousand descriptive codes were generated for the four qualitative datasets. To manage effectively such a large number of descriptive codes the researcher categorised them into a number of primary and sub-categories. The categories represented superficial relationships between the codes, e.g. contamination, recycling and the waste disposal point. This method of categorisation ensured similar codes were, for the most part, grouped together.

The researcher then went through each category in turn and analytically coded the data from the descriptive codes already present. This stage of analytical coding attempted to encapsulate the ideas, beliefs, behaviours and opinions observed in more generalised terms, bringing together codes that were conceptually close together.

The analytical code in example 2 captures an attitude displayed by nursing staff regarding the recycling of waste. The descriptive codes underlying the analytical code draw on nursing staff stating that they do not like disposing of waste that can be recycled by other means, waste contractors should do more to make recycling easier and that they want to be able to recycle more waste.

Example 2

Analytical code

'nursing staff think more waste should be recycled'

Descriptive codes

'thinks it would be a shame to be throwing away things that can be recycled'

'view that waste contractors should do more'

'want to recycle more'

The primary themes were then drawn out of the data through the analytical codes. Working

through the analytical codes using an inductive approach the researcher sought to understand the concepts and constructs that ran through subsets thereof. The primary themes represent these general constructs and concepts, with each logically following on from the analytical codes underpinning them. A diagram displaying an example of the coding process inside the Nvivo 9 software package is available in Figure 4.1. Coding checks were performed by three individuals who did not participate in the data collection or analysis process. The coding check process sought to ensure that the descriptive codes, analytical codes and primary themes all followed on logically from each other.

Appendix N describes the method by which the prevalence of the primary themes within the data was determined. This method was used to decide on the order in which the primary themes were structured in the coding models for each coding model.

4.3 Findings

4.3.1 Findings from the The Maple

Ten primary themes were derived from the observational data from The Maple and the coding model for The Maple is shown in Figure 4.2. The aim of this sub-study was to observe the waste management practice taking place, so it should not be surprising that the first primary theme is titled 'Practice'. This theme includes the employees describing waste management practices, what they think about current practices and if and how they think waste management practices could be changed.

The level of priority employees attributed to and the concern they displayed about waste management came through in the data from a number of sources. Employees displayed a positive attitude towards recycling, indicating concern about waste management. Some employees were also concerned to hear of their peers carrying out inappropriate waste management behaviours, which highlights their concerns about poor waste management behaviour.

I: "Why, have you seen somebody not doing that?"

O: "A couple of instances of people taking gloves off and putting them in their pockets."

I: "Aaaahhhh. Had they actually been touching the clinical waste?"

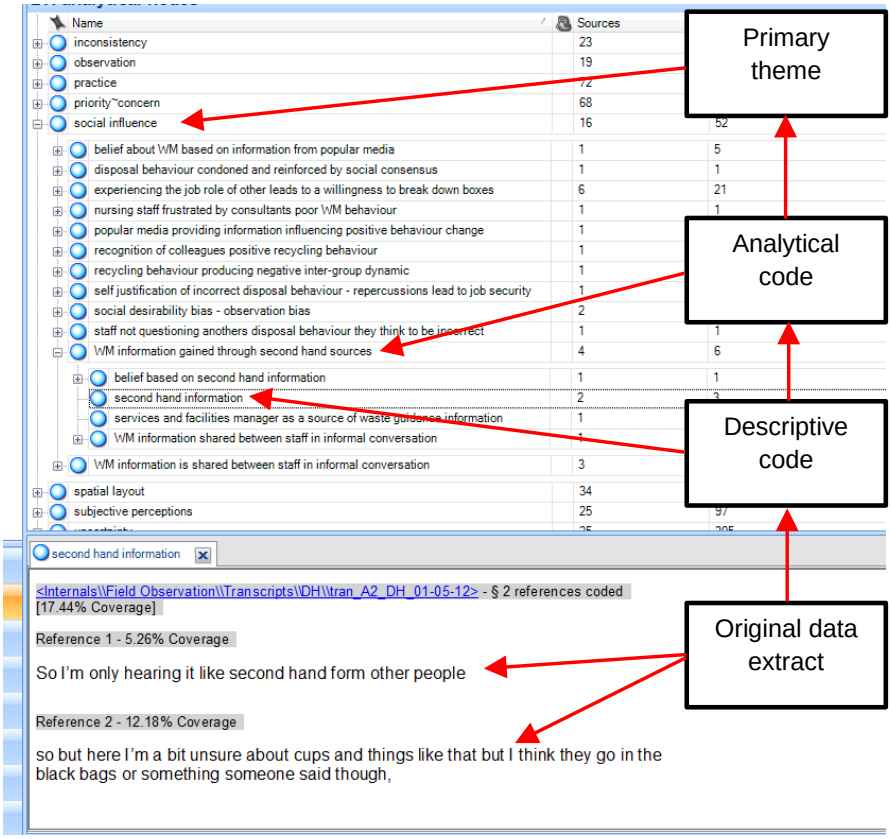

Figure 4.1: An example of the thematic content analysis data coding process within the Nvivo 9 software package

O: "Yeah."

I [exasperated sigh]: "Oh God." *(Tran_A4_The Maple_S2)*

Employees took the time to separate food waste from domestic waste while clearing crockery at meal times. Food waste was put into one tub and domestic wastes into the other. While this separation of was not perfect due to recyclable wastes being disposed of alongside domestic wastes it did show that employees were trying to produce less domestic waste. In this instance they prioritised the reduction of food waste that was being disposed of in the domestic waste

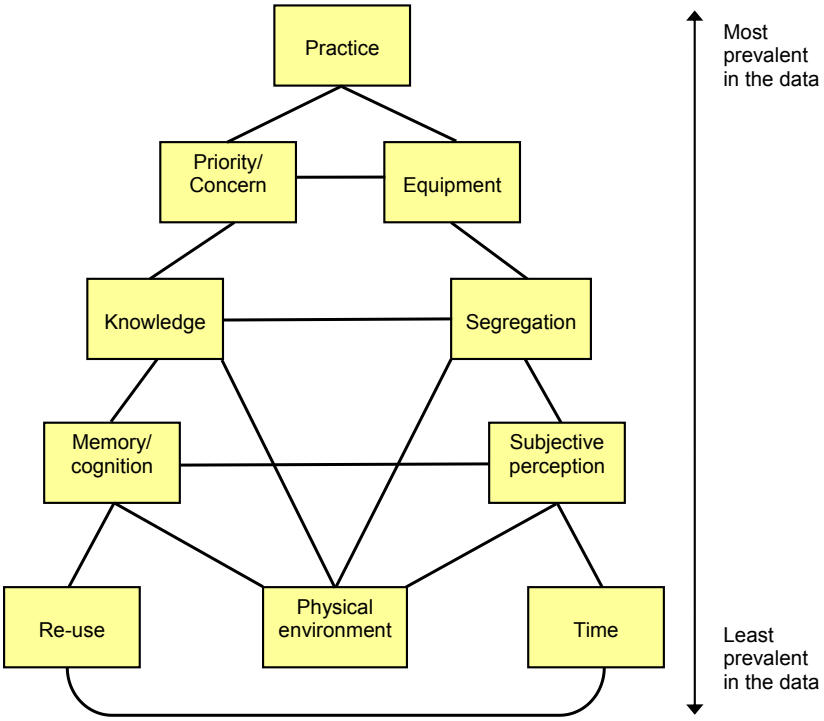

Figure 4.2: Site 1 coding model

stream.

Pictorial guidance notices were observed affixed to some waste bin lids (see Fig 4.3), which was the main form in which knowledge about waste management was provided to employees in the workplace setting. There was a lack of in-situ guidance notices available to aid employees in making waste disposal decisions.

Figure 4.3: Information sticker on the top of a Clinical waste bin at The Maple

Employees appeared to hold stereotypical beliefs regarding waste management – and this knowledge was not always correct; for instance, they believed that all waste coming from a patient's room was domestic waste. This was an incorrect assumption to make, as the observer had witnessed personal protective equipment (PPE) that was worn during a procedure where contamination may have occurred being disposed of in the domestic waste bin. In this instance the knowledge of the individual collecting the waste from the bin was incorrect as well as the assumption made by the individual that it was suitable to dispose of that potentially contaminated waste in the domestic waste bin. This example highlights the importance of the correct segregation of waste at the point of disposal.

The segregation of waste at this site was aided at one point by the use of a sub-system. Waste would be pre-sorted into two waste streams prior to disposal. The sub-system provided a point of disposal in close proximity to the user during a repetitive task. The employees using this

system were able to ensure waste was correctly sorted prior to eventual disposal, and time was saved by reducing the need to travel between their work area and the bin more than was necessary. This is an instance where only two different waste types were being segregated, but at The Maple the researcher observed ten, including three types of recyclables, crockery and glass (broken and unbroken), vegetable waste and milk carton lids.

Such a large number of disposal and segregation decisions can be taxing for the individual, and they may have been made even more cognitively taxing when the waste was comprised of more than one material, either as a result of the manufacturing of the object or the object's use. Another example of how waste management is linked to the cognition of the individual is in the time required for the individual to adapt to a new system of working. Recycling had been in place at The Maple for over three years. When asked if somebody had told employees to recycle, one employee replied, "No, it's just automatic". This may indicate the development of habitual decision making or decision-making heuristics over time. The development of such time-dependent waste disposal behaviours was further highlighted when employees acknowledged a behaviour as wasteful and unnecessary but they did not change this behaviour. It appeared that the individual may be justifying the continuation of the behaviour through their own subjective reasoning.

The individual's own subjective perceptions of the world seemed to influence their understanding of their work environment and waste management. The observer asked employees whether they thought there was anything they could do to improve recycling at the site. On one occasion an employee replied "Yeah, all the stuff that can be recycled is normally recycled" *(Tran_A1_The Maple_S5)* even though not everything that could be recycled was being recycled. A more specific example of the individuals' subjective perceptions impacting on their waste management behaviour highlighted the disposal of re-usable equipment. The employee stated they would dispose of the re-usable equipment "When I didn't fancy washing them up, because they're too dirty – that's what I do." *(Tran_A6_The Maple_S2)*, while other employees would only throw re-usable equipment away "... if there's anything wrong with them." *(Tran_A6_The Maple_S2)*.

Re-use was a concept that was prevalent at The Maple. Local opportunities for re-use were implemented at this site, including the collection of empty glass jars for a local resident and utilising appropriate waste organic materials as animal feed. The re-use of waste was not always appropriate or carried out correctly, which was exemplified by the disposal of re-usable equipment should the effort of correct decontamination be too high, as discussed above, and the use of an inappropriate container to distribute fluids to patients.

These examples of the inappropriate re-use of waste may be the result of behaviours that have developed over time and not been rectified – as one employee remarked, "... because they do fall into bad habits." *(Tran_A4_The Maple_S2)*. It may be that time was also a factor in the maintenance of wasteful behaviours, as one employee stated: "We've just used them for years, I suppose." *(Tran_A1_The Maple_S2).*

One method an organisation can use to prompt its employees to remember to perform specific waste disposal behaviours is the use of guidance notices in close proximity to waste disposal locations. At this particular site there was a lack of waste management-related guidance notices. In this way the physical environment of the health and social care site may impact on the waste management behaviour of the individual.

4.3.2 Findings from The Oak

At The Oak, 14 primary themes were derived from the data and figure 4.4 shows the coding model for The Oak. Again, 'practice' was the most frequently coded primary theme, and all of the other primary themes are connected to it.

The employees at The Oak appeared to display greater concern about and give a higher priority to disposing of waste contaminated with blood, with one employee stating that "Obviously, because it is blood, we have to do it in extra, extra, um, infection control and that." *(Tran_A3_The Oak_S1)*. The observer, however, did observe instances when very small amounts of blood had escaped the employees notice and contaminated waste management equipment. To aid in the waste management process this site provided employees with guidance regarding the management of recyclable waste. The observer noted that one "... staff member then made a light-hearted comment that they did not read much and were unlikely to read it or have the time

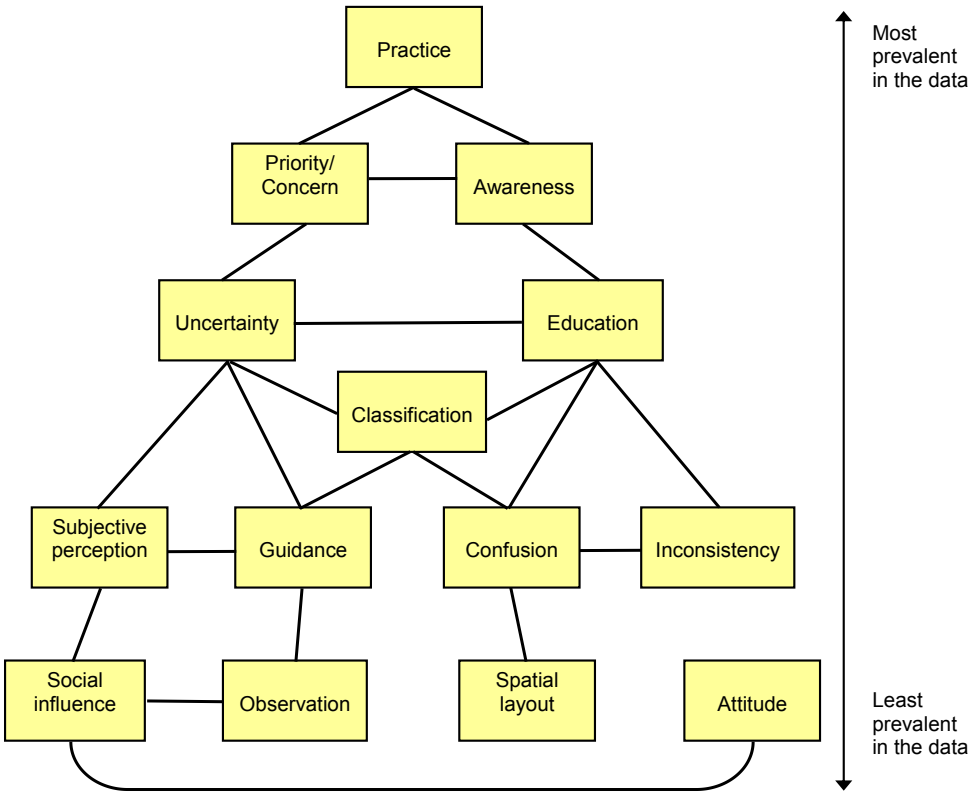

Figure 4.4: The Oak coding model

to read it," while another employee said that they had read the guidance material but that "It is one of those things you read then do something else and forget." *(obnotes_FN2_The Oak_S1)*. For employees the management of recyclable waste seemed a lower priority, which in turn may highlight a lack of awareness regarding waste management.

The potential lack of awareness about waste management was further illuminated by some of the responses given by employees regarding their opinions about recycling. Some of the responses the observer received were dismissive of the subject and lacked any form of detail. There were employees who displayed an understanding of the lack of awareness people have regarding waste management. One employee said "So, yeah, you don't realise what's going on, to be honest; I don't think people are aware." *(Tran_A4_The Oak_S4)*. A lack of awareness about the details of waste management potentially impacts on the classification of different waste types by employees.

Employees at this site were not used to having to segregate different waste types. They were learning to recognise that an object may sometimes be used in a clinical setting but that did not make it clinical waste, an example of which was highlighted by one employee, who said "It was clinical but there was, there's no body fluids or anything, so it's paper." *(Tran_A4_The Oak_S2)*. Here, instead of seeing the waste as clinical waste they saw it in terms of its material and whether or not it was contaminated with potentially infectious material. This change in learning to classify waste types was not easy for employees, and as such they displayed high levels of uncertainty.

Uncertainty was displayed by employees regarding a range of material types, from aluminium cans and plastic cups, to unused equipment. In one instance an employee entered the observation location, looked at the bins and then put the empty plastic hand rub bottle they came to dispose of on the worktop, saying "If I leave it there it will magically disappear," *(obnotes_FN8_The Oak_S1)* perhaps indicating that somebody else would dispose of it. Another source of employee uncertainty when disposing waste was in assessing whether or not an item was contaminated with a potentially infectious agent. To overcome this uncertainty the observer was told "I think anything that, you know, where sort of we've got any queries about at all or

any concerns about will go into the clinical waste every time." *(Tran_A1_The Oak_S3)*.

The education of employees about waste management in the workplace may be linked to employee uncertainty about this topic. Employees receive an introduction, "And when you first start everyone makes sure you know what your doing." *(Tran_A11_The Oak_S2)*. Employees also receive scheduled training, but it was uncertain which aspects of waste management this covered, though it appeared mainly to be clinical waste management related to infection control. One employee explained that if there was any new information, they "... probably wouldn't inform me anyway – it will be the managers" *(Tran_A8_The Oak_S2)*, thereby indicating that they did not expect to receive up-to-date information.

Employees not receiving up-to-date information may reflect the subjective perception that "Things keep changing..." *(Tran_A2_The Oak_S3)*. This remark implies that employees may perceive waste management information to be subject to a high rate of change. The principles of waste management laid out in the relevant legislation, guidance and policies can also be changed through subjective perception. Employees were either not familiar with this documentation or used their own interpretation of it in everyday practice. If they were unsure of what to do, the observer was told "If you're not sure you'd either ask or use your common sense – I think on a lot of it" *(Tran_A9_The Oak_S2)*. This can lead to its own issues, though, because common sense is a subjective quality.

When employees act on their own initiative or use common sense without sufficient background knowledge or guidance, confusion can result. Some employees believed that paper hand towels with which they dried their hands after washing were to be disposed of in the clinical waste bin. Following hand washing an employees hands should be clean and contamination free, meaning that the towels used to dry hands should only be damp with water and can be disposed of in the domestic waste bin or preferably the recycling bin. There was also some confusion regarding the bin in which waste was to be disposed due to the similarity between the colour of the bags. It may be that if the same bag colour is used for two different bins, the wrong type of waste may be disposed of due to an association the individual holds regarding the bin type and the bag colour.

Employees do not always perform the correct behaviours, even if they are aware of them. As one employee said, "Yeah, that was a sharp so it's gone in there, which ideally I should have cut off over there and then not walked across the room with it." *(Tran_A6_The Oak_S2)*. This is reminiscent of employees developing 'bad habits' seen at The Maple, which here results in inconsistent behaviour. The observer witnessed the disposal behaviour of employees varying between departments and within the same department – a finding most clearly illustrated in the disposal of paper hand towels mentioned previously.

Inconsistencies in waste disposal behaviours may have resulted because not all employees were aware of the waste management guidance that was available to them in the form of posters or in a more thorough waste management manual.

Waste management may have been impeded in some instances by the spatial layout of the equipment. Bins were observed to be located behind doors or underneath worktops with objects in front of them obstructing access. The poor location of waste management equipment may not have been an oversight but the result of a lack of space in which to locate it properly. The spatial layout of the observation locations and waste management equipment led to some individuals not being aware of a bin being present. In one instance an employee went to dispose of non-clinical waste in the clinical waste bin while another employee was present. A look passed between the two employees, perhaps indicating that the employee was about to perform an incorrect disposal behaviour in the presence of the observer. The employee disposing of the waste turned away from the clinical waste bin and began searching for an alternative bin. The employee eventually found a domestic waste bin under the worktop and disposed of the waste in that bin. The ability of one employee to alter the waste management behaviour of another employee indicates the presence of social influence in the workplace.

Social interactions such as informal workplace conversations seemed to be a preferred method of procuring waste management information for many individuals. An individual's waste management behaviour was also socially influenced in a wider context by popular media. One employee said "I now have milk bottles from the milkman instead of buying milk in the cartons, because I didn't like the thought of China being, people in China being, polluted by our

rubbish from this country." When asked where they had heard of this issue which had prompted their behaviour change, the employee replied "Oh, in a magazine. In my woman magazine." *(Tran_A5_The Oak_S4).* Employees also recognised the positive behaviours and attitudes of their peers, by commenting on who was good at recycling waste.

They had to think more about waste disposal, since recycling had been implemented at this site, "... now we're thinking a bit more, you know, which one do we put it in, but no, it's good, it is good." *(Tran_A1_The Oak_S3)*, showing that their attitude toward the extra effort it required to recycle and recycling in general was positive. Some employees also displayed a negative attitude towards the poor waste management practices of other employees, saying "It's a bit frustrating, yeah, when you open the bin and find loads of paper in there or something," *(Tran_A4_The Oak_S4)* while one employee describes a number of peers: "You can forget about [the other employees]. They're our dinosaurs." *(Tran_A5_The Oak_S4).*

There was an indication of employees being concerned about their own waste management performance during the observational study, with one employee asking "We're not doing too badly, are we?" *(Tran_A1_The Oak_S2).* Some employees were not as enthusiastic as others about their waste disposal practice being observed, but for some the observer became a source of waste guidance information. These employees felt comfortable in coming to the observer if they had a query regarding waste management, and the presence of the observer raised their awareness of their own practice: "Since your last visit I've been more aware, you know, making sure I put the stuff that can be recycled in the bin." *(Tran_A8_The Oak_S2).*

4.3.3 Findings from The Beeches

The qualitative data from The Beeches produced seven primary themes and figure 4.5 shows the coding model derived from these data. The primary themes for this site sit under and are connected to the primary theme 'practice'.

Employees at The Beeches had difficulty in estimating their own waste production in the workplace, and one employee said that they would only throw away a few items during the day and listed them out to the observer. Later in the day the same employee displayed surprise at the amount of waste they were throwing away. Plastic milk cartons were often cited by employees

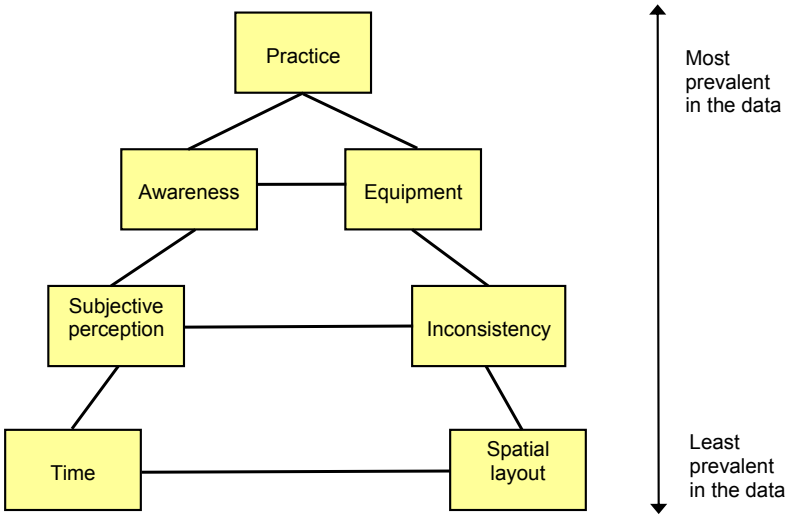

Figure 4.5: The Beeches coding model

as the only or main recyclable waste type produced at the site. These employees were not aware of the other types of recyclable waste they were producing, especially cardboard and plastic packaging.

Apart from being unaware of how much waste was being produced and what was recyclable, employees also thought that putting more waste management equipment around the site, such as recycling bins, would be impractical, with one employee stating "We ain't got the room for all that sort of thing here; we take it all in the kitchen, the bottles." *(Tran_A7_The Beeches_S1).* The waste management equipment that was present on site was often not in a good state of repair. The pedals were found to be often non-functional, the part of the bin that held the bag up was missing or broken or the bin lid was missing. This was most serious when clinical waste bins had to be opened by hand and their bags pulled up out of the bin when they had fallen in.

One difficulty with waste management at this site was that PPE was not always used. When employees were asked about their use of PPE they said "that's the thing, like, we're busy so we go along and think 'oh God, forgot them"' *(Tran_A3_The Beeches_S3)*, thus demonstrating the subjective perception of being too busy. Some individuals perceived the guidance that they had

been given as incorrect and would perform tasks as they desired: "And we're supposed to wear gloves all the time, but I prefer washing my hands, from one room to another." *(Tran_A3_The Beeches_S3).* The fact that some employees carried out waste management and tasks related to waste management in different ways led to inconsistency in waste disposal behaviours.

Some employees questioned who was responsible for emptying the bins: "I don't think we should. I think [other employees] should." *(Tran_A1_The Beeches_S2).* Inconsistencies in the form employee shortages were said to affect the performance of other employees and the cleanliness of the site: "You've got to try and fly around and try and do it all, you can't do a good job – just do what you got to do." *(Tran_A3_The Beeches_S1).*

This site had scant exterior waste storage space, so the waste would accumulate between one collection and the next, and when the waste contractor missed a collection they were left in the precarious position of storing clinical waste in an unsafe manner. The clinical waste bags were stored in an open container that could not be covered or locked, which left the waste exposed and made it possible for humans or animals to come into contact with this potentially contaminated waste. Health and social care sites are reliant on their waste contractors, which leaves them open to breaches of health and safety due to limited space. A positive aspect of the spatial layout of this site was PPE being available for use during waste management at a number of central disposal points where it was likely to be needed.

'Time' was the final theme found at this site. Where employees perceived themselves as too busy already, they voiced negative attitudes towards any more training than they already had to complete and thought was a large amount. The bag-changing schedule at this site was described to the observer as a regular pattern. What was observed was an irregular changing of bin bags which was described by one employee as follows: "But if the yellow bin's not full at dinner time, we won't empty that – we'll leave it for the afternoon shift and they'll empty it this evening." *(Tran_A1_The Beeches_S2).*

4.3.4 Findings from the Pine

Figure 4.6 visualises in the coding model the ten primary themes that were found in the data for The Pine. All of the primary themes are again related to waste management practice and

they are discussed in the context of the data below.

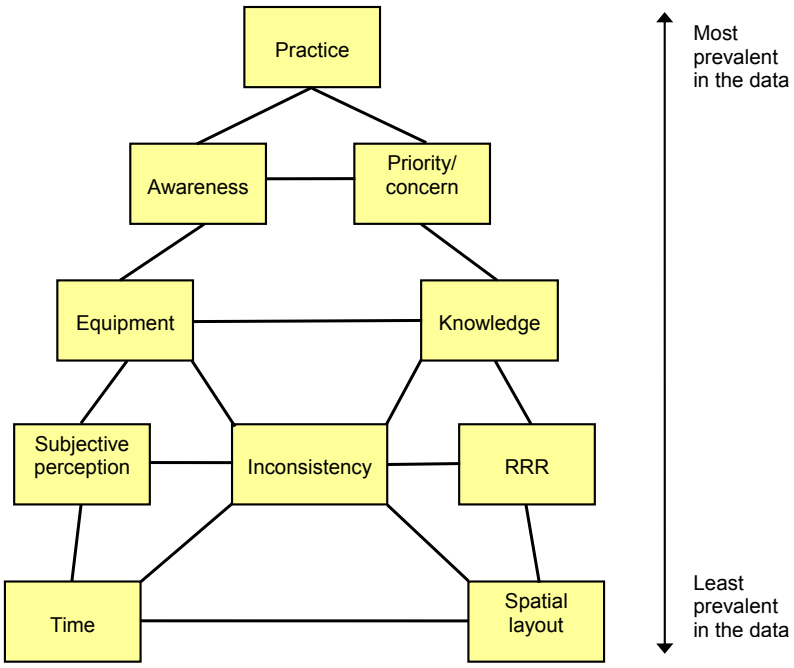

Figure 4.6: The Pine coding model

The organisation had implemented a system to aid in the minimisation of organic waste, displaying a high concern regarding this aspect of waste management and affording it high priority. Other aspects of waste management did not receive the same high levels of priority and concern, one such aspect being the waste management equipment itself. There were a number of occasions when the researcher observed broken equipment, which presented health and safety issues when used. This also displays a lack of awareness regarding the state of the waste management equipment present on site.

Employees did display an awareness of and pride in correct waste management, with individuals saying that waste, specifically latex gloves, is disposed of correctly "at least when [they are] working." *(obnotes_FN1_The Pine_S5).* There was a lack of awareness regarding correct waste management procedures in the absence of hand-washing and sanitisation performed by

employees. The use of gloves appeared to produce the belief that there was no need for hand sanitisation following clinical waste disposal, exposing a lack of knowledge regarding contamination risks and correct hand-washing procedure.

The high frequency of glove use at this site also highlighted a lack of knowledge regarding the need for their correct disposal. Following the use of gloves to transport soiled laundry or clinical waste, employees were observed to remove their gloves, look uncertain about what to do and then put them in their pocket. Some of the employees confusion may have been partially the result of an inconsistent provision of waste management knowledge through guidance notices across the site. The guidance available across the site varied greatly, and the notices themselves were often ad hoc creations with what seemed little regard for their permanence or positioning.

A lack of equipment required for fully effective waste management lowered waste management standards in some observed instances. When disposing of clinical waste one employee explained "It was a pad, a soiled pad. Sometimes there's, like, kind of little plastic bags, you know, like big sort of nappy bags, really, to put stuff like that in, but I just, you can't, they tend not to be very many around, so I just turn the glove inside out and pull the glove over it and that keeps it sort of quite well-contained, really." *(Tran_A6_The Pine_S2).* In this situation employees did not follow organisational guidance and practice, due to the lack of equipment. Some employees found the equipment difficult to use when working on a one-to-one basis with a patient: "It's so hard on one-to-one, as I want to throw something away but I can't just, yeah, go straight to the bin." *(Tran_A3_The Pine_S1).* The accessibility of waste management equipment when performing diverse tasks was a key issue for employees.

The issue with accessibility was again highlighted in the provision of recycling facilities at this site. There was only a single point of recycling for the entire site which forced employees, should they have wanted to recycle, to collect waste on worktops or the floor until they had time to take them to the single point of recyclable waste disposal. Perhaps as a result of the lack of access to recycling facilities, employees did not recycle all of the waste that they potentially could have done. When the observer informed an employee that the waste they were disposing of in a domestic waste bin could be recycled, they often displayed surprise and acceptance of

this notion, but they did not necessarily alter their behaviour.

One reason why employees may not have been willing to alter their existing waste disposal behaviours may be the subjective perception that the recycling of small amounts of waste was pointless; for instance, one employee said "I just think, is there any point in us doing that for you?" *(Tran_A1_The Pine_S5).* It may also be factor that waste management was perceived as a chore, with one individual being happy to have only one bag of waste to take to the bin. Not only was waste management a chore but it was further perceived as a low-priority task, with the researcher observing bins full to overflowing so waste was spilling onto the floor. This may have been connected to some form of inconsistency in the routine for changing bin bags.

The bin-emptying schedule was not always adhered to at this site, and even when the bag was changed it was often left in the sluice instead of being taken to the exterior waste disposal area. On one occasion an employee noted "We came in to three bags of yellow rubbish this morning. I think they had a bad night of it, to be quite honest." *(Tran_A4_The Pine_S1).* There was also inconsistent knowledge amongst the employees about what could be recycled on site, and some employees were uncertain if any recycling took place at all. This may be linked to the fact that there was only one point for the disposal of recyclable waste on site.

An interesting finding related to the spatial layout of the site was that when employees worked in a specific area consistently they became possessive of that space: "...they're messing me bloomin' [area] up. It annoys me." *(Tran_A2_The Pine_S2).* The observer inquired of one employee if the same employee always worked in the same area. They replied "As much as possible now. It never used to be like that, it used to be you would rotate all the time..." The impact of providing employees with consistent working locations was described to the researcher as "... benefiting the [patients] a bit more, and the care's better..." *(Tran_A3_The Pine_S5).* This continuity benefited both the employees and their patients, thus allowing employees to maintain the standards in their work area and have pride in doing so.

Some individuals, as seen above, did not like their work area becoming disorganised or messy, which was one issue they had with recycling – without recycling bins around the site, employees had to store waste on worktops or the floor. Employees then had to invest time in taking the

recyclable waste to the single recycling point on the site. With what was described by employees as an already high workload, they did not want to take extra time performing extra disposal tasks that were difficult, especially when their time was already taken up with what they perceived as other mundane tasks.

4.4 Discussion

Overall there were 20 unique primary themes found in the observational sub-study and these themes are modelled in Figure 4.7. Data from all of the sites reflected practices associated with waste management in the health and social care setting. It was through these practices that employees and organisations displayed the level of priority and concern they held regarding waste management. The priority given to and concern shown for the management of waste ranged from high to low, with some individuals displaying a high priority and concern for aspects such as safe and proper waste management or effective recycling. Individual awareness of waste management practices varied greatly as well. Most often people were aware that waste management was a necessary requirement and there was a need for correct and proper procedures in this respect; however, there was often a low level of awareness about what exactly constituted correct waste management, the need for fully functional waste management equipment as well as how and why they should be recycling.

The classification of waste was required for effective segregation, and this was most effectively carried out with clinical waste albeit there was a lack of awareness accompanied by uncertainty and confusion in this respect. The equipment that was available to employees for the disposal of waste could have expedited disposal if properly located and maintained, but when not maintained or improperly located it led to ineffective and unhygienic waste disposal practices. While equipment was indeed important, employees required the correct knowledge about waste management practices and how they relate to their work, especially when it came to the classification and segregation of different waste types. Knowledge, it seems, is linked to many primary themes, including guidance for the provision of knowledge and awareness so employees are aware of the information available to them, which may in turn increase their awareness of the need for correct waste management.

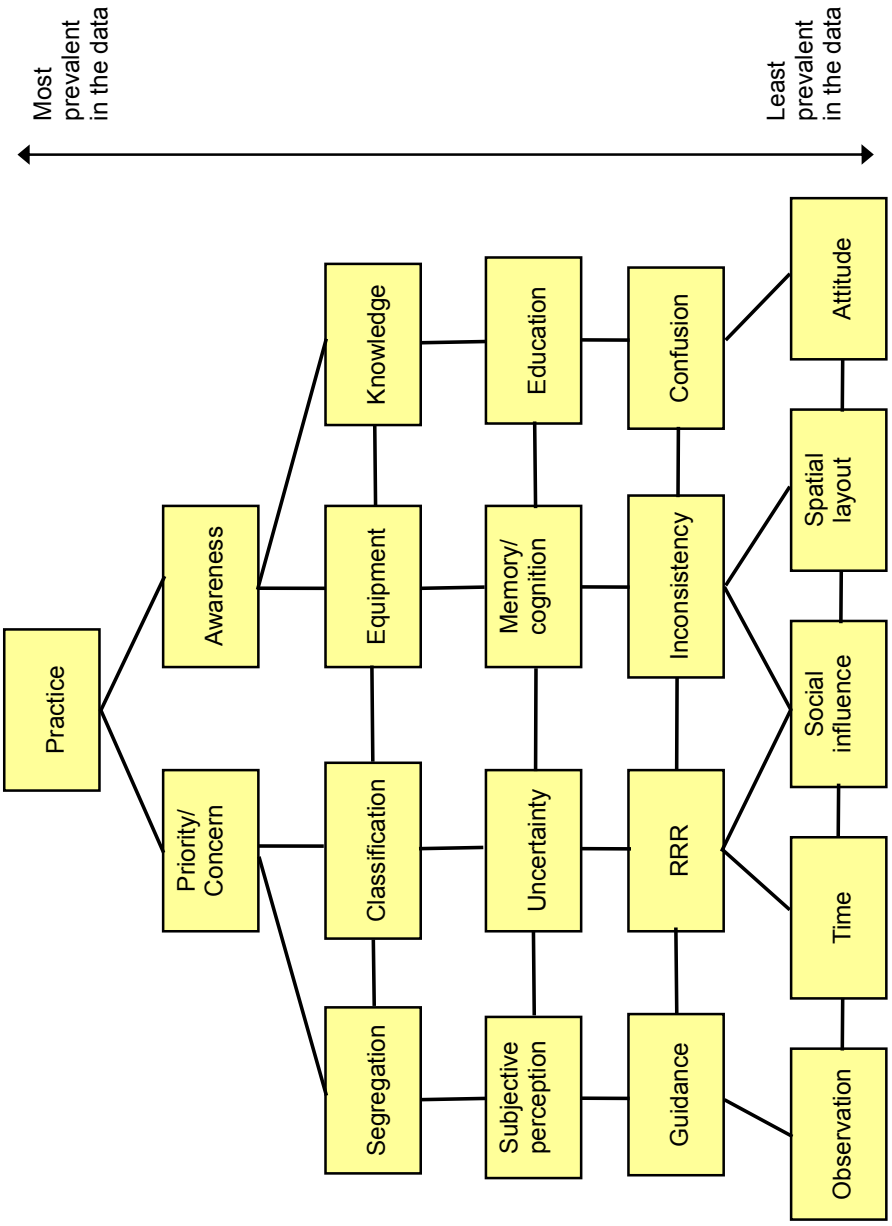

Figure 4.7: General coding model

The level of waste segregation required at each site ranged from low to high. At sites where recycling was not prolific, little segregation was needed. When there was recycling in place at a site the system could either minimise the amount of segregation required, by using recycling bins in which all recyclable waste was disposed of, or maximise it by having many recycling bins for different materials. It seemed that waste management needed to be made as simple and as easy as possible so that it did not rely too much on the individual's ability to remember how and where to dispose of many different waste types. This may have the impact of not taxing the cognitive resources of the individual for whom waste management is not a priority in relation to other tasks and cannot dedicate resources to decision making about waste management. The provision of effective guidance and knowledge is of particular importance here to perhaps support employees and negate the formation of bad habits.

There was some uncertainty displayed by employees regarding clinical waste classification and what constituted contamination, but the majority of uncertainty seemed to centre on recycling and what could and could not be recycled. Again, knowledge, guidance and education may be important in mitigating uncertainty and improving awareness, classification and segregation. The manner in which the individual perceived, interpreted and acted on their experiences associated with waste management varied greatly from person to person, which highlighted the role of the individual and the need to account for how they might perform waste management behaviours in a manner that they believe to be correct or justifiable, though perhaps not necessarily appropriate or desirable.

The education provided to employees regarding waste management was often minimal and delivered as on-the-job training. Such training methods may leave gaps in the individual's knowledge and room for subjective interpretation. With a reduce, re-use, recycle philosophy being implemented at these health and social care sites, to varying degrees, there seems to be uncertainty and confusion regarding waste management practices, and these need to be accounted for or they may affect the success of such changes. There were significant variations in the types of practices, the environment and the equipment present between sites and also within sites. Such inconsistencies further highlight potential sources of uncertainty and confusion as well as the

impact of subjective perception on waste management practices.

The social influence that one individual has on another was observed as influencing waste management behaviour. With information shared between individuals in such a manner, the correctness and detail of the information they are providing to one another may play a role in the consistency of waste management behaviour and provide an effective means of reinforcing the guidance and eduction provided by the organisation.

Chapter 5

Waste Audit Sub-Study

5.1 Introduction

This waste audit sub-study was designed to complement the quantitative data collected during the observational sub-study, which itself collected data on the waste being disposed of by health and social care employees in two specific locations at each site. There was the potential for this sub-study design to capture an incomplete picture of the overall waste composition of each site, but by sampling and cataloging the waste at each site directly from the external waste storage areas there was greater potential for the study of the overall waste composition at each of the participating sites. Previous studies such as Tudor et al. (2008a) have sought to describe the waste composition produced at healthcare sites. Tudor et al. (2008a) found that the material composition of the waste was conducive to the implementation of a recycling system, and such a system would transfer waste out of the clinical and domestic waste streams.

In this chapter the waste audit data collection and analysis methods will be described first. The results of the sub-study will then be presented in relation to the sub-study objectives and finally an overview of the findings will be provided, along with some initial interpretations which will be limited to the actual waste audit and will be fully interpreted in the context of the other studies during the triangulation process presented in Chapter 8.

5.2 Methods

5.2.1 Sampling

Four health and social care sites in the south-west of England participated in this study. As described in Figure 5.1, each site was sampled on three occasions, and during each session

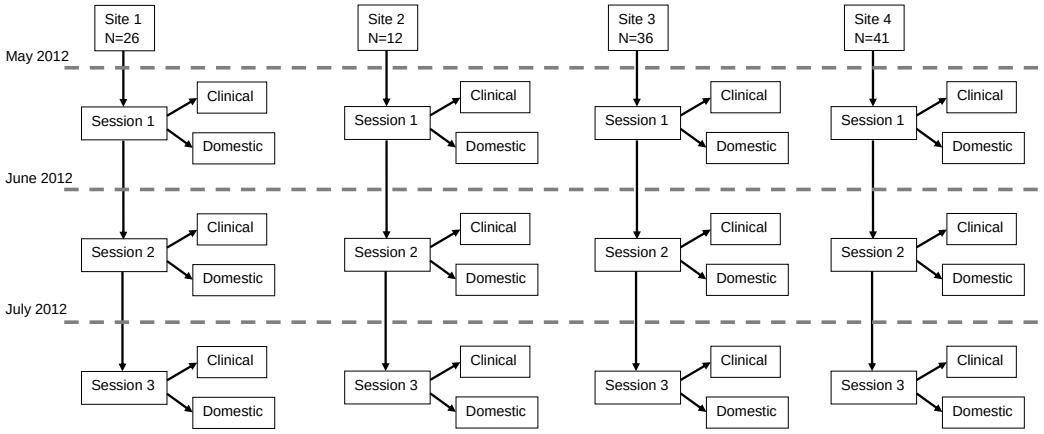

Figure 5.1: The sampling of each site and waste stream in the waste audit sub-study

both the clinical and domestic waste streams were sampled. The data collection took place over three months, May to July 2012 (inclusive). The sites were sampled using a predetermined schedule and each site was sampled once per month over the three months of the study. The schedule for the sampling of the four sites was determined by the external waste collection schedule at each site.

The waste audit was therefore conducted at each site on the day before the waste was collected by the external contractor. At sites where clinical and domestic waste was collected on different days of the week, the day prior to collection of one waste type, where a sufficient amount of the other waste type would be present, was chosen, e.g. if clinical waste were collected on a Tuesday and domestic waste on the Thursday, the waste audit would be carried out on the Monday. The researcher balanced the schedule to ensure that the maximum amounts of clinical and domestic waste would be present at each site, thus providing a sufficient amount of bags of each waste type from which to select the sample of bags to be cataloged.

Due to variations in the amount of waste per bag, and the limited manpower with which to conduct the waste audit, a standardised number of bags being sampled during each session and at each site could not be set. The researcher sampled as many bags of waste, at each site, during each session as they could during the six-hour period they were present on site. The actual number of bags sampled at each site can be seen in Table 5.1. The waste bags were selected

from the external storage bins through accessibility and opportunity, and those bags that were selected were those that the researcher could reach and safely extract from the external storage bins.

This method of selection was determined as fair, due to the researcher not knowing what the contents of any bag would be prior to selecting and opening it. Where more than one external waste storage bin was present, the researcher selected one bag from each bin that contained waste in turn. The waste bags at each site were of similar sizes and rated with safe working weights of 2.5kg to 5kg.

Table 5.1: Number of clinical and domestic waste bags sampled at each site

	Clinical	Domestic
The Maple	22	4
The Oak	6	6
The Beeches	19	17
The Pine	22	19

5.2.2 Procedure

Where reference is made to 'the number of items' in the following sections, this accounts for every individual piece of waste in a waste bag. The statement 'The number of unique items' refers to the number of items that are different from one another in a bag of waste, with no repeats; for example, nine pairs of gloves and 15 tissues may have been cataloged in one particular waste bag, so this waste bag would therefore contain 24 items of waste but only two unique items. The unique items measure provides a means of assessing what is referred to in ecology as' richness', which is a simplified measure of diversity.

Work area and personal protective equipment

Before commencing the data collection for each session, the researcher first set up a safe working area, ensuring that there was a clear path from the external waste storage bins to the area where the data collection would take place and that the distance between these two areas was kept as small as possible to minimise the distance the waste had to be transported. An impermeable plastic sheet was spread on the ground and weighed down at the corners, to minimise

the risk of contamination to the surrounding environment when the waste was being cataloged. All of the waste was confined to this covered work area, and only one bag of waste was opened at a time. Domestic waste was always sampled and cataloged before clinical waste, in order to avoid contaminating the domestic waste with clinical waste while minimising the amount of plastic sheeting used during this study. Extreme care was taken when handling the waste – the researcher wore needle-/cut-resistant gauntlets that also protected the wearer's forearms. A full face shield with chin guard was worn, to protect from fluids and flying objects, along with a plastic apron. The plastic sheet and apron were single use and disposed of as clinical waste. The gauntlets and face shield were re-usable and were fully sanitised following the completion of each data collection session.

Data collection procedure

Each bag of waste was first weighed using a set of calibrated digital hanging scales, and the weight was recorded on the bag weight record sheet, an example of which can be found in Appendix O. The site, date and waste stream were recorded, and each bag sampled was numbered to distinguish it from the others and link it to the data collected on the contents record sheet (Appendix P). The bag was then opened and every item present was catalogued. A short description was given to each unique item in the bag, the material that each unique item was made from was recorded and then the frequency of the number of that particular unique item was also recorded. The material composition of the items was classified using general and easily identifiable categories (e.g. plastic, paper, metal). For simplicity, mixed material wastes were classified as those items comprising two or more general material categories. This process was repeated for every item in every bag of waste. Typical items found in the domestic waste bags included plastic milk cartons, mixed material fruit juice cartons and mixed material condiment sachets. The clinical waste bags included items such as latex and nitrile gloves, mixed material incontinence pads and fabric gauze swabs. Each item/unique item was additionally coded for its potential to be recycled. The decision on whether or not an item could be recycled was made based on the material type and what it was likely used for in the health and social care setting. All of the materials found during this study could potentially be recycled with the exception of

mixed material waste. The use of the item within the health and social care setting was a more subjective decision, but it was bound by the researcher's knowledge of the likelihood of an item being used for patient/client treatment or personal care and visible soiling with blood or bodily fluids.

5.2.3 Analysis method

The data were transferred from the paper record sheets, which were used during the data collection process, to an Excel spreadsheet. The number of potentially recyclable items was converted to a proportion of the total number of items present in a particular bag. The data were then entered into SPSS so that the following data were present for each bag of waste: the total number of items, the number of unique items, the number of materials, the bag weight, the proportion of potentially recyclable items and the proportion of potentially recyclable unique items. Separate datasets were created for each site individually and one for the amalgamated data from all four sites.

Independent samples t-tests were carried out, in order to analyse the differences between the means of the clinical and domestic waste streams overall and between the clinical and domestic waste streams within each site. Analyses of variance were carried out for tests between the sites, overall and by waste stream. Where analyses of variance were carried out and equal variances between the sites could be assumed, the Scheffe post-hoc statistic was used to determine where the significant differences between the site averages were to be found. When equal variances could not be assumed between the sites, the Tamhane T2 post-hoc statistic was applied to identify the specific significant differences between the sites. An alpha level of $p < .05$ was applied to all of the statistical tests reported.

5.3 Results

5.3.1 The waste composition of health and social care sites

This section of the results will describe the composition of the average waste bag, the average waste bag in the clinical waste stream and the average waste bag in the domestic waste stream. This will be in terms of the number of items per bag, the number of unique items per bag, the

number of materials and the weight of the bag. Comparisons will then be made between the average clinical waste bag and the average domestic waste bag. These comparisons will be made for the waste overall, between the four sites and within those four site.

Number of items

The overall mean number of items per bag of waste was $M = 78.74 (N = 115)$ and the $SD = 79.99$. The large standard deviation is a result of the large range of 461.5 with the minimum number of items equal to 5 and the maximum equal to 466.5. Fewer items were found per bag of waste in the clinical waste stream $(M = 62.97, SD = 62.97 and N = 69)$ compared to the overall mean number of items per bag of waste. The mean number of items per bag of waste in the domestic waste stream $(M = 102.38, SD = 96.91 and N = 46)$ was higher than the overall mean number of items per bag of waste. On average there was a greater number of items per bag present in the domestic waste stream compared to the clinical waste stream at $t(70) = -2.44, p = .017$ (equal variances not assumed).

The number of bags of waste (N), means (M) and standard deviations (SD) for the number of items per bag of waste at each of the four sites are presented in Table 5.2. A significant difference was found between the means $F(3,111) = 7.57$ and $p < .001$, as equal variances could not be assumed and post-hoc testing using Tamhane T2 revealed a significant difference between the means of The Maple and The Beeches at $p = .027$. Waste bags at The Maple contained significantly more items per bag of waste than those at The Beeches. It is important to note that The Oak has what would appear to be a much greater average number of items per bag than the other three sites – the smaller sample size of The Oak is likely responsible for this difference not being significant.

Table 5.2: The mean number of items per bag of waste at each site

	The Maple	The Oak	The Beeches	The Pine
N	26	12	36	41
M	87.00	162.29	46.14	77.66
SD	52.54	144.95	55.18	70.52

Table 5.3 shows the number of cases, means and standard deviations for the clinical and do-

mestic waste streams at each site. At The Maple a significant difference was found between the mean number of items in the two waste streams, $t(24) = -2.35, p = .027$. On average there were more items in the domestic waste bags than the clinical waste bags. The average numbers of items per bag in the clinical and domestic waste streams were statistically similar at The Oak, at $t(10) = -.329, p = .749$, although a larger average number of items was found in the domestic waste stream. There was a statistically significant difference in the number of items found per bag in the clinical and domestic waste streams at The Beeches, $t(17) = -2.44, p = .026$, with a larger average number of items per bag in the domestic waste stream than in the clinical waste stream. There was no difference between the means at The Pine at $t(21) = -1.89, p = .073$. There were more items on average in the domestic waste bags; however, the size of the difference is not significant, due to the much higher standard deviation in the domestic waste stream than the clinical waste stream findings.

A significant difference was found between the mean number of items per bag in the clinical waste stream at the four sites, namely $F(3,65) = 8.66, p < .001$. Equal variances could not be assumed, so post-hoc testing was conducted using the Tamhane T2 statistic. It was then found that the clinical waste stream at The Beeches contained on average fewer items per bag than The Maple and The Oak $(p < .001)$. The average number of items across the domestic waste streams of the four sites was found to be similar at $F(3,42) = 2.19, p = .103$.

Table 5.3: Mean number of items in the clinical and domestic waste streams at each of the four sites

	The Maple		The Oak		The Beeches		The Pine	
	Clinical	Domestic	Clinical	Domestic	Clinical	Domestic	Clinical	Domestic
N	22	4	6	6	19	17	22	19
M	77.50	139.25	147.92	176.67	25.37	69.35	57.75	100.71
SD	45.04	67.05	159.77	142.12	12.63	73.47	27.16	95.63

Number of unique items

The average number of unique items present per bag overall was $M = 12.50 (N = 115)$ with an $SD = 10.57$. The large standard deviation is again accounted for by a large range of 50, where the minimum number of unique items per bag was equal to 2 and the maximum equal to 52. The

mean number of unique items per bag in the clinical waste stream was $M = 9.01, (N = 69, SD = 9.20)$, which was fewer than the mean number of unique items in the domestic waste stream at $M = 17.74, (N = 46, SD = 10.42)$, and this difference was significant at $t(113) = -4.72, p < .001$ (equal variances assumed).

Table 5.4 presents the number of cases, means and standard deviations for the number of unique items found per bag of waste at each of the four sites. The analysis of variance showed that there was a significant difference between the means, $F(3, 111) = 21.39, p < .001$. In this case equal variances between the sites could not be assumed, and post-hoc testing using Tamhane T2 found significant differences between The Oak and The Maple, The Beeches and The Pine at $p = .001$. The number of unique items per bag was similar at The Maple, The Beeches and The Pine, but the number of unique items per bag at The Oak was significantly greater than these three sites.

Table 5.4: The mean number of unique items per bag of waste at each site

	The Maple	The Oak	The Beeches	The Pine
N	26	12	36	41
M	10.19	31.17	10.36	10.39
SD	7.32	13.30	7.47	8.42

The number of cases, means and standard deviations for the numbers of unique items in the domestic and clinical waste streams at all four sites are shown in Table 5.5. At The Maple there was no significant difference in the number of unique items per bag between the two waste streams at $t(24) = -1.63, p = .116$. There was a similar average number of unique items in the clinical and domestic waste streams, $t(10) = -.546, p = .597$, at The Oak. At The Beeches there was a significantly greater number of unique items on average per bag in the domestic waste stream compared to the clinical waste stream, $t(21) = -4.88, p < .001$, and at The Pine there were also significantly more unique items per bag in the domestic waste stream than in the clinical waste stream $t(21) = -3.99, p = .001$.

Testing the differences between the mean numbers of unique items per bag in the clinical waste streams at each of the four sites using an analysis of variance indicated the presence of significant differences, namely $F(3, 65) = 20.18, p < .001$. Equal variances could not be assumed, though, and when the Tamhane T2 statistic was applied it did not reveal any signif-

icant differences between the means of the four sites. The analysis of variance, when applied to testing the difference between the mean number of unique items per bag in the domestic waste streams at all four sites, again indicated a significant difference between the means at, $F(3,65) = 7.34, p < .001$. Equal variances were assumed in this instance and the Scheffe post-hoc test was applied. The Oak was found to have a significantly larger mean number of unique items per bag in the domestic waste stream than The Maple $(p = .028)$, The Beeches and The Pine $(p = .001)$.

Table 5.5: Mean number of unique items in the clinical and domestic waste streams at each of the four sites

	The Maple		The Oak		The Beeches		The Pine	
	Clinical	Domestic	Clinical	Domestic	Clinical	Domestic	Clinical	Domestic
N	22	4	6	6	19	17	22	19
M	9.23	15.50	29.00	33.33	5.90	15.35	6.05	15.42
SD	7.47	3.32	16.53	10.23	3.74	7.48	3.02	9.86

Number of materials

Overall, the average number of materials per bag of waste was $M = 5.52, (N = 115, SD = 1.81)$. The domestic waste bags were found to contain more materials per bag, $M = 6.09, (N = 46, SD = 1.93)$, than the clinical waste bags, where $M = 5.14 (N = 69, SD = 1.64)$, $t(113) = -2.81, p = .006$ (equal variances assumed).

The number of cases, means and standard deviations for the number of materials found per bag at each of the four sites are reported in Table 5.6. An analysis of variance found no significant differences between the means $F(3,111) = 1.94, p = .128$ (equal variances assumed). The number of materials per bag at each of the four sites was similar, with each bag containing between five and seven material types on average.

Table 5.6: The mean number of materials per bag of waste at each site

	The Maple	The Oak	The Beeches	The Pine
N	26	12	36	41
M	5.46	6.67	5.25	5.46
SD	1.61	1.67	1.59	2.08

Table 5.7 contains the number of cases, means and standard deviations for the number of

materials per bag in the clinical and domestic waste streams at each of the four sites. No significant difference was found between the mean number of materials per bag in the clinical and domestic waste streams at The Maple: $t(21) = -1.72, p = .100$. The average number of materials per bag in the clinical and domestic waste streams at The Oak were similar at $t(10) = .674, p = .515$. At The Beeches a significantly larger average number of materials per bag was found in the domestic waste stream than in the clinical waste stream, $t(34) = -2.95, p = .006$, and similar average numbers of materials per bag were found in the clinical and domestic waste streams at The Pine, namely $t(27) = -1.83, p = .079$.

A comparison of the mean number of materials per bag in the clinical waste stream at all four sites revealed a significant difference between the means at $F(3,65) = 4.09, p = .010$. Equal variances were assumed, and post-hoc testing using the Scheffe method found that significantly more materials per bag were on average found at The Oak than at The Beeches $(p = .015)$ and The Pine $(p = .041)$. There was, however, no significant difference between the mean numbers of materials per bag in the domestic waste streams at all four sites, $F(3,42) = .044, p = .987$, and the mean number of materials at each site was similar and approximately equal to 6.

Table 5.7: Mean number of materials in the clinical and domestic waste streams at each of the four sites

	The Maple		The Oak		The Beeches		The Pine	
	Clinical	Domestic	Clinical	Domestic	Clinical	Domestic	Clinical	Domestic
N	22	4	6	6	19	17	22	19
M	5.36	6.00	7.00	6.33	4.58	6.00	4.91	6.11
SD	1.73	.00	1.79	1.63	1.35	1.54	1.41	2.54

Bag weight

The mean weight of a bag of waste was found to be $M = 2.44kg, (N = 115, SD = 1.38)$. The difference between the clinical and domestic waste stream mean bag weights was found to be statistically significant at $t(113) = 4.54, p < .001$ (equal variances not assumed). The bags in the clinical waste stream weighed on average $M = 2.85kg, (N = 69, SD = 1.46)$, which was more than those in the domestic waste stream, which weighed on average $M = 1.82kg, (N = 43, SD = .99)$.

Table 5.8 contains the number of cases, means and standard deviations for the bag weights at each of the four sites. A significant difference was found between the means at $F(3,111) = 6.74, p < .001$. Equal variances between the sites could be assumed in this case, and post-hoc testing was conducted using the Scheffe statistic. The Maple was found to have on average significantly heavier waste bags than The Oak ($p = .044$), The Beeches ($p = .004$) and The Pine ($p = .001$).

Table 5.8: The mean weight per bag of waste at each site (kg)

	The Maple	The Oak	The Beeches	The Pine
N	26	12	36	41
M	3.43	2.13	2.19	2.11
SD	1.47	1.04	1.17	1.33

The number of cases, means and standard deviations for the bag weights in the clinical and domestic waste streams at each of the four sites can be found in Table 5.9. At The Maple the bags in the clinical waste stream were found to be significantly heavier than those in the domestic waste stream at $t(24) = 2.20, p = .038$. At The Oak there was no significant difference between the mean bag weights of the clinical and domestic waste streams, $t(10) = -.765, p = .462$, and the mean bag weights for the clinical and domestic waste streams were also similar at The Beeches, where no significant difference was found: $t(34) = -1.89, p = .068$. At The Pine, however, the clinical waste bags were found to be on average significantly heavier than the domestic waste bags at $t(39) = 2.45, p = .019$.

A comparison of the mean bag weights for the clinical waste stream across all four sites revealed significant differences between the sites, namely $F(3,65) = 4.48, p = .006$. Equal variances were assumed, so post-hoc testing was carried out using the Scheffe method. The post-hoc test did not reveal any significant differences; however, the results were close to being significant. The analysis of variance of the mean bag weights of the domestic waste streams at all four sites found the average bag weights to be similar at $F(3,42) = 1.02, p = .394$.

Table 5.9: Mean bag weights in the clinical and domestic waste streams at each of the four sites (kg)

	The Maple		The Oak		The Beeches		The Pine	
	Clinical	Domestic	Clinical	Domestic	Clinical	Domestic	Clinical	Domestic
N	22	4	6	6	19	17	22	19
M	3.68	2.05	1.90	2.37	2.52	1.82	2.56	1.60
SD	1.43	.82	1.18	.91	1.35	.81	1.33	1.16

5.3.2 Assessment of the proportions of potentially recyclable waste in health and social care waste

This section will describe the proportions of recyclable items and potentially recyclable unique items found per bag, overall, in the clinical waste stream and in the domestic waste stream. Comparisons will then be made between the four sites and between the clinical and domestic waste streams.

Proportion of recyclable items

Overall, the average percentage of recyclable items in the waste bags was $M = 45.28\%$, $(N = 115, SD = 38.54)$ and the percentage of recyclable items in any one bag ranged from 0% to 100%. The clinical waste bags contained on average fewer than the overall average percentage of recyclable items, $M = 17.97\%(N = 69, SD = 22.40)$, while the domestic waste bags contained a higher proportion of recyclable items at $M = 86.25\%(N = 46, SD = 22.40)$. The proportion of recyclable items in the domestic waste bags was greater than that found in the clinical waste bags, namely $t(109) = -21.16, p < .001$ (equal variances not assumed).

The number of cases, means and standard deviations for the proportions of recyclable items per bag of waste at each of the four sites are given in Table 5.10. Site 2 had the largest mean proportion of recyclable items per bag, and there was a significant difference between the means: $F(3, 111) = 5.49, p = .001$. Equal variances could not be assumed, so post-hoc testing was conducted using the Tamhane T2 statistic. The mean proportion of recyclable items per bag of waste at site 2 was significantly greater than that found at site 1 $(p < .001)$, site 3 $(p = .002)$ and site 4 $(p = .006)$.

Table 5.11 shows the number of cases, means and standard deviations for the proportions of

Table 5.10: The mean proportion of recyclable items per bag of waste at each site (%)

	The Maple	The Oak	The Beeches	The Pine
N	26	12	36	41
M	25.30	75.43	45.29	49.13
SD	30.81	14.08	39.46	40.92

recyclable items per bag in the clinical and domestic waste streams at each of the four sites. The domestic waste bags at The Maple contained on average a significantly greater proportion of recyclable items than the clinical waste bags: $t(20) = -21.87, p < .001$ (equal variances assumed). At The Oak there was a significantly greater proportion of recyclable items in the domestic waste bags compared to the clinical waste bags, $t(10) = -3.40, p = .007$ (equal variances assumed), and at The Beeches there was again a larger proportion of recyclable items found in the domestic waste stream compared to the clinical waste stream, namely $t(34) = -16.76, p < .001$ (equal variances assumed). The domestic waste bags at The Pine also contained a significantly greater proportion of recyclable items than the clinical waste bags at $t(39) = -12.00, p < .001$.

There was a significant difference between the mean proportions of recyclable items per bag in the clinical waste stream across the four sites $F(3,65) = 17.33, p < .001$. Equal variances were assumed and the post-hoc test applied was the Scheffe statistic. This revealed that the mean proportion of recyclable items per bag in the clinical waste stream at The Oak was significantly larger than The Maple, The Beeches and The Pine at $(p < .001)$, while the proportions of recyclable items per bag for the domestic waste stream were similar at each of the four sites at $F(3,42) = .37, p = .772$ (equal variances assumed).

Table 5.11: Mean proportions of recyclable items in the clinical and domestic waste streams at each of the four sites (%)

	The Maple		The Oak		The Beeches		The Pine	
	Clinical	Domestic	Clinical	Domestic	Clinical	Domestic	Clinical	Domestic
N	22	4	6	6	19	17	22	19
M	13.60	89.70	65.55	85.30	10.53	84.14	15.81	87.71
SD	13.94	3.62	8.27	11.57	14.92	10.84	22.39	14.42

Proportion of unique recyclable items

The average proportion of unique recyclable items was overall $M = 46.26\%(N = 115, SD = 32.42)$. The proportion of unique recyclable items per bag in the clinical waste stream was lower than the overall average, $M = 23.62\%(N = 69, SD = 18.80)$, though the domestic waste bin average was higher than the overall mean proportion at $M = 80.22\%(N = 46, SD = 12.77)$. There was a significantly greater proportion of unique recyclable items in the domestic waste stream compared to the clinical waste stream at $t(113) = -19.22, p < .001$ (equal variances not assumed).

Table 5.12 contains the number of cases, means and standard deviations for the proportions of unique recyclable items per bag at each of the four sites. Although the means do differ from one another, these differences were not large enough to produce a statistically significant difference between the means $F(3, 111) = 2.59, p = .056$ (equal variances not assumed).

Table 5.12: The mean proportion of unique recyclable items per bag of waste at each site (%)

	The Maple	The Oak	The Beeches	The Pine
N	26	12	36	41
M	33.57	61.08	44.98	51.09
SD	29.01	20.25	36.44	31.61

On average there was a larger proportion of unique recyclable items in the domestic waste stream compared to the clinical waste stream at The Maple, i.e. $t(23) = -12.81, p < .001$ (equal variances assumed) (Table 5.13). At The Oak more unique recyclable items were found on average in the domestic waste bags than in the clinical waste bags, $t(10) = -7.68, p < .001$ (equal variances assumed), and again at The Beeches there was a significantly greater mean proportion of unique recyclable items in the domestic waste bags than the clinical waste bags at $t(34) = -13.30, p < .001$ (equal variances assumed). At The Pine a greater proportion of unique recyclable items was present in the domestic waste bags compared to the clinical waste bags: $t(39) = -10.56, p < .001$ (equal variances assumed).

There was a significant difference between the mean proportions of unique recyclable items in the clinical waste streams across the four sites at $F(3, 65) = 20.18, p < .001$. Equal vari-

ances could be assumed and the Scheffe post-hoc testing method was applied. The significant difference between the mean proportions of recyclable unique items in the clinical waste stream was between The Oak and The Beeches, where a greater mean proportion of recyclable unique items was present at the former compared to the latter. Domestic waste streams at each of the four sites contained similar proportions of recyclable unique items per bag, namely $F(3,42) = .37, p = .893$.

Table 5.13: Mean proportions of recyclable unique items in the clinical and domestic waste streams at each of the four sites (%)

	The Maple		The Oak		The Beeches		The Pine	
	Clinical	Domestic	Clinical	Domestic	Clinical	Domestic	Clinical	Domestic
N	22	4	6	6	19	17	22	19
M	24.21	85.03	43.15	79.00	13.86	79.77	26.12	80.01
SD	20.09	4.10	9.71	6.04	16.87	12.18	16.51	16.04

5.4 Discussion

The present sub-study found that there was a greater number of individual items of waste in the domestic waste stream compared to the clinical waste stream. Greater numbers of unique items were also present in the domestic waste stream compared to the clinical waste stream, and one would expect to find a greater range of materials in those same domestic waste streams. The domestic waste bags, however, did not weigh as much as the clinical waste bags, even though they contained a greater number of items. The differences between the general compositions of the clinical and domestic waste streams might be the result of the types of items being disposed of. Additionally, items in the domestic waste stream might be smaller but more numerous, and those in the clinical waste stream may be larger but weigh more than the greater number of smaller items in the domestic waste stream. The presence of offensive liquid waste in the clinical waste stream might also impact on the weight of the clinical waste bags, particularly as large numbers of incontinence pads were disposed of at the social care sites.

A number of differences and similarities were identified between the waste compositions at the four participating health and social care sites. The clinical waste stream at The Beeches contained a significantly lower number of items than the other two social care sites (The Maple

and The Pine), which may have been due to an overall lower production rate of clinical waste resulting from a difference in activities performed at The Beeches compared to The Maple and The Pine, or it might be the result of the clinical waste bins being emptied on a more regular basis, which would provide less time for the waste to accumulate. The number of items in the domestic waste streams at each of the four sites was similar. The numbers of unique items in the clinical waste streams of the four sites were also similar; however, there was a greater number of unique items in the domestic waste stream at The Oak compared to The Maple, The Beeches and The Pine. The Oak was also found to have a greater number of materials in the clinical waste stream compared to The Beeches and The Pine, which indicates a greater diversity of materials being used and disposed of in the clinical waste bins at The Oak. All four sites displayed similar levels of materials in their respective domestic waste streams, which is an interesting finding because while The Oak showed a greater diversity of unique items in the domestic waste stream compared to the other three sites, there was not greater diversity in materials to accompany this change. This finding is the opposite to what was found at the clinical waste stream, where similar numbers of unique items preceded a difference in the number of materials present.

The clinical waste bags at The Maple were found to be significantly heavier than those at The Oak, The Beeches and The Pine, and although they did not contain the largest mean number of items, the greater weight may be due to the potential for liquids and/or heavy offensive waste produced at the social care site. The average weight of the domestic waste bags at each of the four sites was similar, which could indicate that the amounts of domestic waste and the types of items comprising the domestic waste at each site were themselves similar. Such a conclusion is further evidenced by the only significant difference between the domestic waste streams of the four sites, namely the greater number of unique items found at The Oak, because in all of the other measures the domestic waste streams of the four sites were found to be similar.

Within each site there were similarities and differences between the compositions of the clinical and domestic waste streams. At The Maple there were more items in the domestic waste bags and similar numbers of unique items and materials in the clinical and domestic waste streams, but it was the clinical waste bags at this site that weighed more than the domestic waste bags.

At The Oak the waste bags in the clinical and domestic waste streams were found to be similar across all four of the measures, thereby indicating similar levels of diversity in the items and materials, which happened to produce similar bag weights. At The Beeches it was the domestic waste bags that on average contained greater numbers of items, unique items and materials. Despite these differences the weights of the clinical and domestic waste bags were similar. At The Pine a different pattern was again observed – the number of items, the number of unique items and the number of materials were similar across the domestic and clinical waste streams, although the the clinical waste bags weighed more than their domestic counterparts.

The proportions of recyclable items and unique items provided perhaps the most interesting findings in this study. At each of the four sites and overall there was a greater proportion of potentially recyclable items and unique items in the domestic waste bags compared to the clinical waste bags. Similar proportions of potentially recyclable items were found in the domestic waste streams at each site. The Oak, however, was found to have the greatest proportion of potentially recyclable items in the clinical waste stream compared to The Maple, The Beeches and The Pine. The Oak only had a greater proportion of potentially recyclable unique items in the clinical waste stream than The Beeches. Overall, there was a greater proportion of potentially recyclable items found at the healthcare site compared to the social care sites and similar proportions of potentially recyclable unique items at each of the four sites. These findings indicate that there is the potential for recycling domestic waste at health and social care sites and further potential for the transfer of possibly inappropriately disposed of waste from the healthcare clinical waste streams to recycling. These findings agree with those of Tudor et al. (2008a), who also demonstrated that domestic waste streams at healthcare sites contain a high proportion of potentially recyclable waste.

Chapter 6

Decision Making Questionnaires sub-study

6.1 Introduction

The design of behavioural change or improvement interventions can be most effective when the psychological factors underlying the behaviour are better understood (Rockström et al. 2009). In the case of this study the behaviour under investigation was the waste disposal behaviour of health and social care employees. When employees have to decide between different possible courses of action to achieve a desired waste management goal, the cognitive process that they go through involves the use of a decision-making strategy. As can be seen in Chapter 1, there is conflicting literature on decision making in waste management, and usually the decision-making strategy has been assumed prior to the commencement of the study when a specific theoretical approach has been selected. Previous studies have adopted one of two approaches to modelling waste disposal behaviour: the first assumes a conscious decision-making process based on the Theory of Planned Behaviour (TPB) Ajzen (1991) and the second approach assumes habitual decision making based on automatic goal-directed behaviour Verplanken and Orbell (2003). These previous studies have not directly tested the applicability of one theory of decision making over the other to waste disposal behaviour, because the research designs focused exclusively on one theoretical approach to decision making or the other.

This chapter will first describe the sub-study methods, including the construction of the questionnaire, the sampling and the data collection procedure. The results of the data analysis will then be presented, reflecting the order of the sub-study objectives. Finally the discussion at the end of the chapter will discuss the meaning of the findings in the context of the sub-study objectives, summarising what the results might mean for the understanding of waste management

decision making at the participating health and social care sites.

6.2 Methods

6.2.1 Questionnaire construction

Two questionnaires were devised based on existing theories on decision making that have been applied to waste management. The first questionnaire was based on the SRHI (Verplanken and Orbell (2003)), a 12-item scale that can be used with a known or potentially habitual task. The questions are then adapted to fit the behaviour under investigation. The task for this specific sub-study was workplace waste management, and so the question was "Disposing of waste at work is something...". The 12 questionnaire items that followed this statement included statements such as "I do frequently", "I do without having to consciously remember" and "That belongs to my daily routine".

The second questionnaire was based on the theory of planned behaviour (TPB), originally described by Ajzen (1991). For simplicity the original three constructs – attitude, subjective perception and perceived behavioural control – described by Ajzen (1991) to predict behavioural intentions were used. The questionnaire consisted of 14 items: three questions for attitude, e.g. "I think disposing of waste is easy", three questions for subjective perception, e.g. "The company I work for thinks I should put rubbish in the correct bin", three questions for perceived behavioural control, e.g. "I decide which bin a piece of rubbish should go in", and five questions for behavioural intentions, e.g. "I recycle everything I can".

All of the items on both the SRHI and the TPB questionnaire used a seven-point Likert scale, which ranged from 1="Strongly Agree" to 7="Strongly Disagree", with 4="Don't Know". All of the items on both questionnaires used the same scale as a control and for comparability. The template of the full SRHI questionnaire is in Appendix Q and the full TPB questionnaire template is in Appendix R.

Several items of demographic information were also collected in the questionnaire (Appendix S). The participant was first asked to state their name and gender. Then they were asked for their age, which was split into seven categories. The first six categories ranged from 16

to 75 years old, increasing in equal increments of 10 years, while the seventh category was "76+". The participant was also asked to provide their job description by ticking one of nine categories, which included care staff, manager and administrator. An "other" category was also included, with space for the employee to write in their job description. The final two pieces of demographic information collected were the length of time that the employee had worked in the health and/or social care sector and the length of time that they had worked in their current job position. Both of these questions used the same categorical scale with five time periods: less than one year, 1 to 5 years, 5 to 10 years, 10 to 15 years and over 15 years.

6.2.2 Sample

The questionnaire was distributed to employees of four health and social care sites in the south-west of England during August 2012, coinciding with the observational sub-study described in Chapters 3 and 4. Twenty-seven health and social care employees participated in this sub-study – Female=20 and Male=7 (N=27) – and they were selected through opportunity sampling. This sampling method was deemed appropriate due to the nature of the workplace environment and the exploratory nature of the sub-study. The health and social care workplace environment is very busy, and employees are often called away to perform a task at a moment's notice. The researcher had to recruit participants when they had sufficient time to complete the questionnaire. Due to the limited availability of participants and the limited the time-frame for the collection of data, this study was an exploratory pilot sub-study. The exploratory nature of the study meant that while the sub-study did not require a large sample' it nonetheless did require the researcher to be present during the completion of the questionnaire, to answer any questions the participants may have had.

6.2.3 Procedure

The sub-study was a repeated measures design, with all of the participants completing both the SRHI and the TPB questionnaire. To control for order effects a counterbalanced design was used, with some of the participants completing the SRHI followed by the TPB questionnaire (N=12) and some completing the TPB questionnaire followed by the SRHI (N=15). All of the participants completed the demographics section prior to the SRHI and TPB questionnaire.

Due to the exploratory nature of the sub-study the researcher was present while the employees completed the questionnaire. The participants had previously received a briefing regarding the larger study and had been informed that they may be asked to complete a questionnaire. The researcher verbally reiterated the participants' right to withdraw from the study at any time and provided verbal instructions on the completion of the questionnaire. Following the completion of the questionnaire the researcher debriefed the participants, by explaining the purpose of the questionnaire and thanking them for their participation.

6.3 Results

6.3.1 Outliers and Item Analysis

The data were first checked for outliers through the conversion of the questionnaire results into z-scores. The results for two participants were found to be greater than 2 sd's from the mean, so the data for each of these participants for both of the questionnaires were removed from the analysis. This resulted in N=25.

The results from the self-report habit index (SRHI) and theory of planned behaviour (TPB) questionnaires were individually subjected to an item analysis, in order to identify any questions that did not contribute to the overall construct assessment undertaken in the questionnaire. The item analysis sought to maximise the Cronbach's Alpha value – and therefore internal reliability – while maintaining the maximum number of questions. The minimum acceptable Cronbach's Alpha value that would be accepted was .7, and all items with a corrected total correlation value of less than .2 were immediately removed.

Two items were removed from the SRHI – questions 4 and 7 – which resulted in a 10-item scale, where $\alpha = .745$. Four items were removed from the TPB questionnaire – questions 1, 7, 8 and 13 – thus creating a 10-item scale ($\alpha = .754$).

6.3.2 Difference between the questionnaire responses

The SRHI was found to have a significantly higher mean response score than the TPB mean response score at $t(24) = 2.655, p = .014$. The SRHI produced a mean response score of M=16.68, where SD=5.31 and N=25. For the TPB questionnaire M=15.56, SD=4.59 and N=25.

The scores for the SRHI and TPB questionnaires were not correlated, indicating that one was not predictive of responses for the other (r=.303, p=.141 and N=25).

6.3.3 Difference in order of presentation within questionnaire type

The presentation order of the questionnaires did not produce any significant difference in the mean response for the SRHI, $t(23) = -1.023, p = .317$. When the SRHI was presented first, M=17.46, SD=6.53 and N=11. When the questionnaires were presented in the reverse order, with the SRHI questionnaire second, M=19.64, SD=4.13 and N=14.

For the mean response score to the TPB questionnaire the presentation order did not produce a significant difference at $t(23) = -.385, p = .723$. When the TPB was presented first, M=15.86, SD=4.07 and N=14. For those to whom the TPB questionnaire was presented second, M=15.18, SD=5.36 and N=11.

6.3.4 Difference in gender of respondent within questionnaire type

The mean response score for the SRHI was not significantly different for male and female participants at $t(23) = .602, p = .553$. M=19.83, SD=4.71 and N=6 for male respondents to the SRHI. For female respondents M=18.32, SD=5.56 and N=19.

TPB questionnaire responses were not significantly affected by the gender of the respondent at $t(23) = .877, p = .390$. For male participants completing the TPB questionnaire, M=17.00, SD=5.69 and N=6, while the female participants produced a mean response score of M=15.11, SD=4.27 and N=19.

6.3.5 Difference in age of respondent within questionnaire type

The mean response scores of the different age categories to the SRHI questionnaire can be found in Table 6.1. The age of the participants was not significantly correlated with their response to the SRHI $r = -.026, n = 25, p = .903$, two tails.

For the TPB questionnaire the mean response scores of all the different age categories are reported in Table 6.2. There was no significant between the mean TPB questionnaire response score and the age of the participant $r = -.340, n = 25, p = .096$, two tails.

Table 6.1: Mean and standard deviation for the participants' responses to the SRHI by age category

Age range	N	Mean	S.D.
16-25	9	17.44	5.39
26-35	4	23.00	4.69
36-45	5	17.40	6.77
46-55	5	19.60	3.91
56-65	1	20.00	0.00
66-75	1	13.00	0.00
Total	25	18.68	5.31

Table 6.2: Mean and standard deviation for the participants' responses to the TPB by age category

Age range	N	Mean	S.D.
16-25	9	16.33	2.96
26-35	4	18.75	7.54
36-45	5	14.80	4.15
46-55	5	14.00	5.05
56-65	1	12.00	0.00
66-75	1	11.00	0.00
Total	25	15.56	4.59

6.3.6 Difference in job type of respondents within questionnaire type

The job type of the respondents did not significantly affect the mean response score on the SRHI at $F(16,6) = 2.028, p = .121$. The same was found for the TPB questionnaire, where the mean response score did not differ significantly between the participants' job roles, $F(16,6) = 1.711, p = .182$. The mean response scores for the SRHI are reported by job type in Table 6.3 and in Table 6.4 for the TPB questionnaire.

6.3.7 Difference in respondents' time in the health/social care profession within questionnaire type

The length of time that the respondents had spent working in a health and social care profession was not significantly correlated with their SRHI score $r = -.149, n = 25, p = .478$, two tails. Analysis using Pearson correlation did not find a significant relationship between the participants TPB questionnaire score and the length of time they had been working in a health or social

Table 6.3: Mean and standard deviation for the participants' responses to the SRHI by job type

Job type	N	Mean	S.D.
Housekeeping	1	23.00	0.00
Care staff	10	17.90	5.11
Nursing staff	3	17.00	6.08
Manager	2	26.00	0.00
Deputy manager	1	17.00	0.00
Administrator	1	29.00	0.00
Other	5	17.20	2.78
Total	23	19.00	5.21

Table 6.4: Mean and standard deviation for the participants' responses to the TPB by job type

Job type	N	Mean	S.D.
Housekeeping	1	20.00	0.00
Care staff	10	16.30	3.89
Nursing staff	3	16.67	8.08
Manager	2	16.50	0.71
Deputy manager	1	22.00	0.00
Administrator	1	10.00	0.00
Other	5	11.60	1.95
Total	23	15.48	4.59

care profession $r = -.143, n = 25, p = .495$, two tails. The mean response scores for the SRHI can be found in Table 6.5 and for the TPB questionnaire in Table 6.6.

Table 6.5: Mean and standard deviation for the participants' responses to the SRHI by time within health/social care profession

Duration	N	Mean	S.D.
<1 year	3	18.33	9.71
1-5 years	7	21.00	4.16
5-10 years	4	17.25	4.11
10-15 years	3	17.00	3.61
>15 years	8	18.13	5.99
Total	25	18.68	5.31

Table 6.6: Mean and standard deviation for the participants' responses to the TPB by time within health/social care profession

Duration	N	Mean	S.D.
<1 year	3	12.00	2.00
1-5 years	7	17.29	4.54
5-10 years	4	20.50	4.04
10-15 years	3	12.33	2.31
>15 years	8	14.13	3.98
Total	25	15.56	4.59

6.3.8 Difference in respondents' time in current health/social care employment within questionnaire type

The SRHI response scores of the participants were not significantly correlated with the length of time they had been working in their current health or social care role $r = -.248, n = 24, p = .243$, two tails. The scores of the participants for the TPB questionnaire were significantly correlated with the length of time they had occupied their current health or social care employment role $r = -.454, n = 24, p = .026$, two tails. This relationship indicated that the longer an employee had been in their current employment role the lower their score on the TPB questionnaire. The mean, SD and N values for the SRHI can be found in Table 6.7 and for the TPB questionnaire in Table 6.8.

Table 6.7: Mean and standard deviation for the participants' responses to the SRHI by time with current health/social care employer

Duration	N	Mean	S.D.
<1 year	8	19.25	6.74
1-5 years	7	20.00	4.32
5-10 years	1	20.00	0.00
10-15 years	5	17.40	6.23
>15 years	3	15.33	4.04
Total	24	18.63	5.42

Table 6.8: Mean and standard deviation for the participants' responses to the TPB by time with health/social care employer

Duration	N	Mean	S.D.
<1 year	8	16.50	4.75
1-5 years	7	17.71	5.02
5-10 years	1	12.00	0.00
10-15 years	5	13.20	2.68
>15 years	3	11.33	1.53
Total	24	15.33	4.55

6.4 Discussion

6.4.1 Difference between the mean questionnaire response scores

The significant differences between the employee responses to the two questionnaires represent an important finding. The lower score indicates a greater frequency of use, or strength, regarding the conscious decision-making process as described by the TPB, which means that conscious decision-making strategies may have a greater influence than unconscious decision-making strategies on waste management decision-making in a health and social care setting. The difference, while significant, was not so great as to exclude the occurrence of habitual decision making. It would seem that consciously made waste management decisions may be more prevalent than habitual decisions. It is also possible that due to the unconscious – and therefore not so easily perceived – nature of habitual decisions, the participants were not able to report on these behaviours so easily. Such a conclusion is given less weight, however, due to the SRHI having been designed to minimise the impact of the unconscious nature of the behaviour.

With the habitual decision-making processes and the conscious decision-making processes being of different strengths with regard to health and social care waste management decisions, it was important to know that the two questionnaires were independent and had measured different constructs. The questionnaire responses were not correlated, thus allowing for the conclusion that the two types of decision making being measured by the questionnaires were distinct and one was not predictive of the other, therefore making it possible that they account for different aspects of decision making within the context of health and social care waste management.

The difference in strength between these two methods of decision making, and their apparent independence from one another, may indicate that they act on different parts of the waste disposal process. The act of deciding into which bin to dispose of waste is most likely an independent decision on deciding how to open the chosen bin. It is possible that the general question about the participants' waste disposal behaviour was not specific enough to distinguish between what is quite likely a number of different decisions that need to be made when deciding how to dispose of an item of waste. It is therefore plausible that both habitual and conscious decision-making processes are involved in the disposal of health and social care waste, even though they are utilised independently for different aspects of this task. Research following on from this study might seek to break down the act of health and social care waste disposal into its basic decision components and investigate which decisions at this greater level of specificity are the result of conscious and habitual processes.

Recent research has shown that the TPB might not be an accurate description of health and social care waste management. Young et al. (2013) found, through a review of the literature and meta-analysis, that the TPB did not yield an accurate representation of the psychological constructs underpinning pro-environmental behaviour improvement interventions. Attitudes which form one of the three main constructs in the TPB were found to be of minimal importance for workplace decision-making strategies. The finding that neither the TPB nor the SRHI can accurately account for variations in the decision-making strategy observed during this sub-study or the studies reviewed by Young et al. (2013) implies that both models are incomplete descriptions of workplace decision making. Future research focused on deriving a new or revised theory of decision making will help to further our understanding of the decision-making processes utilised by employees in a workplace context.

6.4.2 Mediating factors

The order in which the questionnaires were presented to the participants did not influence their responses, thereby negating the possibility of any order effects. Most of the potential mediating variables did not have any impact on the participants' responses. The gender of the respondent did not affect their responses to either the SRHI or the TPB questionnaire. Age may have

been a factor that influenced decision-making style, potentially due to changes in awareness or conscientiousness regarding their own waste management behaviour, but this was not the case. Participants of all ages responded in a similar way on both the SRHI and TPB questionnaire. The job role of the participants who completed the questionnaire did not impact on their responses to either of the two questionnaires, which indicated that the decision-making processes utilised by different types of employee are similar.

The amount of time that an employee had spent working in the health and social care sector did not influence their use of different decision-making styles. The amount of time that an employee had been working in their current health or social care role was the only variable that was significantly associated with a change in use of decision making style. This variable was not significantly associated with changes to SRHI response score, but was significantly associated with changes to the TPB questionnaire response scores. The significant correlation between the length of time an employee had been in their current health or social care employment role and their TPB questionnaire score was negative. This negative relationship indicated that, the longer an employee had been in their current job role the more likely they were to use a conscious decision making style when disposing of waste. This is a counter-intuitive finding because, as habitual behaviours develop and arguably gain in strength over time, one would expect to see that those participants who had worked in health and social care for a relatively longer period of time, would have developed and exhibited more habitual decision-making behaviours.

What the findings of this sub-study postulate is that habitual decision making remains consistent over the length of employment, but conscious decision making increases over time. A possible explanation for why the use of conscious decision making strategies would increase as the length of time in a particular health or social care employment role increases, is that the finding is an artifact of the health and social care sites that the participants used in this sub-study came from. The implementation of recycling and changes to the waste management systems, particularly at The Oak, may have been more difficult to adjust to for employees who had been working in their current employment role longer. Those employees who had been working in their current employment role longer may have more strongly established habitual waste dis-

posal behaviours, then when the system of waste management changed it took more conscious effort and perhaps a longer period of time for them to adapt.

The age of the employee was the only other variable that was close to being significantly correlated with the TPB questionnaire score. It was not applicable to carry out a partial correlation controlling for the age of the employee due to age not being significantly correlated with the TPB questionnaire score. It is possible that as age increases health and social care employees become more reliant on conscious decision making strategies. Further research will be required to determine if and how, the length of time an employee has been in their current employment role and the age of the employee, impact on the decision making strategies used by health and social care employees when carrying out waste management practices.

6.4.3 Conclusion

The findings from this sub-study have shown that waste disposal decisions at the participating health and social care sites were the result of both conscious and habitual decision-making processes. Conscious decision-making processes also appear to be of a greater strength or salience to the individual than habitual processes. The TPB questionnaire and the SRHI are independent and measure different aspects of the waste disposal decision-making process, indicating that conscious and habitual decision-making processes may act on different parts of waste disposal behaviour. Gender, age, job role and time working in the health and social care sector were all found not to influence health and social care waste disposal decision making processes.

Only the length of time an employee had been in the current job role was associated with their score on the TPB questionnaire. This counter-intuitive finding indicates that the decision making strategies used by health and social care employees for health and social care waste management may differ over the course of their career; however, further research is required examine this relationship in detail and rule out the other variables, such as age, from mitigating this relationship.

Chapter 7

Management interviews sub-study

7.1 Introduction

In order to obtain a more complete picture of the health and social care waste management system it was important to assess not only the behaviour and personal perspectives of the employees using the systems but also the management of each organisation responsible for implementation and maintenance. Each organisation's management team is in a position of authority, whereby managers must ensure that the waste management system and associated systems meet legislative requirements, that employees know how to use the system and that they are using it correctly.

This chapter will start by describing the methods used in the sub-study, including the sample, interview schedule and analysis technique. The findings from the sub-study will then be presented under the main topics of policy, guidance and training. Any thematic links between these three topics will also be highlighted. The chapter will finish with a summary of the findings and a discussion of their implications for waste management in the respective organisations.

7.2 Methods

The consolidated criteria for reporting qualitative research (COREQ) 32-item checklist (Tong et al. 2007) was completed for this study and can be found in Appendix T.

7.2.1 Sample

A purposive sampling technique was used in this sub-study. A member of the company management team responsible for the implementation and management of the waste management systems at each of the four participating sites was selected. Their selection for interview was

based on their knowledge of company policy, guidance provision and employee training. The four sites that participated in this programme of research were run by two organisations, which meant that two persons, one from each organisation, were interviewed.

Terminology

The terms organisation 1 and organisation 2 are used in the presentation of this sub-studies findings, to demonstrate that there are two interviewees representing the organisations who operated the four participating sites. The term 'organisation 1' refers to the interviewee representing the organisation operating The Oak. The term 'organisation 2' refers to the interviewee representing the organisation operating The Maple, The Beeches and The Pine.

7.2.2 Interview technique and schedule

This sub-study was designed as a semi-structured interview, and the interviews were expected to last up to 60 minutes due to interviewee obligations. They were carried out between May 2013 and July 2013, inclusive, and took place at a time convenient to the interviewee. The interviewer during this study was the author of this thesis.

The interview schedule (Appendix U) was split into three main sections:; training, guidance and policy. This schedule was constructed based on the experiences the researcher had had during observational sub-study prior to the interviews taking place. The subjects in the interview schedule were included to gather information about topics which the researcher perceived as important to the project and could not be covered by non-management level employees during the other sub-studies. In this way the interviews were a qualitative survey of information pertaining to waste management from the perspective of a management level employee.

The training section of the interview schedule included discussion points such as 'What training do staff receive?', 'Do all staff receive the same training?', questions on the management of different waste types and 'Testing of understanding'. The discussion points aimed at prompting a discussion on both general training information and then more specific waste management training details.

The second section of the interview schedule, guidance, focused on the what, where and how

of guidance provision. The interview schedule used general discussion points such as 'What guidance is provided to staff?', 'Who decides what guidance should be provided?' and 'How often is the guidance reviewed and/or revised?'. The use of such general discussion points allowed the interviewer to pick up on the company-specific examples that the interviewee was prompted to provide and then to pursue more detailed and company-specific information.

The final section of the interview schedule was concerned with company policies. Discussion points in this respect sought to prompt a discussion regarding policies in general as well as gleaning more specific information about waste management and related policies. The discussion points included 'Where does the policy come from?', 'What sources are used to inform the design of the policy?' and 'Is staff adherence to the policy monitored?'. In a similar manner to topic two, guidance, general discussion points were used, thereby allowing the interviewer to use the company-specific examples provided by the interviewee to gather further information around each discussion point.

The use of the semi-structured interview technique allowed the interviewer to not only explore relevant topics of interest that arose during the interviews, which were not included in the interview schedule, but also to alter the order or content of the discussion points, should certain discussion points be more appropriately covered at a different time during the interviews.

7.2.3 Analysis technique

The interviews were digitally recorded using a Dictaphone, and the MP3 files were then transcribed verbatim. The interview transcripts were then uploaded to NVivo 9 for coding and organisation. The management interviews sub-study was a qualitative survey which would provide additional information and context to the data collected during the other sub-studies in this study, which would be of particular importance during the data triangulation to be presented in Chapter 8. To facilitate this process, the management interviews sub-study data was descriptively and analytically coded using the same process as described in Chapter 4 Section 4.2.3. Due to the predominantly descriptive nature of the data, it was not suitable to develop themes from the analytical codes as would be the normal practice during thematic content analysis. The coding process provided a way for the researcher to organise the interview data and following

the coding process the codes and associated data from the interviews were organised under the three main topic headings of; policy, guidance and training. It is under these three topics that the interview data is presented in the remainder of this chapter.

7.3 Findings

7.3.1 Waste management policy in the health and social care setting

The creation of waste management policies for the two participating organisations was undertaken by multi-departmental teams at the organisation's respective head offices.

"...there's different representatives at corporate level...they'll come together depending on which one it is to bring their elements to it..."

The waste management policy at organisation 1 was reported to have most likely been created in this manner. It was a collaboration between the services department and the infection control department at the head office. Organisation 2 also utilised the experience of multiple departments in the creation of its waste management policy. A 'policy subgroup' had been recently brought together to create and implement new and revised policies within the organisation, and it was this group that was responsible for the latest revision of the organisation's waste management policy.

Using the combined experience and knowledge of different departments within their organisation, the participating health and social care organisations were able to ensure that there was continuity between the waste management policy and the related policies, one of the most important being the infection control policy. The waste management policy was related to the infection control policy in a manner that reduced the risk of infection or contamination. The continuity of the waste management policy with the other related policies ensures that employees are less likely to encounter conflicting information within the policy documents.

"...we've obviously people responsible for overall clinical, people responsible for estates, clinical governance, health and safety so there's different representatives at corporate level and they'll come together for depending on which policy it is to bring their elements to it..."

Ensuring continuity is important for employees, as conflicting information is more likely to

make them uncertain of an appropriate form of behaviour. When information in an organisation's waste management policy is consistent with other related policy documents, the appropriate behaviour should be simpler for the employee to ascertain from the policy document. There would be no conflicting information in the related policy documents that might cause them to question information in the waste management policy.

The use of multi-departmental teams also ensured that the appropriate legislation was included in the waste management policy.

"...the group sort of overall clinical director...you'd have that sort of combination of knowledge and they obviously then tap onto, tap into, legislation..."

By working in a multi-departmental team the organisation could also ensure that legislation and policies would be fully cross-referenced, which would enable an employee reading the waste management policy to know where to find additional information but perhaps contained within another policy. This would most likely make the process of finding information simpler for the employee.

The waste management policy at organisation 1 referred to the management of both clinical and domestic waste but not recyclable waste, which was classified by the organisation as being similar to general waste.

"I'm not sure it would be, or is. Because it's really handling of general waste versus handling of clinical waste, and I suppose you would class recycling as the general waste stream. So I don't think it details as such recycling."

There appeared to be the perception that waste management was part of infection control. The interviewee from organisation 2 did not make direct reference to recycling in waste management. The waste management policy for organisation 2 states that the organisation is committed to lowering its carbon footprint and engaging with sustainability. While basic information is provided about the recycling practices currently taking place, there are no detailed strategy or guidelines for employees to follow.

"[Organisation name] encourages all staff to recycle all products and items when they can. This

will reduce the amount of waste that ends up in landfill sites. In general [Organisation name] will work with the contractor used for taking recycling products. Bins and bags are supplied for the [sites] to segregate their recycled items and these are collected from the waste disposal area. [Organisation name] aim to recycle as much of their waste products as they can, this will help reduce the amount of waste and its impact on the environment. Items for recycling include, material, paper, cardboard, tins, plastics and glass bottles."

At organisation 1 all of the standard policies came from head office, including the waste management policy, any revisions to which were sent through the computer administration system (CAS) as a 'CAS notification'. The revised waste management policy was then distributed to the employees by email and discussed during management meetings.

"...at the various forums, whether it be the heads of departments meeting or the infection control meetings or the health and safety risk management meeting; so, whatever forum is relevant, it will be communicated through there".

Any changes to the waste management policy in organisation 2 were cascaded through to the organisation's sites. The cascading process was done via email notifications and the policies made available to the organisation's sites on a shared online resource. The current system relied on the email recipient reading the email, accessing the revised waste management policy and printing it out so a hard copy was available for all site employees. A hard copy of all of the up-to-date policies and procedures should be kept in a folder at each site; the interviewee, however, recognised that this system of dissemination was only as good as the person receiving the email and then remembering to print it off.

"Not always a foolproof way of getting it out to them, because, you know, it's only as good as the people when you send the email – 'please print this off take out the old put in the new one' – and once we've done our reorganisation at head office we're going to print another set for each of the homes."

Following the reorganisation of this organisation's head office, full and up-to-date copies of all the organisation's policies and procedures, including those for waste management, would be printed off and given to each site. For the dissemination of policy to employees, information

regarding policy changes was verbally cascaded out and:

"...if you ask any members of staff they should know where to go to get a policy, if they need one."

Both organisations 1 and 2 made their waste management policies available via the internet. For organisation 1 this was via the company's intranet site and for organisation 2 this was via their online shared area. At organisation 2 the online shared area could only be accessed by the site management and administration teams, while the company intranet site used by organisation 1 could be accessed by all company employees. By allowing all of their employees access to the waste management policy through its company intranet, organisation 1 made it easier for its employees to access waste management policy in their own time, which may encourage more people to access the policy when unsure of the appropriate behaviour. Access to the waste management policy at organisation 2 required greater effort on the part of the employee, as they were required to request a hard copy from the site administrator. This may have led to fewer employees accessing waste management policy information when it was required, perhaps due to work-based time pressures. The practice of printing hard copies is also an unsustainable practice due to the consumption of paper, so allowing employees electronic access to waste management and other policies would reduce paper consumption at organisation 2.

An employee's knowledge of his or her organisation's policies is conveyed to them through their induction training. Part of the induction training at both organisations 1 and 2 was to ensure that new employees were aware of and had read the policies relating to their department and job role, including the organisation's waste management policy.

Organisation 1 did not have a standardised system for checking their employees had read and understood the waste management policy, and the systems currently being used were described as being ad hoc. Some departments used signature sheets on which employees would sign to the effect that they had read, understood and would adhere to a certain policy document. There was also a new electronic system which at the time of the interviews had not been implemented. This system would be integrated with the electronic time sheet system and use a notification box to inform employees when a revised waste management policy document was available.

Using this system the employee would electronically state their having read and understood waste management revisions.

Organisation 2 was already using signature sheets, whereby employees would read and sign some policies to acknowledge they had done so, e.g. health and safety. This process required the waste management policy to be reprinted and re-signed by the employee, in order to acknowledge that they had read and understood changes when a major revision was made.

7.3.2 The use of waste management guidance in the health and social care setting

The interviewee from organisation 1 provided examples of guidance topics that centred on waste management. There were guidance notices located around the site that provided information on what types of waste were to be disposed of and in which bin. These guidance notices were based on the site policy, and therefore the waste disposal information on them should have been in accordance with national legislation. There were also said to be guidance notices that informed employees about what should and should not be done when disposing of recyclables. One issue that was raised about the guidance notices was a lack of sufficient information to aid in recycling. The organisation's employees had raised questions about the types of plastics that could be recycled, but the guidance notices contained information about where plastics should be disposed but not the types plastic that should be disposed of and in which bin. This is important information for the employee due to the multiple types of plastics and the fact that not all types of plastic are recyclable or recycled by every waste contractor.

"I mean, people have queried can we, can we put this type of plastic? I'm trying to think of an example because that did come up, can we put this in the recycle? And I then contacted [company name], got the answer and come back and given them the answer then circulated that to everybody so they're all aware."

When employees at organisation 1 enquired about which types of plastic could be recycled, the waste contractor was asked by the organisation to provide an answer. The waste contractor then responded by saying that all types of plastic could be disposed of in the recycling bin, and this information was then circulated to the employees. According to the organisation, the waste contractor was quite proactive in sending them information to provide to their employees. The

interviewee did say that the new waste contractor had

"...taken some time to get integrated with us and understand our business."

The interviewee went on to say that as the waste contractor had become more integrated with the organisation they had provided more waste management information. All of this information went through the support services and facilities manager, before being disseminated to the employees.

The guidance provided by organisation 2 to its employees was described as "varied." It was found that there was some organisation-wide standardised guidance that included fire notices and hand-washing information. In the housekeeping and catering areas guidance notices were provided on the subjects of chemicals, cleaning materials and kitchen practices required by environmental standards. Any waste management information that was provided to employees was described as "basic," with no reference to legislation or legal responsibilities.

Waste management guidance in organisation 1 appeared to be disseminated in a top-down manner. Information would be passed from the corporate to the local site level through facilities and risk management forums attended by a member of the management team. Waste management guidance was then issued to employees at the local site level by the support services and facilities manager. Guidance would then be verbally communicated via heads of department meetings to general employee meetings and then departmental meetings. As well as verbal communication, the organisation would circulate guidance posters to employees by email and on notice boards, also using flyers for disseminating guidance. These forms of physical information transmission allow for the provision of the same information to all employees.

Organisation 2 differed from organisation 1 in its provision of waste management guidance. There was an organisational consensus not to put lots of posters and other materials on the walls, which came to the fore because it was believed to make the sites appear too clinical in appearance. The organisation saw its services as being client-led, and so it tried to make its sites feel like homes instead of clinical environments. As a result of this approach general information would be put on employee notice boards and/or discussed at meetings. General information may also be sent to employees by email or memorandum, possibly in the standard

post. The very few areas where guidance was displayed on the walls were employee-only areas. The sluices and staff rooms were cited as those most likely to contain waste management guidance.

"...the company structure is that we don't put loads and loads of things on walls to make it look too clinical, if you can understand that."

Recycling was a new waste management process for organisation 1, and it was therefore important to provide guidance for employees on how to use this new waste stream, to help avoid waste disposal errors. Posters were used to disseminate recycling guidance to the employees, by being put on actual bins to provide information at the point of disposal.

"In some areas they're actually on, the posters are on the bin, the pantry area – it's on a dishwasher, sort of, next to the bin..."

These guidance posters told employees what waste goes in which waste streams and what they should and should not do with regard to recycling. Employee inquiries did and should have continued to inform the waste management guidance provided by the organisation. The interviewee was aware that there were high levels of theatre waste that could have been recycled but was not currently being recycled. This was an area where waste management, and particularly recycling guidance, may be of use in the future.

Organisation 2 was said to be in discussion with a potential future waste contractor about the possibility of providing 'toolbox talks' as a form of verbal waste management guidance provision to employees. This was an innovative idea that could possibly help the organisation improve waste management at their sites while maintaining their commitment to not putting waste management guidance notices on the walls.

7.3.3 Waste management training in the health and social care setting

No specific waste management training took place at organisation 1, and there were no waste-specific elements to the e-learning programme. The interviewee, however, indicated that there was the potential for this to change, as the training programme was under constant review.

"...reviewing what they are doing all the time and it kind of changes on an annual basis for us

going forward."

Waste management was possibly included in the infection control e-learning element, but the interviewee was unsure which aspects were covered. Training on the subject was also stated to be covered in some form during the infection control training and employee induction training.

The induction training was described as the main type of training provided by organisation 1 to their employees. This was the initial training process all employees underwent on joining the organisation. An induction check-list was used, and this was the same for all of the different departments, with clinical staff undergoing a similar induction to non-clinical staff. Although waste management was said to be included during an employee's induction training, it was not a separate subject requiring signing off by the employee's supervisor.

There appeared to be the perception that waste management was part of infection control practices for clinical staff. The waste management roles of housekeeping and portering staff were also perceived to be slightly different from one another, in that portering staff were perceived as mainly taking waste in sacks to an external storage area, whereas housekeeping staff were perceived as handling waste from bins an putting it into larger sacks. Housekeeping staff, due to their perceived role, were told about glove use during waste bag disposal, how to handle bags of waste, what to put removed waste bags in and what type of waste bag should be disposed of and where. The recent introduction of recycling practices to this organisation was perceived as an education for all employees, regardless of department or job role.

"...we haven't done anything prior to the last six months, you know, so it's an education for all of us, really..."

Like organisation 1, waste management at organisation 2 was not covered as a specific subject or in a separate training session. The interviewee was not aware of any of their type of organisation currently providing waste management training. Waste management was incorporated into other training sessions and during in-house induction training. All new employees must complete their induction training during the first few weeks of their employment, a process coordinated by the training coordinator. The interviewee thought it likely that new employees would be instructed in the handling and disposal of waste during their induction training,

while some basic waste management information was thought to be covered in health and safety training.

"...we'll talk about waste on other subjects...on health and safety we talk a little bit about it, but it's just basic talk..."

Any waste management training that did occur was described as being provided verbally and informed in an ad hoc manner rather than being evidence-based. The interviewee perceived time as a barrier to providing specialist waste management training, because with so much training already taking place the interviewee was unsure if another training topic could be included. The company, however, was in discussions with a potential waste contractor about providing toolbox talks for the more formal verbal provision of waste management training for the organisation's employees.

7.4 Discussion

At both organisations 1 and 2 the responsibility for creating and revising waste management policy had been removed from local level – both head offices dealt with this process. This enabled all of the local sites to be governed by the same waste management policy, thus standardising practices and procedures to which multi-site organisations adhere. Having the head office of an organisation responsible for policies meant that all of the different departments for whom the waste management policy would be applicable could have some form of input into the policy creation and revision process. This cross-departmental working arrangement was present in both organisations 1 and 2 and appeared to provide a method of integrating relevant information and perspectives from those people and departments with appropriate knowledge and expertise.

Email or some form of electronic distribution appeared to be the favoured method of policy dissemination for both organisations 1 and 2. There were variations in the systems used, such as a company intranet site or networked hard drives for the storage of policies. Both organisations used similar systems for disseminating new or revised policies to their local sites. The electronic dissemination of the waste management policy did rely on a person receiving a notification

about a revised waste management policy, then acting on the notification accordingly. There was the potential for human error at this point, if the notification was not actioned correctly by the recipient. Both organisations also relied on existing employees to teach new employees about the policies they needed to be aware of and also made sure that their employees were able to access a copy of the organisational waste management policy, whether in electronic or hard copy format.

There was a system in place at both organisations for monitoring employee understanding of policies. This commonly took the form of employees signing a document to the effect that they had read, understood and would adhere to a particular policy. Such a system covers the organisation from a legal perspective, should an employee get into difficulties through non-adherence to a policy. What it does not do, though, is provide a system for monitoring actual employee adherence to a policy or the effectiveness of said policy.

Waste management policies at organisations 1 and 2 covered clinical and domestic waste but not recyclable waste in any detail, even though recycling took place within both organisations. These waste management policies classified recyclable waste as being similar to domestic waste, possibly because current legislation and best practice guidance provided by governing bodies such as the Royal College of Nursing classify recyclable waste as non-hazardous and the same as domestic waste. When this is interpreted by an organisation they may not be aware of the need for a distinction between domestic and recyclable wastes in the waste management policy document. Both interviewee expressed the possibility of recycling being included in the next revision of their organisation's waste management policy.

Guidance at organisation 1 was designed to aid employees in appropriately disposing of waste, particularly recyclable waste items. One organisation provided guidance to its employees through various media, such as email, posters, flyers and verbal information at meetings. There was also reported to be guidance posted on the bins themselves, to provide guidance right at the point of disposal. At organisation 2 there was general agreement within the organisation that they would not put up guidance posters in patient areas unless it was a legal requirement. This was due to the company ethos of not making their sites feel clinical, though this had led to no

standardised waste management guidance being displayed by the organisation for the benefit of its employees. Any waste management guidance that was provided was described as basic, varied and ad hoc.

The organisational agreement to not display guidance in patient areas did not prevent organisation 2 from displaying waste management-related guidance in employee-only areas. It was in the employee-only areas that some non-waste management-related guidance was displayed. There was a formal top-down guidance dissemination process in organisation 1 whereby information would come from head office to the local site management or directly from the local site management. This information would then either be distributed to heads of department through formal meetings or directly to employees via email, posters or flyers.

Interaction between the organisation and the waste management contractor appeared to be an important factor in the effective acquisition of waste management guidance. It was reported at organisation 1 that the more the waste management contractor understood the organisation's business, the more accurately and efficiently they could provide guidance and respond to inquiries.

One area that was identified as requiring further assessment and guidance regarding waste management and recycling at organisation 1 was the operating theatres. This was reported to be an area that would be targeted for improvement in the future by the organisation. Organisation 2 was in talks with a potential future waste contractor about the possibility of providing what they termed 'tool box' talks, which would provide the organisation's employees with verbal guidance and training by the waste contractor and in collaboration with the organisation. This highlights the earlier point about the importance of involving a waste contractor in producing effective waste management practices. Further to this point, organisation 1 provided examples of using waste management guidance, which was disseminated verbally to resolve issues such as waste contamination and employee uncertainty. In these instances the organisation relied on the waste contractor to feed back any inappropriate waste disposal behaviour or the employees to report any uncertainties, in which case the waste contractor could then provide the appropriate guidance.

Neither organisation provided specific waste management training. Any waste management training that did occur tended to feature in other training sessions such as the induction training process and infection control. The training that was provided by both organisations varied according to department and job role; however, the two organisations did have some differences in the types of training they provided their employees with and the methods by which they did this training. Organisation 1, for instance, used an e-learning system for a lot of its generic training sessions, while organisation 2 stated that it provided its employees with transferable, nationally recognised qualifications such as health and social care diplomas. Organisation 2 also went on to espouse the value of its training methods and flexible and adaptive resources. Furthermore, the company was willing to make training fit in with its employees' lifestyles,recognising that not everybody wants to undertake training but it is a requirement of the organisation and therefore should be encouraged.

Overall, waste management training at both organisations tended to be very ad hoc and was delivered verbally during other training sessions. In organisation 2 waste management training was described as non-evidence-based when it did occur, while in organisation 1 the introduction of recycling practices was described as an education for all employees.

Chapter 8

Data Triangulation

8.1 Introduction

This study was carried out using a multi-strategy concurrent triangulation design (Creswell 2009), which enables more than one sub-study of the same phenomenon to be carried out over the same period of time. The purpose of such a research strategy is to facilitate the exploratory investigation of complex situations and phenomena (Robson 2011). The real-world situation of health and social care waste management is one such complex situation, as it consists of multiple phenomena and influencing factors.

When using a multi-strategy approach that inherently includes both qualitative and quantitative data, the researcher will often want to compare and contrast the findings from each of the individual sub-studies. If the researcher is to include all of the sub-studies in the comparison process, the presence of both qualitative and quantitative data precludes the use of standard qualitative and quantitative multi-study analyses such as meta-analysis, meta-ethnography or meta-synthesis. The process of triangulation allows the researcher to overcome the qualitative and quantitative disparity and interpret both data types in the context of one another. Triangulating the sub-studies' findings provides a more complete picture of the phenomena under investigation than by interpreting each sub-study in isolation. The validity of the findings from the study is also enhanced through the identification of complementary or conflicting findings (Creswell 2009; Gray 2009; Robson 2011).

The aim of this chapter is to describe the triangulation process and present its findings.

8.1.1 The data triangulation process

Data triangulation required the findings from each individual sub-study to be interpreted in the context of every other sub-study, so the findings from all four of the sub-studies described in the preceding chapters were included. The process was achieved by the researcher first pairing up all of the sub-studies so that each was paired with every other sub-study only once and with no repeats. Each pair of sub-studies was then selected one at a time. The findings from the two sub-studies in the selected pair were then compared by looking for consistent and conflicting findings and potential explanations for or factors influencing the findings. Notes were made recording each instance of consistency, conflict, explanation and influence. Each note was coded so the researcher knew from which comparison of sub-studies the triangulated findings originated.

Similar triangulated findings were linked together next, which took the form of an iterative process whereby the researcher linked together those findings that had similar themes or concepts. All of the links drawn between the triangulation findings were recorded. Each of the triangulated findings was numbered and the links between the triangulated findings entered into the computer program Gephi, which enabled the researcher to produce a node-based diagram of the fully triangulated and linked data. The node diagram is presented in Figure 8.1, while the results of the triangulation process are presented in the following sections.

8.2 The triangulated findings

In the following sections the triangulated findings will be presented. A coding scheme has been used to link the discussion of the findings below to the node diagram of the linked data and illustrate from which pair of sub-studies the findings originate. An example of the code used within the text is (10 AB). The number (e.g. 10) within the brackets represents the node number within the node diagram of the linked data. The two letters that follow the number (e.g. AB) represent the two studies from which the triangulated finding originated.

The sub-studies have been attributed the following letters:

A = Management Interviews Sub-Study (Chapter 7)

B = Observational Sub-Study: Quantitative Findings (Chapter 3)

C = Observational Sub-Study: Qualitative Findings (Chapter 4)

D = Waste Audit Sub-Study (Chapter 5)

E = Decision-Making Questionnaires Sub-Study (Chapter 6)

Using the example (10 AB), this code can be interpreted as relating to node number 10 in the diagram and originating from the triangulation of the management interviews sub-study (A) and the quantitative observational sub-study (B).

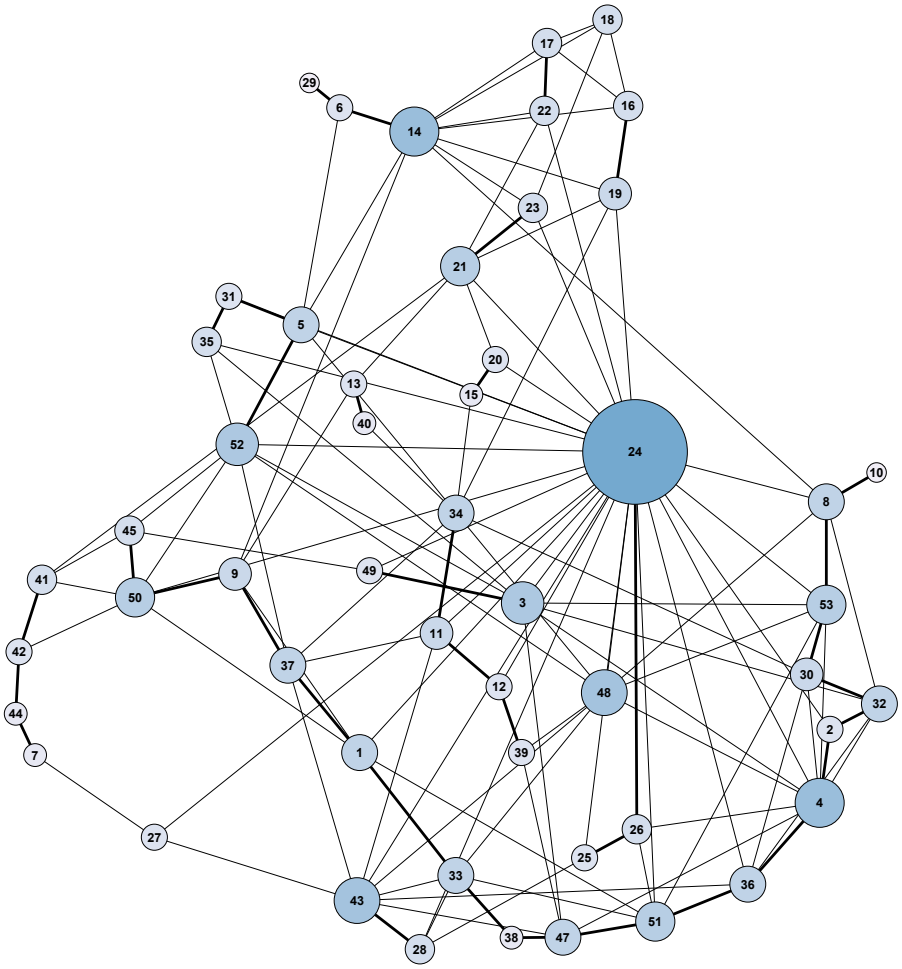

Figure 8.1: A node based diagram of the links between the triangulation findings

8.2.1 A summary of the findings at the site level

The Maple

At The Maple the use of the physical environment by employees appeared to influence the findings regarding waste disposal behaviour. The domestic waste bin received the largest proportion of waste at this site, possibly due to one of the bins being located in a catering area where the catering employees were not disposing of clinical waste but mainly domestic and recyclable waste. The housekeeping employees were found to dispose of more domestic waste than other waste types, perhaps due to them being active in location A, where only domestic and recycling bins were present. At location B they were observed to be disposing of cleaning-related domestic waste. The job roles and tasks of the different employee types likely impacted on the areas they were working in and types of waste they were generating at those different locations.

Similar levels of appropriate and inappropriate waste disposal behaviours were observed at this site, for which there are several potential influences. Employees often held inappropriate and stereotypical waste management beliefs such as all waste in the domestic waste bins from a patient's room actually being domestic waste. Such a belief was unfounded due to the researcher observing clinical waste being disposed of in these domestic waste bins. There was a segregation sub-system at location A that allowed employees to separate food waste from domestic waste, which in turn led to the appropriate disposal of the food waste; however, recyclable waste was mixed with domestic waste, leading to inappropriate waste disposal behaviours.

There was a high level of recycling segregation required at this site. For new employees this may have led to confusion, but the recycling system had been in place for a significant amount of time. For existing employees inappropriate waste disposal behaviour was more likely the result of incorrect waste management knowledge that had been manipulated over time by their own subjective perception or the social influence of colleagues. With little or no waste management guidance at this site, there was no opportunity for the employees to rectify their inappropriate waste management knowledge. This led to such behaviours developing into habitual behaviours over time (19 BC).

Paper and plastic were the most commonly found materials to be disposed of inappropriately by employees. This may have contributed to the high level of potentially recyclable waste found in the domestic waste stream during the waste audit sub-study (16 BD).

The Oak

There was greater concern and higher priority given to the disposal of potentially contaminated waste at The Oak, which may have influenced the higher levels of appropriate clinical waste disposal. There was also waste management guidance available in various forms for employees at this site, though employees were not always aware of this guidance or did not pay attention to its presence. This indicates that the high levels of recycling observed may have been due to the novelty of the recently implemented recycling system and not actual knowledge about recycling.

Cardboard was most commonly disposed of in the recycling bins. This was perhaps due to the ease with which employees could decide on the contamination status of this material, as it was often used for packaging which was removed prior to the use of equipment. Uncertainty about the contamination status of waste was reported to be a central reason for disposing of waste in the clinical waste bin. If cardboard was not often in a situation where it could be potentially contaminated, this would make its contamination status easier to discern and it would be recycled more often by employees.

The high levels of recycling at this site conflicted with the self-reported lack of employee knowledge, information and training regarding waste management. Employees may have been making logical decisions and using 'common sense' when disposing of waste and recycling, but such decision making was not always sufficient, due to the continued presence of inappropriate waste disposal behaviour.

Further inappropriate waste disposal behaviour may have occurred at this site during the observation, had the observer not been present due to employees making enquiries of the observer regarding appropriate waste disposal practices. There was a particular inconsistency in the disposal of paper waste, especially paper hand towels, which contributed to the inappropriate waste disposal behaviour.

Nursing employees disposed of the largest proportion of waste at this site and also displayed a lack of awareness or concern regarding waste management guidance. Overall, however, there was a positive attitude towards recycling, which may have contributed to the high levels of appropriate waste management behaviour. The presence of the observer was also reported by the employees to be a positive influence in this respect (20 BC).

Although high levels of recycling were observed to be taking place, paper was one of the most commonly disposed of materials and was more often disposed of inappropriately. The waste audit sub- study also found high levels of potentially recyclable waste in the clinical and domestic waste streams, which did not agree with the high levels of recycling found during the observational sub-study. This contradiction could be explained by the fact that although most waste disposal was appropriate, there was still the potential for more recycling or the locations observed at this site were not representative of the entire site. It was may also have been a combination of these two explanations, and there might have been less recycling occurring in other areas of the site and although recycling was taking place, there was still the potential for more to be done (15 BD).

The Beeches

It was reported by employees at The Beeches that they did not always use the required PPE, due to forgetting to collect it or being unable to reach it when it was required. When PPE was used, however, it was disposed of appropriately in the clinical waste bin. This appropriate disposal behaviour accounted for mixed, latex and nitrile waste being the most commonly disposed of waste in the clinical waste bins.

The employees only recycled plastic milk cartons and believed that was the only item they could recycle on site. Overall there was general uncertainty about appropriate recycling behaviours. There was also a negative attitude towards on-site recycling and the placement of a recycling bin(s) in the workplace environment. This uncertain and negative attitude to recycling makes it surprising that employees did actually recycle plastic milk cartons (22 BC).

Perhaps due to the lack of recycling taking place at this site the domestic waste bin received the largest proportion of waste and more inappropriate waste disposal behaviours were observed

at this bin type. Paper and organic waste was commonly disposed of inappropriately in the domestic waste bin, which likely contributed to the high proportion of potentially recyclable waste found in the domestic waste stream during the waste audit sub-study (17 BD).

The Pine

At The Pine organic waste was one of the most commonly disposed of materials, even though there was a system in place to monitor and reduce this waste type. Any remaining food waste following meal times was collected in a separate container so the catering employees could record how much food was wasted and reduce portion sizes accordingly. This system did not appear to be very effective, though, due to the continued high quantity of food waste. The recycling behaviour of employees at The Pine similarly reflected that of employees at The Beeches, as only plastic milk cartons were observed being recycled at this site. Such behaviour may be partially due to there only being a single point of recyclable waste disposal for the entire site. This lack of recycling disposal facilities forced employees to store plastic milk cartons on worktops and the floor.

As discussed earlier, some employees harboured a negative attitude to recycling in the workplace. They perceived it as pointless, annoying and difficult. The lack of recycling equipment such as bins and storage containers likely contributed to this negative attitude, due to recyclable waste taking up the employees' work space. The employees at this site were possessive and proud of their workspace, and the inadequate storage of recyclable waste was reported to make their area look untidy. Employees under these circumstances would not be likely to recycle items other than plastic milk cartons, as more recyclable waste would make the work area look increasingly untidy due to the issue of disposal and storage space. Recycling was further discouraged by the lack of waste management guidance, which resulted in inconsistencies in employee knowledge and uncertainty about recycling (23 BC).

The largest quantity of waste at The Pine was found to be disposed of in the domestic waste bin, while more inappropriate disposal behaviour was performed at this bin through the disposal of cardboard and paper. These materials were items of recyclable waste that the employees did not or could not store for recycling, possibly due to the unwillingness to clutter the work area,

storage issues and lack of guidance. All of these factors together resulted in both inappropriate waste disposal behaviour at the domestic waste bin during the observational sub-study and a higher proportion of potentially recyclable waste in the domestic waste stream during the waste audit sub-study (18 BD).

8.2.2 A summary of the differences in waste management between participating sites

Between sites

There were some similarities and differences between the four sites which may have contributed to this project's findings. There were no clinical waste bins present in one of the observation locations at The Maple, The Beeches and The Pine, which would perhaps account in part for the lower clinical waste amounts at these sites. There was also no domestic waste bin present at one of the locations at The Oak, and this possibly contributed to the domestic waste bins at this site not receiving a large amount of waste. Both The Beeches and The Pine used a single point of collection for their recyclable waste, and only plastic milk cartons were believed by the employees to be recyclable. This may account for the recycling bins being the least used bin type at these sites.

The recycling system at The Oak had only recently been introduced, and this novelty may have contributed to the greater levels of appropriate disposal behaviour. The recycling systems at The Maple, The Beeches and The Pine had been in place for a longer period of time, providing the employees with the opportunity to adapt their behaviour to the system, although these recycling systems did not encompass as large a variety of waste as the system introduced to The Oak. There was also considerably less waste management guidance available to employees and less emphasis placed on recycling at sites The Maple, The Beeches and The Pine compared to The Oak.

The bins being used, the different employees disposing of waste and the different bins used by different employees most likely reflect the different workplace activities carried out by both the different employees within a site and the sites themselves. The clinical waste bins most often received materials associated with common clinical waste (e.g. nitrile and latex gloves). Paper

was most often disposed of in the domestic waste bins, most likely as the result of the high level of paper hand towel use common to all four sites, while cardboard packaging was sometimes recycled, particularly at The Oak. Domestic waste bins received high levels of inappropriate waste disposal, possibly due to them being the recipients of potentially recyclable waste that employees were unaware they were able to recycle.

Nursing employees across all four sites were not observed undertaking tasks related to patient meal times, which would account for them only disposing of a very small proportion of organic waste. Care and housekeeping employees, however, were responsible for patient meal times and therefore disposed of greater quantities of organic waste. Cardboard was a highly recycled material type, perhaps due to its more obvious ability to be recycled. Paper and plastic were the most often inappropriately disposed of materials overall, perhaps due to the low levels of employee awareness and knowledge about recycling in the workplace, particularly regarding the classification and segregation of different recyclable material types (21 BC).

The observational sub-study confirmed the waste audit finding that the majority of the potentially recyclable items were disposed of in the domestic waste bins at all four sites (41 CD). The low levels of recycling taking place at the social care sites may account in part for the large number of potentially recyclable items in those domestic waste streams. The four sites implemented different bin-changing schedules, which may account for some of the differences between the sites in the number of items found in the clinical and domestic streams. Where the bins were changed on a more regular basis a lower number of items would be expected, due to the length of time the bin bag had been in place (42 CD).

The bin-changing schedule may not have been the only factor influencing the number of items found in the domestic and clinical waste streams at each site, as the observational sub-study also found that there were variations in employee adherence in this respect. This was particularly interesting, as an employee would describe the bin-changing schedule as it should have been carried out but then go on to justify why they did not agree with or adhere to this schedule (44 CD). Often the justification for employees not changing a bin bag was that the bin was not full. If employees did wait for the bin to become full, this may account for the similarities in the bag

weights found during the waste audit sub-study (7 DE).

When an employee consciously decides to change a bin, and this behaviour is defined as a macro behaviour, it may be the case that micro habitual behaviours are also triggered, such as the way in which the bag is removed, tied and placed prior to disposal. If bin changes are linked to other behaviours such as the end of an employee's shift, then the macro bin change behaviour may become a micro behaviour within the larger macro behaviour pattern of ending the shift. Over time and with repetition, the bin change behaviour may also become a micro habitual behaviour within the macro end of the shift behaviour pattern.

At all four of the participating sites large numbers of potentially recyclable items were found in the domestic waste streams during the waste audit sub-study. While the majority of the potentially recyclable items at all four sites were not disposed of in the clinical waste bins, the waste did not reach the recycling bins. Potentially recyclable items found in both the clinical and domestic waste streams were not all of the same type but a wide variety of items. This finding leads to the conclusion that there is not a problem with employees not knowing how to dispose of one or two specific items; rather, their confusion on the subject is much more generalised (14 AD). If this is a general issue that employees have with recycling, it could be the influence of time and priority pressures on waste disposal decision making. It could also be the absence of waste management training, ineffective waste management guidance or a combination of all of the aforementioned factors.

It is uncertain whether the high volume of potentially recyclable items in the domestic waste streams of the four sites was the result of conscious or habitual decision-making processes (6 DE). An argument can be made for both cases, which makes it likely that some of the inappropriate disposal behaviours result from conscious decision making and others from habitual decision making. Employees were able to describe their conscious decision-making processes, while others described some of their waste management behaviours as habitual or themselves and their colleagues as falling into bad waste management habits (29 CE).

The Maple, The Beeches and The Pine were all governed by the same waste management policy, but the resulting waste compositions differed between the three sites (13 AD). The same may

have been true for The Oak, due to its waste management policy being produced at corporate head office level. The same policy was probably distributed to multiple other sites within the organisation. Not only did the overall waste composition differ between sites using the same waste management policy, but also the waste disposal behaviours of its employees (40 AB). In this instance either the employees were not all adhering to the policy or the policy was not sufficiently detailed to produce standardised waste management behaviours. It may be that the behaviours being performed were believed by individual employees to be in adherence with the policy, due to ambiguity within the policy allowing for multiple interpretations.

Recycling was not discussed explicitly in the waste management policy of The Oak; however, high levels of recycling were still taking place (34 AB); nonetheless, large quantities of potentially recyclable waste were to be found in the clinical and domestic waste streams. Some of this recyclable waste may have come from the theatre department, where the organisation was aware there needed to be further improvements made to recycling practices. Not all of the potentially recyclable waste, however, could be attributed to the theatre department, which meant that there was the need for further improvement to waste disposal practices across the rest of the site (11 AD).

The high quantity of potentially recyclable waste in the clinical and domestic waste streams of The Oak should have been fed back to the organisation by the waste contractor. This did not appear to be happening, otherwise site management would have been aware of the high levels of potentially recyclable waste and the further need to improve the effectiveness of their waste management system and practices (12 AD). This finding highlights the importance of the organisation monitoring its own waste composition in a systematic manner and not relying solely on the waste management contractor to feed back potentially inappropriate waste disposal behaviour (39 AB).

8.2.3 The environment, the self and others

Visual cues – guidance

To aid employees in the performance of appropriate waste management behaviours the organisations, particularly The Oak, provided their employees with guidance. Information in the form

of posters and flyers was perceived by the organisation to be effective at improving employee waste management behaviour. The employees, however, reported that they found it confusing or were unaware of the existence of such information. This had the effect of them not understanding the waste management guidance or the desired waste management practices.

There were examples of employees being able to make use of the guidance to a greater or lesser extent. The guidance did not aid all of the organisations' employees in improving their waste management behaviour (51 AC). For the waste management guidance to be optimally effective, all employees should be able to understand and make use of the guidance.

One type of material that was prevalent in the waste streams at the participating health and social care sites was plastic. Many employees were uncertain about which types of plastic could be recycled. Some asked management about this issue, and management then went to their waste contractor and requested this information. They received the response that all types of plastic could be disposed of in the recycling bin. Management disseminated this information to their employees in what they believed to be an effective manner and were satisfied that all employees had received this information. However, during the observational sub-study it became apparent that many employees had not received this information and were still uncertain about which types of plastic could be recycled. During discussions with the employees they described a diverse range of different beliefs about plastic recyclability (47 AC).

It is possible that the effective provision of guidance to resolve waste management related issues was localised to the source of the issue or information request (38 AB). If this holds true, it would explain why the information did not propagate out to all areas of a particular site. The continued occurrence of inappropriate disposal of plastic waste at the site was evidence that the guidance did not spread and change employee behaviour across the entire site (33 AB).

The provision of waste management guidance by the organisation to the employee was perceived by those employees using the available information as a prompt towards the appropriate behaviour (1 AE). This guidance prompt may not have always been read by an employee, but the mere presence of a poster on or above a bin could potentially act in a supraliminal (above the level of conscious awareness) manner through prospective memory, which in turn could initiate

appropriate decision making based on what has previously been read (Tobias 2009).

The observational study found that there was a considerably lower amount of waste management guidance and higher amounts of inappropriate waste disposal behaviours at The Maple, The Beeches and The Pine compared to The Oak (9 AD). Even though the social care sites (The Maple, The Beeches and The Pine) provided less waste management guidance to their employees than the healthcare site (The Oak), the waste audit sub-study found that the waste streams at the healthcare site contained more inappropriately disposed of items overall. There was more potentially recyclable waste in the clinical and domestic waste streams at The Oak, especially in the clinical waste stream (37 AB).

Memory

The memory of the employee was found to be a factor that further influenced the performance of ineffective waste management behaviours. Employees reported forgetting what the proper waste management procedure may have been, which resulted in a lack of information on which to base a waste management decision. In some instances, although the employee performed an inappropriate waste management behaviour, they believed the behaviour to be appropriate. The performance of an inappropriate behaviour was not intentional. This type of forgetful behaviour also extended beyond waste management to the use of disposable equipment such as PPE which would have become waste following its use (24 CE).

Such occurrences exemplify the importance of an organisation understanding the actual procedures that employees carry out and not a hypothetical perfect situation, as sometimes employees forget things, including correct waste management practices. The placement of equipment and the design of processes and procedures could be carried out in such a way as to facilitate effectively the desired decision and behaviour on the part of the employee. If inappropriate decision making and practices resulting from those decisions were allowed to continue as part of daily practice for the employee, bad habits could form where the inappropriate decision becomes the automatic decision made under similar circumstances, further becoming part of the normal routine.

Awareness

The ability of the employee to remember to make the appropriate waste management decisions is linked to the need for them to be aware of their own waste management behaviour and the importance of such decisions in a wider environmental context. There are two examples from the observational data that illustrate both the employees' high awareness and low awareness of waste management behaviour and how this influenced their decision making.

The first example is the instance when an employee reported that they only disposed of a small amount of waste during an average shift. Having reported this to the observer the employee seemed to become more consciously aware of their waste management activity during that shift. The employee later reported to the observer that they were surprised how much more waste they disposed of than they previously thought. Perhaps due to waste disposal being a task of low priority, and the behaviour being of a short duration performed at irregular intervals, the employee did not recollect all of the waste disposal activities they performed during a shift.

An opposing example of this was when an employee stated that they were aware of and concerned about the large quantity of disposable gloves they used in a single day. Although this employee was consciously aware of the high volume of waste they were producing, they stated that they would not change their behaviour, due to the need to protect both themselves and the patient from potential infection. In this example other factors were of higher priority in determining the decision making and behaviour of the employee than the impact of their waste management behaviour (24 CE).

At The Maple, The Beeches and The Pine there was a lack of organisational emphasis on waste management and specifically recycling. It is possible that the organisational focus contributed to the employees' perception that recycling was difficult, pointless and annoying. There was a lack of knowledge and understanding about recycling amongst the employees which, together with the small amount of recycling equipment and guidance, may have further contributed to the negative attitude (50 AC).

Organisation 2 who operated The Maple, The Beeches and The Pine alluded to the possibility

of having a waste contractor run 'toolbox' talks where employees would receive waste management information and be able to discuss practices and issues with a well-informed individual (45 AC). Such a practice, if instigated, may have had the possible effect of not only providing employees with waste management information but also engaging them with the topic and raising their awareness of the issues and the importance thereof.

Subjective perception

(24 CE) Information gathered by any individual through their senses is subjected to the influence of their previous cognitions, i.e. thoughts, emotions, knowledge, etc., and this is the basis for subjective perception, which is is a top-down influence on sensory information mitigating its transfer between working, short-term and long-term memory. This concept appeared to influence many different aspects of waste management-related cognition and behaviour throughout the data. Specifically, the process of subjective perception had an impact on the waste management decisions of the individual. One such example comes from the qualitative observation findings at The Maple. The employees would throw away re-usable containers when they did not want to wash them up, because they were too dirty. In this instance, although the employee has been instructed to perform a certain behaviour, they perceived it to be acceptable to perform a completely different one instead. Although the vocal justification for this change in procedure was that the employee could not be bothered to wash dirty containers, they would likely have gone through a process of rationalising and justifying this decision to themselves. However long or short such a justification may have been, it would most likely have been the result of a conscious decision-making process, due to their ability to vocalise their reasoning to the researcher.

Social influence

The dissemination of knowledge throughout a healthcare or social care site or organisation appeared to play a central role in waste management behaviour. Information was propagated through a site or organisation in a top-down manner, while information originated at head office/corporate level or from site management. This information was then passed on to the employees, either verbally through the employee hierarchy or directly from the management in a

more permanent written form such as an email, poster or flyer. The amount of information that the intended recipient, the employee, actually received appeared to vary, and some information did not reach them at all, as described in Section 8.2.3.

One way employees found to mitigate the risk of not receiving information was to rely on sources other than their employer. Information about waste management that influenced their waste management decisions was found to come from two social sources, one of which was the popular media. A magazine story had the impact of changing an employee's household waste management behaviour. This same employee was also more aware of the need for recycling in their workplace and tried to make correct waste disposal decisions, particularly when recycling. The second source of social influence on employee knowledge and decision making was employee workplace interactions. When they were uncertain or confused about appropriate waste management behaviour, they would sometimes engage a colleague (or a group of colleagues) in a discussion about the behaviour and together reach a group consensus on a course of action.

The organisations stated that they had provided waste management guidance to their employees. The need to resolve uncertainty and confusion through social interactions highlights that employees are not aware of the guidance available to them, the guidance is not clear or the guidance is not providing sufficient information. It was also found that employees at The Oak perceived waste management to be changing very quickly, and they expected that they would not receive up-to-date waste management information (48 AC).

Concern

There were indicators for the level of concern the organisation harboured regarding waste management. During the management interviews both of the interviewees said that no waste management-specific training had taken place at any of the participating sites. The waste management training that did take place was ad hoc, most commonly taking place during the induction training of new employees and within infection control training sessions (35 AB; 50 AC).

If waste management and the environmental issues associated with waste management were of a high level of concern for the participating sites, more training for employees would have taken

place and could have been used to ensure that the participating site employees were effectively disposing of waste and minimising subsequent environmental impacts. Through training and regular testing of the employees' understanding of appropriate waste management practices the site management may have been able to minimise the occurrence of inappropriate waste management behaviour observed during the observational sub-study (32 AB).

The monitoring of waste management practices, and the effectiveness of the waste management guidance, is another indicator of site management's concern about waste management and the environmental impact of this behaviour. The waste management behaviour of employees was described as being monitored through ad hoc inspections. The effectiveness of the monitoring process was questionable, though, due to the continued occurrence of inappropriate waste disposal behaviours (36 AB). At The Oak management perceived the waste management guidance they supplied to their employees as being effective. The guidance was not optimally effective due to employees often stating that they were not aware of it, that the information was confusing and they would like more (51 AC). At The Maple, The Beeches and The Pine there was little emphasis placed on recycling, which led to employees expressing the opinion that it was difficult and an annoyance. The lack of recycling equipment and waste management guidance may have been a contributing factor to the negative employee sentiment about recycling (50 AC).

If the organisations had held a higher level of concern about waste management, they might have increased their monitoring of employee behaviour and the effectiveness of their guidance on the subject. With more regular and systematic monitoring of employee waste management behaviour, management could have increased their understanding about which waste management tasks employees were having difficulties with. From this information the organisation would have been able to provide guidance to help with these tasks.

Employees at the participating sites also demonstrated varying levels of concern about their waste management behaviours. At The Oak they appeared to be more concerned about ensuring clinical waste was disposed of appropriately. Some employees also displayed concern about the disposal of recyclable waste. This was evident when they asked the observer if items of waste were recyclable or not. These enquiries may have been the result of the uncertainty and

confusion about appropriate recycling practices, and they may have felt compelled to perform the correct waste management behaviours and were more concerned or even fearful of being reprimanded if they did not.

During discussions with employees at The Oak about the wider implications of waste management beyond the immediate health and social care situation there were some displays of concern. For example, one employee had started purchasing their milk in re-usable glass bottles from the milkman because they were concerned about the plastic milk cartons being shipped to China, being burnt and causing pollution (20 BC). Positive examples such as this were few in number, though; at The Beeches and The Pine, for instance, the general sentiment was that recycling was a waste of time, difficult and annoying (50 AC), and employees were more concerned about keeping their work areas tidy than carrying out recycling. The only waste that was regularly recycled at these sites was plastic milk bottles (23 BC).

Increasing employee concern about their waste management behaviour and the wider environmental implications of their waste management behaviour may help increase recycling rates and appropriate waste disposal behaviour at the participating health and social care sites. If employees become more concerned about their waste disposal behaviour in the workplace and the negative environmental impact of their behaviour, they may become more motivated to recycle and ensure they perform the most effective waste disposal behaviours possible.

Salience

Salience is the prominence of something within the real-world environment. The more salient something is, the more noticeable or important it might be to the individual observing it. In the case of waste management at the participating health and social care sites the salience of waste management equipment, guidance and information about the importance of the subject varied. Guidance was present to varying degrees across the four sites studied in the current study, as discussed in Section 8.2.3. Variations in the levels of waste management guidance would have impacted on the salience of the information and influence the importance of waste management as perceived by the employee (37 AB). Where there was more waste management guidance, fewer inappropriate waste disposal behaviours were performed. While this is not be assumed

to be a casual relationship, it is possible that the presence of waste management guidance will make employees more aware of the appropriate waste disposal practices and the importance of acting correctly.

There were a number of factors that may have altered the salience of the waste management guidance. The location of the guidance, for instance, appeared to influence whether employees read the information or not. Information posters were observed to be located behind doors and other objects and either high up on a wall or very low down. An example of low guidance salience was an employee not knowing how to dispose of used batteries. When they asked the observer if they knew how to dispose of the batteries, there was a guidance notice high up on the wall, partially obscured by a door and next to the employee. This information not being salient to the employee resulted in them leaving the batteries on a worktop for somebody else to dispose of (20 BC). This example highlights how low-level salience of waste management guidance did not aid in improving waste management behaviour at the participating sites.

The format and the content of waste management guidance can also influence the salience of that information. A waste disposal handbook was available to employees at The Oak in their department office. This book was described as containing a large amount of information. One employee said they did not read a lot and did not intend to read this handbook. Knowledge that the waste management guidance book contained lots of information lowered the salience of the handbook for this employee as a source of information (23 BC) – a finding which indicates that waste management guidance should be short and concise, if employees are to consider them an important and useful source of information.

Having some form of waste management guidance available to employees did appear to be of benefit and improve waste management practices compared to those sites where there was little or no such support. It may be that even if the guidance is not read, employees consider their waste management practice more. Greater amounts of appropriate waste management behaviour were observed being performed at those sites that had waste management guidance compared to those that did not (51 AC).

A number of different factors appear to influence the salience of appropriate waste management

practice at the four participating health and social care sites. Further research, such as that outlined in Chapter 10 Section 10.5.2, should seek to identify causal relationships between factors such as the content, format and location of waste management-related information and its impact on employee understanding of appropriate practice and waste management behaviour.

8.2.4 Waste disposal and its priority for the employee

Time and priority

The Maple, The Beeches and The Pine provided less waste management guidance to their employees than The Oak, yet they produced lower amounts of potentially recyclable waste during the waste audit sub-study. Employees often said they did not have enough time when performing workplace activities and intimated that waste management was a low-priority task. As a result the lack of time and low priority may have resulted in conscious waste management decisions being attributed less attention and cognitive resources. An example of this was seen in the observational data, when an empty milk carton was retrieved from the recycling bin, rinsed and then used to distribute fluids to the patients (27 CE). Such a waste management decision was inappropriate and demonstrates the conscious decision to prioritise fluid distribution over correct waste management. This was a typical example of prioritisation.

It may not always be appropriate to prioritise a waste management decision over other tasks, but the waste management task should still be carried out in an appropriate manner. Perceived time pressures and the level of priority attributed to waste management activities by the employee would appear to influence their decisions in this respect.

Task difficulty – regularity and simplicity

The difficulty of a waste management task comprise the regularity with which a task was performed and the simplicity of the task. Employees at The Oak perceived waste management practices to be changing at a fast pace, which meant they were not performing the same waste management tasks on a regular basis for a prolonged period of time. This rapid change in practice was linked to a lack of information about the changes in practice, making it difficult for employees to pinpoint appropriate waste management behaviours (48 AC). At The Beeches and

The Pine there was little organisational emphasis placed on recycling, which led to employees only recycling plastic milk cartons. The regular task of recycling the milk cartons was carried out with apparent ease, but further recycling was described as difficult and annoying (50 AC). It appears that the more frequently and the more consistently an employee is able to carry out waste management practices especially recycling, the easier these behaviours are for them to perform.

The recycling of only milk cartons at The Beeches and The Pine also highlights the second aspect of task difficulty, namely simplicity, i.e. recycling only one item of waste is a simple task compared to the recycling of many different items. At The Oak more recycling was carried out than at The Beeches and The Pine, but there were still large amounts of inappropriate disposal observed, which might have been due to the large amount of segregation required. When the recyclable waste had to segregated by material type, this increased the difficulty of the task because the number of choices and decisions about the material and its appropriate disposal path increased.

An example where extra segregation was used effectively was when a segregation sub-system was used to separate food waste from what was classed as domestic waste by the employees. This system provided employees with only two disposal options, which was apparently an easy level of segregation for them to achieve. The segregation sub-system also made the waste disposal process easier, because it allowed the employees to segregate the waste where they were working, before disposing of it in the appropriate bin (19 BC).

The high level of recycling observed at The Oak indicates that simple minimal segregation may increase recycling rates at the four participating sites. Recyclable waste at the site only required minimal segregation, because there was one bin type for all recyclable waste, except glass and large cardboard waste for reasons of practicality. Although, as previously noted, the novelty of the recycling system may have contributed to the high levels of recycling, the simplicity of the recycling system at this site may also have encouraged employees to use these bins more regularly (20 BC).

8.2.5 Waste disposal and decision making

When employees were faced with a disposal decision, where they were confused or uncertain about the appropriate decision, it was likely they would have had to engage in conscious decision making, in order to dispose of the waste. Conscious decision making would likely occur even if their response, as was observed in the observational sub-study, was to leave the waste on a worktop for somebody else to dispose of. Such decisions would require the employee to decide that they did not know which bin to dispose of the waste in and then where to leave that waste (26 CE). With the implementation of recycling the employees of The Oak were required to change the way in which they classified waste in the workplace. When first faced with this change they were confused and uncertain, as has been previously discussed. Therefore, the classification decision-making process is also more than likely a conscious process prior to the formation of any automatic or habitual classification and waste disposal behaviour (25 CE).

The Oak was found to be conducting the most recycling disposal behaviours of all four sites. At this site recycling equipment appeared to be readily available, and a great deal of emphasis was placed by management on the use of this waste stream. The waste audit sub-study, however, found this same site to have the largest proportions of potentially recyclable waste in both the clinical and domestic waste streams. It is possible that uncertainty and confusion regarding appropriate recycling behaviours, such as that seen around the disposal of plastics, may have contributed to the large proportions of potentially recyclable waste found in the clinical and domestic waste streams. Employees relying on 'common sense' knowledge from household waste disposal practices, where only certain types of plastic are often recycled, may have contributed to the large amount of potentially recyclable waste found during the waste audit (43 CD).

Some employees did describe their approach to waste disposal decisions as relying on common sense when they were uncertain of the appropriate behaviour. Such 'common sense' decision making may have utilised already established waste disposal patterns, although household waste management systems are different to workplace waste management systems, which would result in inappropriate workplace waste disposal behaviour (28 CE).

8.3 Conclusion

The triangulation of the data from all four of the sub-studies undertaken during the current study provided a means by which all of the findings could be brought together and interpreted in a meaningful way. This process provided insights into the findings on three different levels. The first level was that of the individual sites that participated in the current study. The quantitative aspects of employee waste disposal behaviour observed in the observational sub-study (Chapter 3) and the waste compositions investigated in the waste audit sub-study (Chapter 5) could not only be compared but also contextualised, by using the qualitative findings from the observational sub-study (Chapter 4). The decision-making questionnaires sub-study (Chapter 6) helped to provide insights into how the employees chose to dispose of health and social care waste. It was the management interviews sub-study (Chapter 7) that enabled the findings about the employees and how they went about waste management activities to be understood in relation to the overall management of waste-related activities at the participating sites.

Secondly, comparisons were able to be made between the participating health and social care sites on all of the levels described above. The waste compositions, disposal behaviours, employee perspectives and management-level operations were all integrated and compared across the participating sites, which highlighted a number of similarities and differences.

The triangulated findings, including those from the individual sites and the comparison between the sites, then provided a third level of insight which was more conceptual and highlighted the more important factors found in the data relating to waste management behaviour at the four participating health and social care sites. Thirteen main conceptual factors were found to influence employee waste management behaviour, namely visual cues, awareness, subjective perception, social influence, time, priority, decision making, salience, concern, memory, task difficulty, task regularity and task simplicity.

In the next chapter (Chapter 9), these 13 factors, derived from the data triangulation process, will be presented as part of a theoretical framework for understanding employee waste management behaviour at the four participating health and social care sites.

Chapter 9

A theoretical framework for understanding and improving waste management behaviour at the participating health and social care sites

9.1 A theoretical framework of waste management behaviour at the four participating sites

9.1.1 An introduction to the theoretical framework

This section will introduce a theoretical framework of waste management behaviour at the four health and social care sites who participated in this study, which will be referred to using the acronym HWMBIF (*H-W-M-Bif*), which stands for 'the Health and social care Waste Management Behaviour Improvement Framework'. The framework is composed of the factors found to be influencing waste management behaviour during the data triangulation process described in Section 8.2. Figure 9.1 is a diagrammatic representation of the HWMBIF. Each factor in the framework will be described the following section (Section 9.1.2).

9.1.2 HWMBIF factors

Decision making (conscious, habit, behaviour)

Behaviour - 'Behaviour', used as a general term in the model to represent the specific task set, is the focal outcome of the model. Human behaviour is often described as being a series of 1.5 second-long actions and cognitions, while a task is a concatenation of two or more 1.5 second actions and cognitions resulting in a complex behaviour (Logan 2009). The task set results from

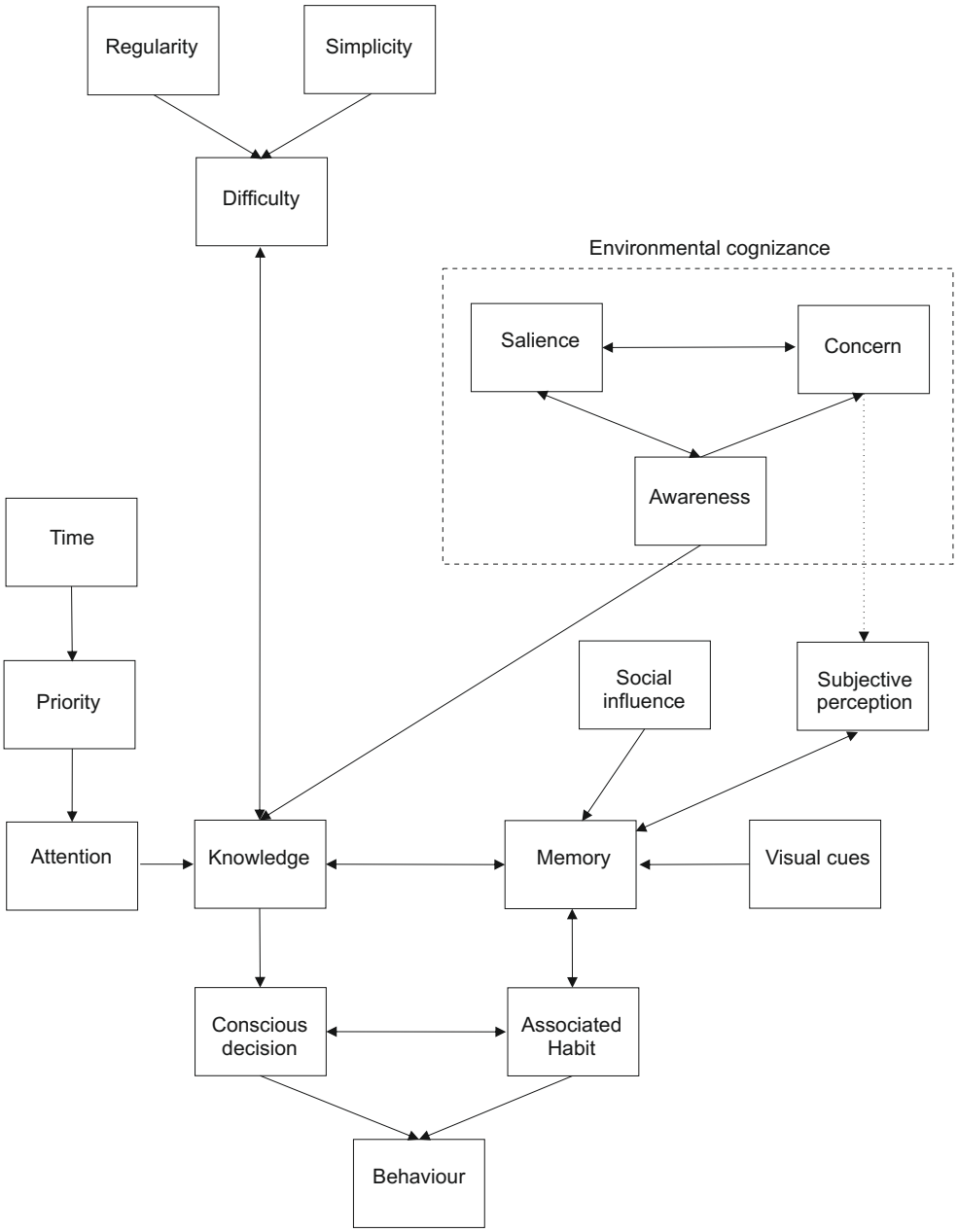

Figure 9.1: The Health and Social Care Waste Management Behaviour Improvement Framework (HMWBIF)

a plan which has been conceived by a human actor, in order to fulfil one or more desired goals (Jersild 1927). The task set in the context of the HWMBIF is the disposal of an item(s) of waste in a health and social care environment. This task set is constructed of a number of 1.5 second behaviours, including determining a location for disposal, deciding into which bin to dispose of the waste and operating the bin to facilitate the disposal of the waste.

Conscious Decision - Conscious thought is defined by Dijksterhuis and Nordgren (2006) as "... object-relevant or task relevant cognitive or affective thought processes that occur while the object or task is the focus of one's conscious attention." A conscious decision is a decision that is made about the object or task that is the focus of the individual's attention at the time of the decision.

A simplified example of conscious decision making in the context of health and social care waste management might be as follows: an employee enters a room carrying a piece of waste that they intend to dispose of. The task that is relevant in this situation is the disposal of the item of waste. One object of attention is the item of waste in their hand, and the waste bins present in the room are further objects of attention relevant to the current task. The employee assesses the item waste to decide into which bin the item of waste should be disposed.

The assessment of the item of waste in this example is the point at which other factors of the HWMBIF, such as the individual's prior knowledge, task difficulty and any visual cues in the room, impact on the decision-making process. These factors will be discussed further during this section.

Associated Habit - 'Habit', under the modern cognitive paradigm, is technically termed 'automaticity' (Aarts 2000). Stored memory representations are used to enact a behaviour similar to a behaviour performed in the past, in the presence of specific stimuli, towards the fulfilment of a given goal (Aarts and Dijksterhuis 2000). The 'automatic' actions undertaken by the individual are goal-orientated and relevant to the current task. The decision that is enacted as a result of the goal-directed automatic process is unconscious, and the unconscious nature of the decision can be defined as "... cognitive and/or affective task-relevant processes that take place out side of conscious awareness" (Dijksterhuis 2004).

In this definition the 'task' is a reference to the task that is the current subject of conscious attention. A task will have a subset of goals associated with it, to facilitate the completion of the task. This is why habit is technically defined as 'goal-directed automaticity- – a conscious task and goals that guide the performance of unconscious automatic decisions and behaviour which take place below the level of conscious awareness. The term 'habit' is used in the context of the HWMBIF, because habitual decisions/actions are reliant on and take place within the larger conscious macro-task set. In this way micro-habitual behaviour becomes associated with macro-conscious behaviour.

The following example explains the definition above and the process of association, by using the context of health and social care waste management behaviour. An employee enters a room carrying a piece of waste that they intend to dispose of. The task that is relevant in this situation is the disposal of the item of waste, in the same way that is for the conscious decision-making process. The employee, however, has disposed of this type of waste in the past under similar circumstances.

In the conscious decision-making process the item of waste and the waste bins available are objects of attention relevant to the decision-making process, and an assessment of the waste is undertaken. The objects do not become the focal points of conscious attention in this example, and the assessment of the waste is not consciously undertaken. These processes are undertaken without conscious attention; the unconscious decision guides the employee's behaviour and how the chosen disposal action is performed.

The processes that the employee goes through during the performance of unconscious decision-driven behaviour are similar to those for conscious decision-driven behaviour. The main difference is the attribution of conscious attentional of resources to the task. During the conscious decision process a person must concentrate on the decision to be made requiring the use of their finite attentional resources, but during the unconscious decision process they do not have to concentrate on the decision being made requiring little or no attentional resources.

Connections – the examples of conscious and unconscious habitual decision-making processes described above are oversimplifications used to illustrate the differences between the two; in

fact, the interaction between and the use of the two decision-making pathways are, in reality, far more complex. The task set is a combination of multiple 1.5 second actions, and during a much-repeated task such as waste disposal, many of these actions will not be novel but in fact the repetition of past actions. Dual process models of cognition posit two pathways of decision making and action (Evans 2008; Smith and DeCoster 2000). The definitions of these two pathways vary between the different models, but in relation to decision making the one system is generally assumed to be drawing on past experiences, to enable faster processing, and the other system requires greater attentional resources for conscious and controlled decision making in novel or difficult situations (Evans 2008).

Not only is there disagreement in the literature about the precise role of these two systems, but there is also disagreement about whether they operate sequentially or in parallel (Evans 2008). The decision making sub-study described in Chapter 6 was based on previous research undertaken in the area of waste management and pro-environmental behaviour. Tudor et al. (2008b) proposed the theory of planned behaviour (TPB) as an action framework for waste management behaviour. Goal-directed automatic behaviour, as measured by the self-report habit index (SRHI), was used to describe sustainability related behaviour by (Aarts and Dijksterhuis 2000). The TPB accounted for the controlled/conscious pathway and the second pathway of habitual behaviour through goal-directed automaticity measured using the SRHI.

TPB and SRHI measures were found to be independently measuring waste management behaviour at the participating sites, which implied that there was a conscious and a habitual decision/action pathway resulting in waste disposal behaviours. That the two measures were independent of each other further implied that the two pathways were operating in parallel and one was not wholly contingent on the other.

Unconscious decision making, as defined above, acts within a conscious decision-making framework whereby the two processes operate in parallel with some crossover. The interaction between these two pathways in the context of health and social care waste management warrants further research. Within stage 1 of the further research described in Chapter 10 Section 10.5, the role of and interaction between conscious and unconscious decision making in health and

social care waste management should be investigated.

Knowledge (knowledge, memory, social influence, subjective perception, visual cues)

Knowledge - One facet of knowledge in the context of the HWMBIF is explicit memory, which describes the long-term storage of information that can be consciously recalled (Eysenck and Keane 2000). There are two main types of explicit memory: episodic memory – memories of past events and subjective facts – and semantic memory – objective general knowledge (Cohen 1996; Eysenck and Keane 2000).

Information or knowledge residing in explicit memory constructs must be consciously accessed, thereby requiring the attribution of cognitive resources, particularly attention. The requirement of conscious attention in accessing information in semantic and episodic memory is why the factor 'knowledge' is linked directly to conscious decision making and attention factors in the HWMBIF.

Memory – explicit memory does not act in isolation; it is partnered with implicit memory. Whereas explicit memory accounts for consciously accessed information, implicit memory accounts for that information which is unconsciously accessed (Cohen 1996; Eysenck and Keane 2000). These two memory types operate in tandem to provide information for the conscious decision/action pathway and the habitual decision/action pathway. When new information is encountered, often through novel situations, it is stored in the explicit memory and accessed through the conscious decision/action pathway.

Over time, if the information is repeatedly accessed, i.e. associated with different stimuli, it will be passed to the implicit memory as a suitable pattern of behaviour (Parkin 1993). These might be either the same specific physical stimuli, e.g. password entry and your computer login screen, or a category of stimulus, e.g. containers with a screw-top lid. From here the pattern of behaviour can be accessed when the appropriate goal and stimulus are present through the habitual decision/action pathway, resulting in a goal-directed automatic behaviour.

Such explicit/implicit memory interactions were observed and described during the presentation of the qualitative findings from the observational sub-study (Chapter 4). Employees were pro-

vided with some form of training which introduced them to the novel situation of waste disposal in the health and social care environment. Over many repetitions of this behaviour they formed waste disposal-related habits such as using a bin in a specific location or putting a specific type of waste in a specific type of bin. Not all of the habitual behaviours formed by employees were desirable, though, as they were observed disposing of waste in an inappropriate bin, which was referred to by their peers as "falling into bad habits."

At The Oak, where a new waste management system had been recently introduced, it was possible to observe how such bad habits would form. An employee was observed consciously deciding which bin to dispose of an item of waste in while describing the process out loud. The employee then went to dispose of the waste in the wrong bin but was corrected by the observer. Had the observer not been present, there would not have been anybody to correct the employee's disposal decision. If this decision/action was repeated, it may have formed over time into an undesirable habitual behaviour.

Visual cues – 'visual cues' are stimuli within the physical health and social care environment that can be visually accessed by the individual and associated with specific decisions/actions. In the context of the HWMBIF they are waste management-related stimuli found within the physical workplace environment. Such cues include the room in which the waste disposal will take place, as some rooms will contain different bins to others. The bins themselves act as visual cues, due to their different styles and colours. The style and colour differences between bin types are a strong visual cue that enables fast and easy identification of appropriate habitual behaviour and minimises confusion.

Some instances were observed during the observational sub-study (Chapter 4) where the bin bag colours and/or bin colours were similar, which resulted in confusion for the employee and waste being disposed of in the wrong bin. There were also guidance information posters and stickers, which have been referred to as informative guidance (Austin et al. 1993). When used to change workplace recycling behaviour, Austin et al. (1993) found that informative guidance prompts improved behaviour, if three conditions were met: i) the guidance makes a specific request or appeal, ii) the prompts are located in close proximity to where the desired behaviour is

expected to occur and iii) the request/appeal made by the prompt is convenient for the responder to perform.

The three guidelines from Austin et al. (1993) are also relevant to the salience of the information which is discussed further in Section 9.1.2, and they would be helpful when creating useful informative guidance prompts for the workplace. Guidance information in the workplace is discussed further as a possible intervention for the improvement of waste management at the participating health and social care sites in Chapter 10, Section 9.2.

Visual cues such as guidance information can also help employees to remember which behaviour they intended to perform, by acting on a component of memory called 'prospective memory', defined as "remembering to remember" (Tobias 2009). Sometimes, when engaged in a task, people forget what it was they were going to do. This may occur particularly when performing an automatic habitual behaviour. A prospective memory prompt, such as a waste management guidance information poster or sticker, can remind the individual of the appropriate automatic behaviour they intended to perform on the basis of a minimal amount of information, e.g. a pictograph or a few words. Such prospective memory prompts were viewed by employees in the present study as important, due to the number of different disposal decisions they were required to make and the small distinctions between those decisions.

Subjective perception – the subjective perception of an individual in the context of the HWMBIF is the potential of the individual to manipulate stored information. This is described through a process called reconstructive memory (Bartlett 1932). Reconstructive memory is based on the idea that people will alter new information using prior knowledge and episodic memory to make the new information congruent with their prior knowledge and experiences (Hemmer and Steyvers 2009). This process was seen during the observational sub-study, when the information provided by the organisation did not agree with the individuals' current behaviour or beliefs about how waste management should be carried out. Employees implied that this process was taking place through 'off the cuff' comments such as "I know we are supposed to do it this way, but...". Finding a way to align the beliefs or past experiences of the employee with the desired practices, might provide a step towards minimising the impact of subjective perception on waste

management behaviour.

Social influence – At the four participating health and social care sites, employees were observed engaging in informal discussions about a number of topics, one such topic was waste management. It appeared that employees would discuss a waste management matter, such as the disposal of a certain item of waste, with other employees when there was uncertainty about the appropriate behaviour. Reaching the majority consensus is an important factor in determining if people will accept an argument or not (Martin and Hewstone 2003). The group would seek to form a consensus on the appropriate behaviour which each individual within the group was free to use or disregard to inform their own behaviour. Such informal networks of information provision also acted as a conduit for the propagation of new information through the workplace. Comments from employees during the qualitative observation such as 'I heard from someone...' highlight the existence of such networks within the health and social care setting.

Social influence through informal networks appears to be one way in which employees gain information about waste management in the health and social care settings. There are two opposing theories that describe the process of social influence; conversion theory (Moscovici 1980) and objective consensus approach (Mackie 1987). Further research will be required to understand the cognitive processing underlying the social influence process observed during the current project. Until future research can determine which theoretical approach is most applicable, propagating appropriate waste management information through these networks will help inform employee waste management practices.

Environmental cognisance - (Salience, Concern and Awareness)

Environmental cognisance – environmental cognisance has three major roles in relation to knowledge/explicit memory: 1) awareness, which is a knowledge-related factor and represents an individual's level of knowledge about environmental issues related to their workplace behaviour and the scope of this knowledge, i.e. from immediate impacts such as the cost of emission contributions and climate change, 2) it describes the level of concern that an individual exhibits regarding their own environmental knowledge and 3) salience, which is the most transitory factor and involves the importance of the knowledge about waste management and

its environmental impact in the immediate location of the individual. All three of these factors interact to influence whether or not an individual will act in a pro-environmental manner. In the context of the HWMBIF, environmental cognisance is used to describe the level to which an employee will take notice of and consider the environmental impact of their waste disposal behaviour. The detail of this construct can be defined further by using the three sub-constructs from which environmental cognisance is formed.

Salience – salience is the construct for describing the importance of the environmental impacts and issues related to waste disposal during the disposal process. It captures how connected the immediate situation of the individual is with the environmental issues the individual is aware of and how concerned they are about those issues. The more salient waste management and the environmental impact thereof is to the employee in their workplace environment, the more likely the employee is to consider these issues of importance to waste disposal and workplace behaviour.

The data highlighted that the presence of guidance and information in the workplace setting was of particular importance to the salience of waste management and the wider impact of waste management activities. The location of the guidance information also appeared to influence its salience in the workplace environment. The proximity of the guidance information to the place where the information was to be enacted was one of the conditions that was found to alter the usefulness of informative guidance prompts by Austin et al. (1993). Data from the current project also highlighted the importance of the content of any guidance information. (Austin et al. 1993) found that one of the conditions for useful informational prompts to improve recycling was for a request or appeal to be made – the use of general information did not appear to be as effective.

Concern – concern is an important feature of environmental cognisance, due to its influence on the amount of consideration and importance given to waste management and related environmental issues. Evidence for the importance of concern in relation to waste management behaviour at the participating sites was evident throughout the current study. The actions and inaction of both the employees and the organisations provided insights into the varying levels of

concern about waste management practices and their wider implications. At The Beeches and The Pine, employees performed only minimal recycling behaviours, partly because their greater concern was about their work areas becoming untidy due to the lack of recycling equipment in the immediate work area. In this instance the employees' concern about being tidy was greater than their concern about the implications of their waste management practices. At The Oak it was possible that the increased recycling behaviour and apparent concern employees had about recycling and appropriate waste management practices were the result of their concern with being reprimanded for inappropriate waste disposal practices.

These examples from the project findings provide a potential link between the factor of 'concern' in the HWMBIF and the value-based norms (VBN) model of environmental concern proposed by Stern (2000). The VBN is based on three types of values: egoistic, altruistic and biospheric. Egoistic values relate to the individual, altruistic values relate to what an individual can do for other people and biospheric values relate to what is good for the natural environment. The type of values that were most prominent in the current study appear to be of the egoistic type, in that the employees were concerned about the impact their waste management behaviours would have on their job. This finding might relate to a need to ensure job security above all else, in order to maintain financial security. These egoistic motivations and the relationship of the VBN to the HWMBIF will need to be investigated further during the refinement of the HWMBIF, as outlined in Chapter 10, Section 10.5.

Awareness – awareness captures the explicit knowledge an individual holds regarding environmental issues related to waste management. Spatial distance, temporal distance and thematic scope are construal levels within the concept of psychological distance (Trope et al. 2007). An individual's level of awareness is best thought of in terms of their ability to be aware of and understand the implications of environmental issues within these three dimensions. The scope of an individual's awareness can be spatially located from a highly local level, i.e. an impact in the immediate area, to a global level, i.e. an impact on the planet's environment. Awareness can also be temporally located from a very low temporal range, i.e. immediate impacts, to a high temporal range, i.e. repercussions in 100 years' time. A third dimension to aware-

ness is thematic scope, which at a low range is awareness of a specific issue closely related to the immediate waste management situation. At a high range of thematic scope the issue is related more loosely to the individual's waste management behaviour and more generally to wider environmental issues.

Hansla et al. (2008) found that biospheric environmental concerns, as described by the VBN, were related to an awareness of the consequences of an individual's own actions, the actions of others and natural environmental change on the environment. This link between awareness and concern highlights the importance of ensuring employees at the participating sites are aware of the impact their waste management behaviour has on the environment. By linking together employee awareness and concern about their own waste management behaviour, and the impact it has on the environment, behaviour could be improved. Employees were found to be unaware of how much waste they produced on a daily basis, and if they were aware, they were not concerned because other issues took priority.

Attention (priority, time)

Attention – The construct of attention within the HWMBIF denotes the attribution of attentional resources to the waste management task being or to be performed. The individual is constantly having to shift their attention between different stimuli and tasks within the physical environment, alongside other cognitive processes in the brain using, some form of selection mechanism (Lavie et al. 2004). The more that an individual has to attend to in their environment – also referred to as a larger display set – the greater the cognitive load the individual is having to deal with (Lavie 1995).

At the participating health and social care sites the employee is continuously performing strings of task sets as they go about their work. When a waste management related task set occurs, the mind of the employee must provision an amount of the finite attentional resources available to the completion of the task set and achieving the associated goals. In the context of the participating health and social care sites, it would be most desirable to have your employees focused on the care of their patients rather than dedicating their time and cognitive resources to the act of waste management. This requirement is balanced by the need to engage the individual

with the waste management task as it is being performed, to ensure that the appropriate waste management behaviour is performed. There are potentially many factors, internal and external to the individual, that could be influencing attentional resource attribution at any one time. Two factors that were apparent in the data from the current project were time and priority.

Time – time is a situational pressure imposed on the individual or perceived by the individual from the external environment. The health and social care workplaces under investigation are busy environments, there are constant demands on employees who have to carry out a multitude of tasks and with only a limited amount of time in which to complete them. The demands and tasks are not stable, so the employee must be reactive to new demands as they arise. Employees often complained about not having sufficient time during their working day to complete all of the tasks they wanted to do; instead, they must fulfill more urgent and pressing demands. Waste disposal is a required demand on the employees' time due to its facilitation of the care process.

The employees, however, especially in the social care setting, stated the desire to spend more time engaging in social interactions with their patients. This is difficult to achieve due to the large number of patients a single employee may be responsible for and the number of tasks that need to carried out (Hollingsworth et al. 1998). The individual must designate their time during the working day to the performance of required tasks and desired tasks. The preference is to be performing desired tasks for as long as possible, so required tasks must be completed as quickly as possible. Waste disposal was a required not a desired task for the employee, which led to them designating it a lower priority and wishing to spend as little time as possible carrying it out.

Priority – this is the attribution of urgency with which a specific task/goal must be carried out relative to the other goals presently available and being planned for. Interruptions leading to reactive changes in task priority have been observed in the healthcare setting and the integration of coping strategies in employee training programmes suggested as a way to deal with this issue (Chisholm et al. 2001). The greater the actual or perceived time pressure from the external environment, the lower the priority waste management seems to become. For instance, if a nurse has to perform a number of procedures within a short time period, the disposal of waste

produced during these procedures is not likely to be of a high priority. The priority of the task may also be altered by a number of other factors, including predetermined behavioural procedures from the performance of past behaviours, similar to habit, and task difficulty. It may be more advantageous for the individual to prioritise easier tasks or more difficult tasks, depending on factors such as the primary goal and subjective feelings at the time (Smith 1982).

Interactions between time pressures, task priority, attention and other potentially influencing factors require greater study under controlled laboratory conditions. Using simplified and repeatable tasks will help to uncover the causal links between these factors in relation to health and social care waste management. These factors are important for understanding health and social care waste management behaviour and will form part of the future refinement of the HWMBIF discussed in Chapter 10, Section 10.5.

Difficulty (regularity, simplicity)

Difficulty – some tasks are more challenging to complete correctly than others, because they require a greater amount of prior knowledge and/or more regular practice. The difficulty associated with a particular task may vary from person to person and over time, thus making it a transient factor that is specific to the individual and the situation. In the context of the HWMBIF and waste disposal behaviour at the participating health and social care sites, difficulty can be defined as the simplicity of the task and the regularity with which it is performed. The more regularly a task is performed, the easier it becomes due to the repetition and rehearsal of said behaviour. Simplicity captures the amount of prior knowledge required for the performance of the task. The less prior knowledge that is required, the simpler a task will be to the person doing it. In the case of waste disposal behaviour, according to the organisations participating in this research, all employees receive the same waste management information.

9.1.3 Organisational factors influencing employee waste management behaviour at the participating health and social care sites

The focus of the HWMBIF lies on understanding the waste management behaviour of the health and social care employee's at the sites under investigation. Limiting the scope of the theoretical

framework to employee waste management behaviour and not including some of the wider organisational influences meant that the HWMBIF could be more detailed and specific when describing factors influencing employee behaviour.

During the study, several important factors relating to the influence of the health and social care organisation on employee waste management behaviour were identified. These factors have been summarised in Figure 9.2. There were four factors for which the organisation was responsible and found to be potential influences on employee waste management behaviour at the participating health and social care sites: policy, training, guidance and monitoring. Figure 9.2 shows these factors to be interlinked, because changes to one factor will impact on the others.

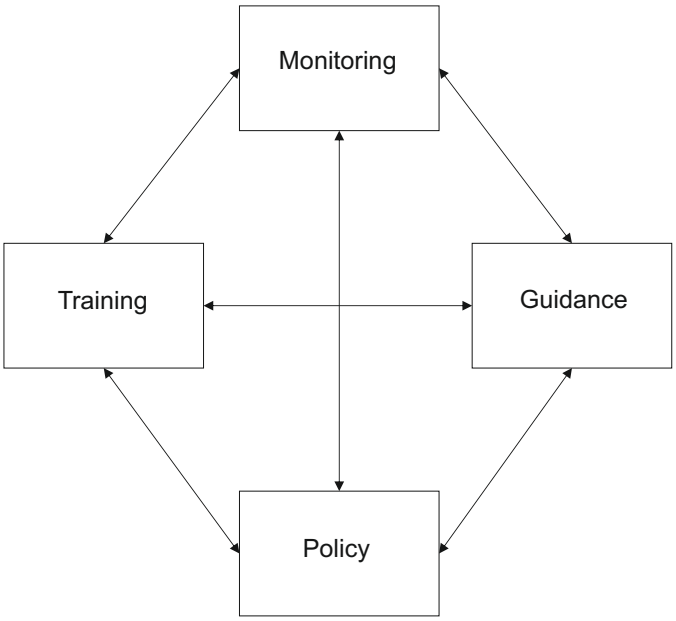

Figure 9.2: Organisational factors influencing employee health and social care waste management behaviour

Policy

The waste management policy at each of the participating sites outlined site waste management practices in relation to the legal requirements of the waste management legislation discussed in Chapter 1 Section 1.1.4. Waste management practices performed by the employees working at the health and social care sites should have been in adherence with the site waste management policy. Any changes to the waste management policy that require changes to behaviour should result in changes to the actual practices of the employees.

All of the employees were required by each of the participating sites to acknowledge that they had read, understood and agreed to abide by the waste management policy. If any changes were made to the waste management policy, the employees would once again be asked to acknowledge that they had read, understood and agreed to abide by it. It was in this way that the participating sites monitored their employees' waste management behaviour. The waste management policy also provided the basis for any waste management guidance information that was given to employees in the workplace environment and any waste management training they may have received.

With the waste management policy as the legal basis for all waste management practices at the health and social care sites, any changes to this policy should result in changes to training, guidance and monitoring. If the participating health and social care organisations intend to commit to changing their waste management practices, setting out their intentions and the changes to practices that are required should result in changes to actual waste management behaviour.

Training

Training was one way in which the organisation could have provided waste management information to their employees. Only minimal waste management training was found to have taken place at the participating health and social care sites, and any that did take place was included predominantly in infection control training and focused on the disposal of clinical waste. The study findings highlighted that most of the recyclable waste was to be found in the domestic waste stream. To improve the effectiveness of waste management and waste management

training, any training programme should aim at providing employees with information about appropriate recycling practices and the disposal of domestic in addition to clinical waste.

The inclusion of general waste management training was an issue that was raised in the management interviews sub-study. One of the interviewees said that they did not have space in their training schedule to include an additional waste management module. The same interviewee went on to say that they were in talks with a waste management contractor who would provide 'toolbox talks' to the employees about appropriate waste management practice.

There are issues with the waste management contractor providing waste management training to health and social care employees. One issue is that the authority of the trainer may be diminished because the information is not coming from the health and social care organisation. The health or social care organisation would also have less control over the information being provided to their employees and would have to ensure that the information complies with legislation, policy and strategic waste management aims. The most effective means for the participating health and social care organisations to provide waste management training to their employees would be to do so in-house. This topic is discussed further as an intervention in Section 9.2.

Guidance

Guidance information, which was available to employees at the participating sites, at least to some extent, aimed at providing informative prompts at the point of disposal to aid employees in carrying out the appropriate waste management behaviour. It was the organisation's choice to provide waste management guidance information, because if it hadn't provided this guidance, it was then their responsibility to ensure that it correctly reflected appropriate practices as described by the waste management policy and was taught in any waste management training.

Monitoring

The most common form of monitoring for waste management described in the current study was employee understanding of the site's health and social care waste management policy. This monitoring process, described above under 'Policy', sought only to have a legally binding

agreement between the employee and employer that the employee had read, understood and would abide by the contents of the waste management policy. This process did not monitor in any way the actual waste management behaviour of the employees.

The only other form of monitoring that was found to occur was the ad-hoc assessment of waste management facilities, equipment and to a limited extent employee waste disposal behaviour. Due to the presence of broken equipment and inaccurate guidance information, though, this form of ad-hoc monitoring cannot be assumed to have been optimally effective.

Introducing regular and irregular spot-checks of waste management practice at health and social sites is one way of making monitoring more useful and effective. The use of systematic checklists would aid this process by providing a list of indicators for the auditor to use when carrying out assessments.

9.1.4 A discussion on the HWMBIF

The HWMBIF and factors influencing employee waste management behaviour at the participating health and social care sites

The HWMBIF, described above, is a novel, dual process, data-derived theory of waste management behaviour at the four participating health and social care site which integrates both the conscious and unconscious aspects of thought and decision making. Both conscious and unconscious processes were found to be operating during employee health and social care waste management behaviour, thereby increasing the usefulness of the framework, because interventions can be designed to account for both types of thought process.

In addition, different types of knowledge needed to be accounted for along with different sources of and influences on new knowledge, explicit memory and implicit memory. It is these different types of memory and knowledge that are responsible for informing the waste management behaviour of employees at the health and social care sites being studied, and these aspects of the HWMBIF are useful in understanding how employees store and use waste management-related information.

The factors of awareness, concern and salience, nestling under the heading ‘environmental cog-

nisance', provide a deeper level of insight into what have previously been referred to as 'attitudes' – a term that has been used to describe an amalgamation of different and poorly understood hypothetical constructs. The three constructs of environmental cognisance go beyond the simplistic 'catch-all' term of attitudes.

Environmental cognisance in relation to waste management at the participating health and social care sites can be briefly described as what the employee knows about environmental issues and the impact of their behaviour, the importance of these issues to the employee and the importance of that information and understanding in relation to the immediate health and social care environment. The greater specificity of these factors compared to the term 'attitudes' means that interventions can be designed to target more precisely those aspects of employee environmental cognisance that will most likely result in positive behaviour change.

Time was the factor that was found to determine the level of priority attributed to waste management tasks at the four health and social care sites. Time may not be the only factor that influences an employee's prioritisation of tasks, but its continued appearance in the data indicated that it was nevertheless important. It may not be possible to provide employees with more time to perform waste management activities, due to other demands on their time, but it may be possible to reduce the amount of time it takes for them to dispose of waste. This could be achieved by making waste management equipment more accessible. The priority of waste management tasks may influence how much attention and thought an employee gives to the waste management task in question. If waste management is of a greater priority for the employee, they may think about their waste management behaviour more by increasing their rate of work in this regard.

The difficulty involved in waste management activities also impacted on employee waste management behaviour. The difficulty of a waste management task was influenced by the regularity with which the employee performed the behaviour and the simplicity of the task. The more often an employee performed a certain waste management activity, the more practised they would become at that task and the easier it would become. Moreover, the simpler a waste management task, the less prior knowledge that is required and the less likely an employee will find the task

difficult, because they are more likely to have the required knowledge base. These factors are important for the HWMBIF and the design of interventions based on the framework, because they will inform the design of waste management systems and the training of employees in the performance of waste management activities at the participating health and social care sites.

Suggestions for interventions based on the HWMBIF will be discussed further in Section 9.2 and will draw on some of the ideas that have been discussed so far in this section.

Organisational factors influencing employee waste management behaviour at the participating health and social care sites

The organisation-relevant factors influencing health and social care employee waste management behaviour provide some of the context in which the actual behaviour takes place. They outline the organisation's expectation of what what management behaviours should be taking place, how the health and social care organisation communicates these expectations to their employees and how they assess the actual behaviour being performed and the success of how they have communicated this information.

The four factors of policy, training, guidance and monitoring also highlight areas where the participating health and social care organisations can begin assessing their current waste management practices. From this assessment interventions are possible for the improvement of waste management practice. Suggestions for interventions based on the findings of the current study are discussed further in Section 9.2.

Similarities and differences between the HWMBIF and previous theoretical frameworks

A comparative evaluation of two theoretical frameworks, created in order to understand health and social care waste management behaviour, was presented in Chapter 1 Section 1.3.2. The frameworks Tudor et al. (2008b) were based on the TPB, and the e-PEB framework from Young et al. (2013) was based on the Tudor et al. (2008b) framework and amended using systematic review data. The HWMBIF presented above derives from the data presented in the preceding chapters. There are a number of similarities and differences between the HWMBIF and the Tudor et al. (2008b) and the Young et al. (2013) frameworks. Although the HWMBIF cannot

at this stage be generalised beyond the scope of the four health and social care sites that participated in the study due to the small sample size, it is useful to make a tentative comparison of this framework to the existing Tudor et al. (2008b) and e-PEB frameworks.

Overall, all three frameworks describe the factors influencing health and social care waste management behaviour. The orientation of individuals with regard to environmental issues is depicted in some form in each of the three frameworks. Both the Tudor et al. (2008b) and the Young et al. (2013) frameworks refer to environmental attitudes and environmental awareness. The HWMBIF does not use the term 'attitudes' but uses salience, awareness and concern under the heading 'environmental cognisance', to describe something similar to environmental attitudes and environmental awareness. The factors of environmental cognisance in the HWMBIF do not include the term 'attitudes', and environmental awareness is a form of knowledge that is linked to concern and salience. The link between these three environmental cognisance factors provides more specific targets for health and social care waste management interventions than the overarching term 'attitudes'.

An important difference between the HWMBIF and the Tudor et al. (2008b) and Young et al. (2013) frameworks is the way that the pathway to behaviour is described. The Tudor et al. (2008b) and Young et al. (2013) frameworks describe single process models in which there is only one pathway – from thought to action. These frameworks are based on the TPB, which assumes behaviour to be the result of conscious decision making. The HWMBIF is a dual process model that allows for waste management behaviour to result from both conscious and unconscious thought processes. There was considerable evidence throughout this study that both conscious decision making and unconscious automatic decision making were occurring during health and social care waste management. Further research will be required to confirm this finding and determine when health and social care waste management behaviour results from conscious and unconscious decision making.

The organisational factors described in addition to the HWMBIF in Figure 9.2 are similar to those included in the Tudor et al. (2008b) and the Young et al. (2013) frameworks. All three theoretical frameworks acknowledge the importance of policy and its influence on practice. The

'guidance' and 'training' factors described Figure 9.2 are reflected in the 'management support and training' factor of the Tudor et al. (2008b) and the Young et al. (2013) frameworks. Monitoring is partially linked to 'motivation' in the Tudor et al. (2008b) framework and 'feedback' in the Young et al. (2013) framework. Monitoring can provide data for feedback on performance and motivation to employees to perform the appropriate behaviour through knowledge of the monitoring process and feedback on performance.

The data-driven nature of the HWMBIF has resulted in a framework that is detailed and specific, and it builds on the work of Tudor et al. (2008b) and Young et al. (2013) by confirming some findings and adding new insights. The importance of using the HWMBIF for designing interventions to improve health and social care waste management at the four participating sites will be discussed in the next section.

9.2 Use of the theoretical framework for improving waste management behaviour at the participating health and social care sites

The following sections will present some possible intervention strategies, developed based on the findings of the current study. Figure 9.3 shows the HWMBIF and includes five numbered points, each of which represents points of possible intervention within the HWMBIF. This section describes five possible intervention strategies using the HWMBIF to improve waste management behaviour at the four health and social care sites that participated in this study. The numbers in the text relate to the numbers on the HWMBIF in Figure 9.3.

9.2.1 Ease of segregation

One way to potentially improve waste management at the participating sites is to make the segregation of waste easier for the employee. This process was easier for the health and social care employee in the past, as everything (minus sharps, cytotoxic, cyctostatic and pharmaceutical waste) was disposed of in the clinical waste bin. This practice minimised the number decisions the employee was required to make. The issues with such a disposal strategy are that the clinical waste is sent for incineration and none of the raw materials can be recovered.

Incineration is a financially expensive method of disposal and environmentally expensive, due to

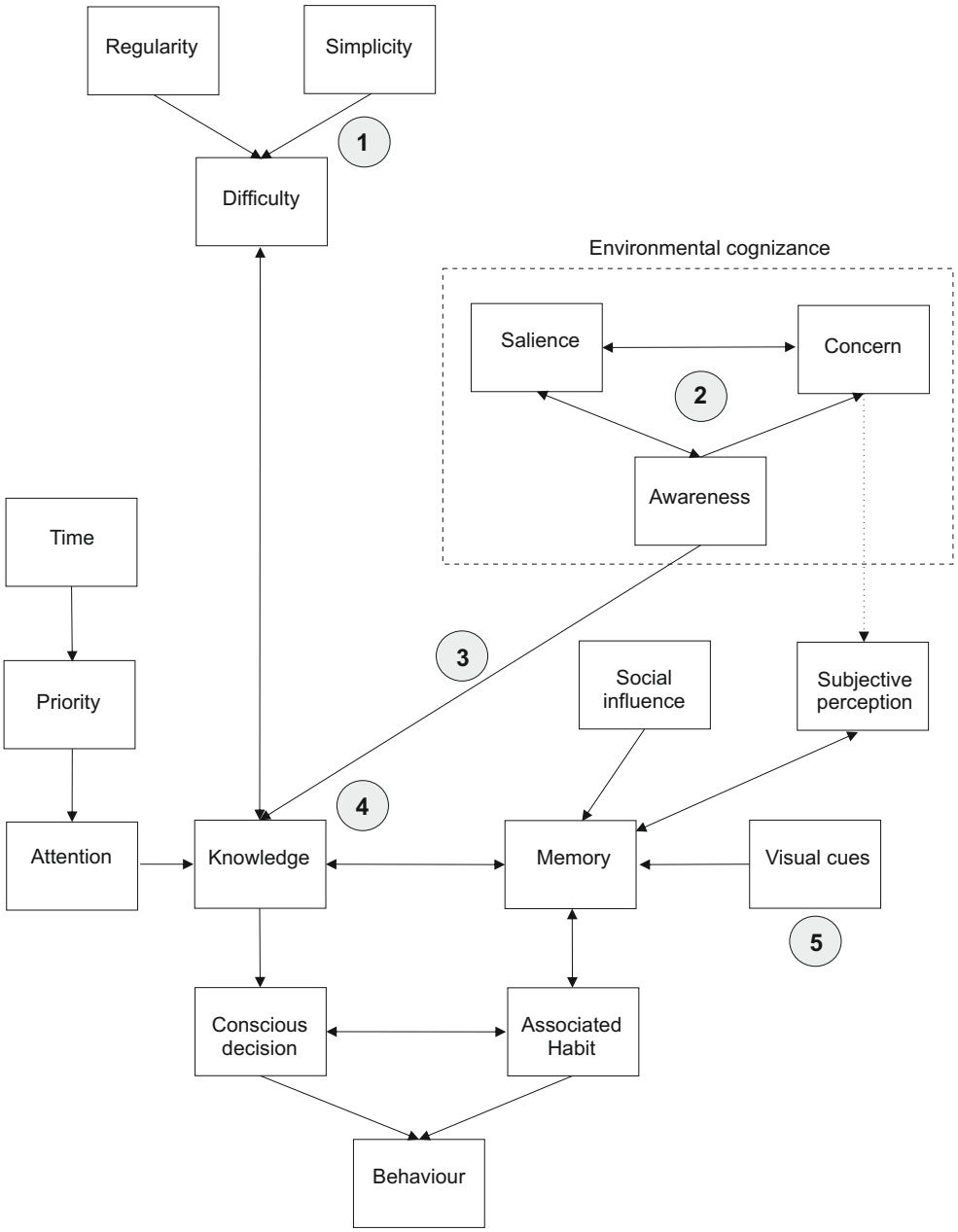

Figure 9.3: Suggested intervention points in the Health and Social Care Waste Management Behaviour Improvement Framework (HMWBIF)

both the incineration process itself and the need to landfill the fly and bottom ash following the incineration process. Modern incinerators often incorporate energy recovery processes, and the emissions from the burning of the waste are considerably less than those from older incinerators. These improvements to the incineration process, however, do not negate the fact that there can be no raw material recovery – the cost is considerably higher than landfill and recycling and the residue from the incineration (approximately 20-30% of the original waste volume) must still be landfilled.

The waste audit and observational sub-studies conducted during this study, along with previous research, have shown that there is great potential in health and social care for recycling to take place (Muhlich et al. 2003; Tudor et al. 2008a). A large amount of the waste currently disposed of in clinical and domestic waste bins could be recycled, though this comes with its own set of issues which can detract from its benefits and prevent health and social care organisations from adopting the practice. The main issue is the amount of segregation and the number of bins that result from the waste contractors' requirement for segregation.

Waste bins take up space in the physical environment, which is so often very limited with only space for one or two bins in a room (Nichols and Manzi 2014). The more bins there are, the greater the number and difficulty of the decisions that have to be made by the employee. This takes both time and effort – something of which the average employee has a limited amount, and they are often not willing to commit greatly to waste disposal. The introduction of a single recycling bin, reflecting the simple strategy of using only the clinical waste bins, may provide a suitable solution to this quandary.

In the HWMBIF the difficulty involved in making a disposal decision is determined by the regularity and the simplicity of a disposal task. By minimising the number of different bins there are to dispose of waste, the less options there are for the employee to chose between and the easier the decision becomes. In order to make the decision between the disposal of waste in the clinical, domestic or recycling bin the employee requires less information than would be required if they had to chose between three or four different recycling bins, each for a different material type. Segregating waste by material can cause confusion, because the employee is

expected to be able to identify different types of material by sight and then match that material to the correct bin. The labelling of the bins can also cause confusion, because the employee is faced with questions such as "Does the label 'plastic bottles' mean all plastics can go in this bin?" The use of a single recycling bin would remove much of the ambiguity around material identification and recycling.

9.2.2 Organisational influence through commitment

This intervention type takes the form of both a structural and a communication intervention, as it seeks to communicate a message from the organisation to the employee with the aid of a small structural change such as a poster or a flyer. Within an organisation there is a level of conformity by the employee to organisational priorities and values, which can be achieved by altering the salience of these priorities or values in the employees' workplace environment. In the case of health and social care waste management the organisation might want to communicate to the employees that appropriate waste management is important to the organisation. The organisation will want their employees to be aware of environmental issues and be mindful of performing appropriate waste management behaviours. For the organisation to transfer this message successfully to the employee, they would aim at increasing the salience of waste management for the employee. This could possibly be achieved through the use of prominent guidance located at waste disposal points. This guidance would communicate not only the appropriate waste disposal practices but also the importance of performing the appropriate practices in relation to wider environmental issues.

Another way for the organisation to demonstrate its commitment to waste management would be for management or senior supervisors to engage in discussions on the subject with their employees. Such face-to-face interaction would increase the employees' awareness of issues relating to waste management and in turn provide the employees with an opportunity to think about and feed back to the organisation their thoughts about current waste management practices, along with ideas for improvements. This form of informal communication between organisation and employee may exert a form of social influence on the employee.

Members of the management team, and senior supervisors representing the organisation, could

answer any spontaneously occurring questions that employees might have and then discuss waste management practices with them. The feedback that the organisation would receive from these informal interactions about the positive and negative aspects of current waste management practice could be used to inform future improvements. For this type of intervention to be effective it would have to be carried out consistently over a prolonged period of time. Such an intervention is a long-term demonstration of commitment and could be labelled as a culture change within the organisation. Waste management would become a collaborative effort between the employee and the organisation, not just something the employee has to do because the organisation says they have to do it.

9.2.3 Training (training monitored and vetted by the organisation)

Training is an important aspect of the provision of knowledge for employee learning, as it ensures that all employees are provided with the same information. One problem with the use of 'on the job learning' is that the organisation must rely on the current employee communicating the desired knowledge and behaviours to the new employee. If the waste management knowledge and behaviour of the current employee providing the training to the new employee is incorrect, this leads to the propagation of inappropriate waste management behaviours, which is not a desirable outcome. Both of the organisations that participated in this study alluded to the fact that their current training programmes were very busy, and so the inclusion of a separate waste management training session was not something they would want to do.

There are three possible ways in which waste management practices could be improved, to overcome the issues of on the job training and already full training schedules. The issue with on the job training is that the organisation cannot be certain what information is being passed from the trainer to the trainee. One way to overcome this problem would be to provide a waste management information sheet to both the trainer and the trainee. Such an information sheet would provide the new employee with a point of reference while undergoing their induction training. For the current employee providing the training they will have a guide to the type of information they need to provide to the new employee. The role of the current employee as a trainer is not diminished in importance, because their role is to put any waste management

knowledge on the information sheet into the context of the workplace environment and the job role of the new employee. The use of an information sheet for the trainer to follow would also ensure that important information is not forgotten during the induction process.

One way to overcome the issue of a busy training schedule would be to integrate waste management training within already existing training sessions, where appropriate. From discussions with the participating organisations, this type of integration was already being carried out to a limited extent within infection control training sessions. The scope of this integration, however, was described as only extending to some aspects of clinical waste disposal, thereby neglecting recycling and domestic waste disposal. It would be the responsibility of the organisation to identify suitable training sessions during which waste management information could be delivered to their employees. One of the participating organisations operated an e-learning system as part of their employee training programme, which would be a suitable place to include waste management training, as it could either be integrated into existing topics or included as a separate section of the e-learning programme.

It would likely benefit an organisation to use a combination of these two strategies for improving waste management training. Changes to induction training would aid in the initial knowledge acquisition of new employees. The inclusion of waste management training during the training programme for all employees would aid in reinforcing and refining the waste management knowledge of those who participated.

9.2.4 Waste classification and segregation

The main area where confusion and uncertainty were found to occur in the waste disposal process was at the point where the employee had to classify the type of waste they had and then decide how to segregate/dispose of that waste. Clinical waste is defined as any item contaminated with blood or bodily fluids or which is known to pose a risk of infection. When uncertainty occurs health and social care employees opt to dispose of waste in the clinical waste bin, by exercising an overcautious or ‘better safe than sorry’ approach. Some employees were observed washing their hands then disposing of the paper hand towels they used to dry their hands in the clinical waste bin. The paper hand towels should have been disposed of in the domestic waste

bin, they would not have contained any potentially infectious material as they were used to dry clean hands.

It is important that the health and social care employee understands what constitutes a risk of infection and which types of bodily fluids contain contaminants that pose a risk to human or environmental health. It is not recommended that the health and social care employee disposes of waste in recycling or domestic waste bins when they are uncertain about the risk of infectious contaminants. It is the organisation's responsibility to ensure that employees have sufficient knowledge to be confident in making such decisions, while it is the responsibility of the employee to seek advice from their manager when such uncertainty or ambiguity occurs. Due to the high work rate in the health and social care environment, the employee should be encouraged to dispose of waste under conditions of uncertainty safely in the clinical waste bin and then seek advice from a colleague or manager about the issue. This means that the organisation should have employees who are highly waste literate and encourage them to support their colleagues or provide easy access to advice through alternative sources.

Maximising the number of materials that can be recycled and minimising the amount of segregation required reduces the amount of prior knowledge required by the employee when making a waste management decision. If the number of items that cannot be recycled is kept to a minimum, these can be more easily retained by the employee than a long list of waste that can be recycled. By minimising the amount of segregation required, the employee has to choose between a lower number of alternatives which can be simple and distinct, such as those at The Oak (glass, cardboard, all other recyclable waste).

When employees at the participating health and social care sites are taught about the segregation of waste, the decision tree in Figure 9.4 would provide a simple process for them to use. The first stage is to use the individual's knowledge of what the item of waste has been used for, in order to determine whether or not it is contaminated with potentially infectious material. If the answer to this is yes, or the employee is unsure whether or not contamination is present, then the waste should be disposed of in the clinical waste bin. If the answer is no, then the employee moves on to the next stage of the decision process. The employee must now identify the general

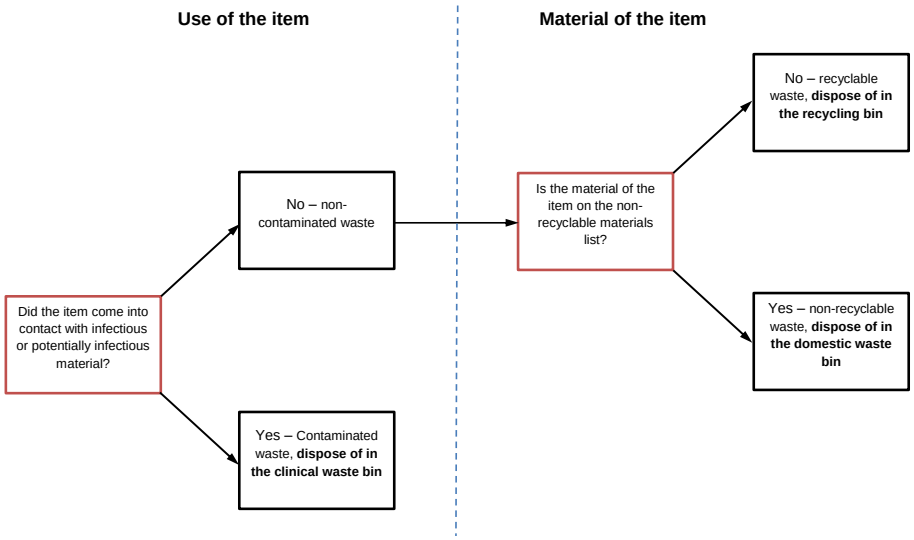

Figure 9.4: Optimal waste segregation decision tree

material category of the waste item, which informs them of the recyclability of that item. If the material is one that is recycled then it goes into the recycling bin, whereas if it is not recycled, it goes into the domestic waste.

This decision process minimises the number of decisions that need to be made. As a guide, should the number of decisions that need to be made by the employee exceed those in Figure 9.4, then the waste management system is too complicated. If the system is too complicated it will decrease the likelihood of appropriate waste management behaviours being performed. The decision tree also prioritises the disposal of clinical waste correctly. All other waste is then recycled unless it is known to be non-recyclable. Non-recyclable wastes are disposed of in the domestic waste bin, which is the least preferred method of disposal in this decision-making process. If the organisation teaches this process, then they will know how their employees decide to dispose of the waste and ensure that their waste management system facilitates this decision-making process.

9.2.5 Guidance notices (supplied by the organisation)

The provision of information to the employee in the workplace environment is another method that can be used to aid in carrying out the appropriate behaviour. The employees viewed guidance as useful and important in helping them with workplace waste management tasks. This study found that the use of such information varied according to both organisation and site, and the effective provision of this guidance was also highly variable, even within a particular site. There were three main aspects in the provision of this information that were central to the guidance information being used by employees: the content, the composition and the positioning of the guidance notice.

The content of a waste management guidance notice needs to convey a message to the employee. The amount of information to be contained in the guidance notice must be determined relative to the situation in which it is to be used. If there is too little information the employee will not be able to make use of the guidance and it may cause confusion, whereas if the notice contains too much information it may also cause confusion but it is also more likely that the employee will not have the time, or take the time required, to read and comprehend all of the information on the notice. The content of the guidance notice should also reflect current practice. If something is changed in the waste management system or practices, guidance notices should be updated to reflect those changes. The continued presence of out-of-date waste management guidance information will not inform employees of the new practice and likely lead to the persistence of old practices, which will prevent the employee from changing their behaviour to the new desired behaviour, thus disturbing any behavioural change through other interventions due to conflicting information.

The composition of a waste management guidance information notice is important, for it aids the employee in understanding content and making use thereof. Content can be presented as either text or pictographs, or a combination of the two. The presentation of the guidance notice is another important factor. Often information is scribbled out on a scrap of paper and stuck to the wall. This method of presentation does not extend any authority to the information. Guidance notices should be presented in a professional manner and constructed in a way that prevents

their being damaged over time, e.g. lamination to protect against water damage. Official and professionally presented information has greater authority and is more likely to be read and acted on by the employee.

A well-designed guidance notice is not sufficient for effective information communication. An important and often overlooked aspect is the positioning of the guidance notice in the physical environment. During this study guidance notices were often located behind doors, bins or other objects. They were also found to be located away from the waste management equipment and point of disposal. Essentially, guidance notices are most likely to be noticed and read by the employee when located on the top of or above the point of waste disposal.

9.3 Conclusion

The health and social care waste management behaviour improvement framework (HWMBIF) presented in this chapter, provides a novel empirically derived theoretical framework for understanding and improving waste management behaviour at the four participating sites. The HWMBIF is a starting point for more extensive investigation and experimentation into health and social care waste management behaviour.

The current study has also provided sufficient data to outline the factors relating to the operation of the health and social care waste management system by the participating health and social care organisations. These findings allowed for an understanding of waste management from the perspective of the organisation in relation to the employee and the operation of the physical waste management system.

The HWMBIF and the organisational factors relating to the HWMBIF, have provided a starting point for the design of interventions to improve health and social care waste management behaviour at the sites who participated in this study. Understanding the behavioural factors and factors external to the health and social care employee, will help in the design of more effective interventions and approaches to health and social care waste management. The inclusion of both health and social care in the scope of the theoretical framework presented in this chapter has improved the usefulness and scope of the project beyond just health care or social care in

isolation. Future testing and refinement of the HWMBIF and interventions, based on this theoretical framework, should seek to improve the generalisability of the framework so it can be applied to health and social care waste management practices on a larger scale. An agenda for future research around health and social care waste management and improving the HWMBIF, will be outlined in Chapter 10, Section 10.5.

Chapter 10

Study Conclusions

10.1 Study findings

10.1.1 Observational sub-study: quantitative findings

Quantitative data collected through observation (Manzi et al. 2014) (Chapter 3) were used to observe systematically the waste disposal behaviour of health and social care employees at the four participating sites. It provided a large number of findings on what type of waste was being disposed of, who was disposing of the waste and, perhaps most importantly, the appropriateness of the waste disposal behaviours. The inclusion of the measure of waste disposal appropriateness was highlighted during the publication of this sub-study as a novel measure which added to the usefulness of the data and subsequent findings. Including the measure of waste disposal appropriateness will be useful for future studies of health and social care waste management.

The high frequency of waste disposal events for the domestic waste bins observed at the social care sites was an important finding, as it indicated that the high volume of clinical waste production at healthcare sites did not translate to social care sites in the same way. The difference in the amount of waste disposed of in the clinical and domestic waste streams for the social care sites compared to healthcare sites, complemented the work of Tudor (2007) in relation to healthcare waste composition but demonstrated that the same waste composition cannot be generalised to social care waste. The clinical waste disposal behaviours at the social care sites were largely appropriate, thereby indicating a small amount of potentially recyclable material in the clinical waste stream – it was the domestic waste streams where potentially recyclable waste was being disposed of instead of the available recycling bins. The reliability of this finding was increased by the high proportion of inappropriate waste disposal for the social care domestic

waste bins. Finding low amounts of recyclable waste in the healthcare clinical waste stream was counter to the findings of high recyclable waste amounts in the clinical waste stream from Tudor (2007), however as will be seen in the waste audit findings, there was a large amount of recyclable waste in both the clinical and domestic waste streams at the healthcare site.

The majority of waste observed at the healthcare site was disposed of in the recycling bin. There were instances of inappropriate waste disposal, but because so much of the waste produced at the observation locations could be disposed of in the recycling bins, the chance of an inappropriate disposal decision being made was lower. The recycling system at the healthcare site had only recently been implemented, and so it is possible that the novelty of the recycling bins positively influenced the high frequency with which they were used to dispose of waste. Even if this is true, the high frequency of use implies that there is great potential for recycling in this healthcare setting. Making use of this potential has been aided by the introduction of legislation such as The Waste (England and Wales) Regulations SI 2011 No. 988 which has removed some of the legal barriers to more sustainable waste management in health and social care as identified by Hutchins and White (2009).

The great potential for recycling in the health and social care sites in this study is further implied by the materials that were being disposed of. The most common materials at all four participating sites were paper, plastic, cardboard and organic waste, all of which are highly recyclable and there is little or no reason why they should be disposed of in domestic or clinical waste bins.

This sub-study has highlighted not only that there is enough recyclable waste produced at the health and social care sites to make recycling worthwhile, but also that, if implemented, employees will make use of the recycling system. It also showed that it is important to make sure that employees know how to dispose of recyclable wastes appropriately and make effective use of the recycling system in order to avoid the issue raised by Blenkharn (2006) of domestic and recycling waste contamination through inappropriately disposed of clinical waste. The simplicity of the recycling system at the healthcare site and the low frequency of inappropriate waste disposal behaviours demonstrate the potential importance of simple systems and 'choice edit-

ing', i.e. the use of simple and strict practices and procedures to limit decision-making demands on employees. However, this option should be used with care, as it removes responsibility from the employee and thus reduces their ability to think critically about the task in which they are engaged (Ruepert et al. 2013).

10.1.2 Observational sub-study: qualitative findings

The qualitative data from the observational sub-study (Chapter 4) brought a deeper level of insight to the quantitative findings. The researcher was able to engage with the health and social care employees to find out why they were disposing of waste in a particular way. Furthermore, the researcher was able to ask questions about topics other than those related to the immediate waste disposal activities taking place. This provided a deeper level of insight and understanding into the employees' understanding of their own waste management behaviour and environmental views in general. The qualitative aspects of the observational study complemented the quantitative parts by providing data otherwise that would have been difficult to access.

One important finding from the observation was the low task priority attributed to waste management activities by employees relative to their other tasks. There was the shared perspective amongst employees that waste management was a mundane task that needed to be carried out, though it prevented them from carrying out other tasks which they would have preferred to be doing. The relatively low priority of waste management was linked to the wide variation in concern displayed by employees about local and global waste management issues and more general environmental issues. Recent research has demonstrated that workplace and household pro-environmental behaviours differ (Mira and Dumitru 2014). This was also found during discussions with health and social care employees. One suggested that the explanation for this was that the individual creates separate place identities for the home and the workplace. While there is some 'spillover' from the home into the workplace, an individual who demonstrate pro-environmental behaviours and values at home might not do the same in the workplace. The lack of concern about environmental issues and performing pro-environmental actions in the workplace may be the result of employees creating a separate place identity in the health or social

care setting (Ruepert et al. 2013).

Knowledge about waste management behaviour and the repercussions of a lack of knowledge were strong themes throughout the analysis of the qualitative data. A lack of knowledge about the appropriate classification and segregation of health and social care waste resulted in feelings of uncertainty among the employees. The introduction of recycling systems increased the number of options from which employees had to choose when making a disposal decision. As found by Grose et al. (2012)too much information or contradicting information can lead to uncertainty and in this instance employees were uncertain how to classify the different types of waste correctly before disposal. In addition, they were often not aware of the decision aids that were sometimes available to them, a finding which, as Botelho (2012) highlighted, demonstrates the importance of the organisation providing information to the employee.

Employees demonstrated confusion and an inability to remember consistently the waste management information they had previously been provided with, which might have been linked to the low priority attributed to waste management by the employee which in turn prioritised the storage of other information over waste management information in memory. To aid employees in remembering what the correct waste management behaviours were and how to perform them accordingly, the participating sites sometimes provided visual aids which took the form of posters or notices containing text and/or pictures. The visual aids were important in initiating prospective memory and helping employees remember what to do (Tobias 2009), but they were often ineffectual due to poor content, composition or placement. These findings highlight the importance of communicating information in the workplace (Austin et al. 1993).

Knowledge, the provision of information and task priority were just three of the many important findings to come from the observational sub-study. These findings highlight the relative importance of waste management to the employee and how they perceive the task. Employees require knowledge about waste management so that they are able to make appropriate decisions, and they also require help remembering this information. This sub-study showed how important it is for the organisation not to assume that their employees know how to perform appropriate and effective waste management actions – they need the organisation's help to do so. The qualitative

part of observational sub-study provided a large amount of detailed information that informed the development of the HWMBIF. It was an important sub-study in the overall study design and demonstrated the importance of the mixed methods approach. Bringing together qualitative and quantitative data benefited in equal measure the quality of the research, the depth of the research and its usefulness.

10.1.3 Waste audit

An overview of the composition of the domestic and clinical waste streams at each of the participating sites was produced through a waste audit sub-study (Chapter 5). The observational sub-study provided direct information about the disposal behaviours of health and social care employees, but it was possible that the waste compositions observed during this sub-study did not represent the overall waste compositions of the participating sites. The waste audit sub-study provided a general overview of the waste composition at each site and, importantly, the potential for recycling without the need to carry out detailed observations at all waste disposal locations.

The domestic waste streams at all four sites were found to have the greatest variety of waste disposed in them and the largest numbers of individual items. These findings were consistent across all of the sites and was not something found during the observational sub-study. Very little domestic waste was disposed of at the healthcare site during the observation, but waste from across the entire site contained more items and a greater variety of items than the clinical waste stream. The consistency of this finding across all four sites highlights the successful transfer of non-clinical waste to the domestic waste stream. This same transfer was not achieved from the domestic waste stream to the recycling waste stream in either the healthcare or the social care setting.

Domestic waste streams at the health and social care sites also contained the highest proportions of potentially recyclable items. All four sites demonstrated the potential for their domestic waste outputs to reach the 20% reductions observed by Tudor et al. (2008a) and even the potential 60-80% reduction in domestic waste amounts stated by Tudor et al. (2008a), should the recyclable portions of domestic waste be transferred to the recycling waste stream.

Overall, the waste compositions of the health and social care sites that participated in this sub-study showed great potential for reducing both clinical and domestic waste amounts through the transfer of recyclable wastes to the recycling waste stream. This would result in financial savings for the site, because clinical and domestic waste is more expensive to dispose of by weight than recyclable wastes. Recycling waste also produces fewer greenhouse gas emissions than clinical and domestic waste disposal methods, which would reduce the carbon footprint of the site. In the future, targeting interventions at domestic waste streams, to improve the management of waste at the participating health and social care sites, will likely have the greatest impact on the carbon footprint and cost of disposal.

10.1.4 Decision making questionnaires

Waste disposal at the participating health and social care sites requires the employee to make decisions about how to dispose of the waste correctly. Previous research on healthcare and household waste management has used the theory of planned behaviour (TPB) and goal-directed automaticity, commonly referred to as 'habit', as the theoretical basis for explaining waste disposal behaviour. There are issues of validity with both of these theories, though, and they differ greatly in their underlying psychological processes. These differences mean that they cannot both be correct as singular explanations of waste disposal behaviour at the health and social care sites in this study. The decision-making questionnaires sub-study (Chapter 6) was designed as a pilot study to begin investigating whether questionnaires based on the TPB and goal-directed automaticity, the self-report habit index (SRHI), measure different facets of waste disposal decision making.

The findings from this sub-study showed that TPB questionnaire and SRHI are independent and do indeed measure different aspects of health and social care waste disposal decision making. This indicates that both conscious decision making and habitual decision making are involved in health and social waste disposal. If this is the case, then neither the theory of planned behaviour nor goal-directed automaticity can provide a fully theoretical description of health and social care waste management behaviour, because one theory does not include the other. This was an important finding, because it showed that any theory seeking to describe health and social care

waste management behaviour had to account for both conscious and habitual decision making. The use of a theoretical framework based on only the conscious decision making approach of Ajzen (2001) by Tudor et al. (2008b) and Young et al. (2013) results in their frameworks neglecting the habitual aspects of waste management behaviour and those frameworks being incomplete.

This sub-study was only a pilot with a small sample size, so the findings should be treated with caution; however, there are some interesting and counter-intuitive findings that deserve attention. Health and social care waste disposal decision making did not appear to be affected by demographic variables such as employee age and the length of time worked in a health or social care setting. It was hypothesised that waste disposal decisions might change in line with the length of time that an employee had worked in such an environment, while more recent employees might have been unsure of the correct processes or more established employees might have altered correct practices over time, though this was not what had happened in reality. None of the demographic variables altered the findings. This could tentatively be thought to indicate that waste management knowledge is collected and habits form early on in employment, but further research will be required to test this hypothesis fully. If the hypothesis holds true, this might mean that there is a critical period at the beginning of employment in the health and social care settings in this study, when waste management knowledge and habits form. This will be important for targeting future waste management interventions at new employees.

The decision-making questionnaires sub-study shows that waste management-related decision making is more complex than previous research has assumed. There is a need to account for both conscious and habitual decision-making processes when studying and designing interventions for health and social care waste management at the participating sites. A study of the critical period for knowledge acquisition and habit formation will be important in future research, and while this study did not provide many answers, it nevertheless provided many important questions for future research.

10.1.5 Management interviews

The majority of this study focused on non-management-level employees and their waste management behaviour. The management interviews sub-study (Chapter 7) sought to gain the perspective of the management-level employee responsible for waste management at the participating sites. The perspective of the management-level employee was important for understanding the management of the waste management systems and the communication of information and training of non-management-level employees using the systems.

This sub-study found that it was the responsibility of site management to ensure that their employees understood waste management policy. Such policies are based on legislation and guidance that according to Grose and Richardson (2013), contain contradiction and ambiguity which result in uncertainty for manager. If the manager is uncertain about the information they are writing into a policy, it follows that the employee would likely be uncertain about interpreting the waste management policy as well. There was no specific waste management training provided to employees besides what they received during their induction. Understanding of the policy was monitored only through employees providing a signature to the effect that they had read, understood and would abide by the contents of the waste management policy. This process did not ensure that appropriate waste management behaviour was being carried out, due to the observation finding that inappropriate waste disposal behaviours were being performed. There appears to be the need for a distinction between monitoring employee acceptance of a policy document and monitoring how they approach and what they know about waste management.

Site management were also responsible for ensuring that their employees had sufficient information and the correct equipment to be able to carry out waste management activities in line with the site waste management policy. This was not always effectively carried out due to broken equipment and inaccurate guidance notices which were observed during the observational sub-study. This finding indicates that waste management was not a high priority task for management-level employees – in the same way that it was not a high-priority task for non-management-level employees. Further research will be required to link the managerial priority attribution to non-management employee priority attribution.

The monitoring of actual waste management behaviour during normal site operation was the responsibility of the organisation. The interviewees alluded to an audit process whereby they would ensure waste was being disposed of appropriately, waste management equipment was available to the employees and in good working order and the appropriate guidance information was available. The audit process was described as involving the responsible manager walking around and checking waste management activities and equipment, but the interviewees did not elaborate on the process further. A re-evaluation of these audit processes may be necessary, due to the continued occurrence of inappropriate waste management behaviour and the presence of broken equipment along with inaccurate waste management guidance. A quick and reliable waste audit process for health and social care site management would be a useful tool to help ensure employees can perform and are performing appropriately in this respect.

10.2 The health and social care waste management behaviour improvement framework

One theme that is central to the HWMBIF is information. Health and social care waste management relies on the communication, recall and use of information. The employee must learn about health and social care waste management practices and, to a certain extent, use their prior knowledge about waste management from other settings to inform their waste management-related decisions. Once this information has been stored by the individual in a knowledge base, they must recall the information at the appropriate time to inform their immediate waste management decision. This is the use of prospective memory, remembering to remember. The use of cue's to action within close proximity to where the action should be performed, can help improve recall of the appropriate action (Tobias 2009). This process can be interrupted and the information lost or altered at any time through a number of intervening factors. Information does not come from one source, though, as employees receive information from their peers, the media and their employer. The employee must then process this information and decide what is useful to them and what is not. This process and the information itself are influenced by the employee's prior knowledge. Information is disregarded because it is believed to be unimportant or altered to fit more succinctly within the employee's current knowledge framework.

Once the employee has stored the information, any recall thereof is also imperfect and prone to errors, which can leave the employee uncertain about the appropriateness of their behaviour. By providing visual cues to prompt the recall of information or additional situational information, the organisation can aid the memory of the employee (Austin et al. 1993). The HWMBIF is in many respects a theoretical framework of an health and social care waste management information-processing system. This system, however, is not as simple as the computation-based systems of early cognitive science, in that it is dynamic and unpredictable. How people gather, store, recall and use it is still a central component of this framework for understanding health and social care waste management behaviour at the four participating sites.

A second key theme to come from the HWMBIF is the relative importance of waste management and other environmental issues to the employee. This theme demonstrates the dynamic and unpredictable nature of human behaviour. Recent research has shown that a person's pro-environmental intentions and behaviours do not always translate to the workplace. The reason for the lack of behaviour transfer from the household setting to the workplace setting is not well understood; however, early indications suggest that the strength of the individual's environmental values may have a role in this respect. This idea is mirrored in the HWMBIF, which was developed independently prior to the release of the early LOCAW project reports. The HWMBIF includes a set of psychological factors that are amalgamated under the heading 'environmental cognisance': environmental awareness, environmental concern and issue salience. Arguably these factors go beyond a basic value-based theory of pro-environmental behaviour, and they may be components of what can be referred to as 'pro-environmental values'.

Whether different or related to the value theory, environmental cognisance and its constituent factors are different for every person – for each employee the information basis and thought processes that have created the knowledge frameworks underlying each component will vary dramatically. These psychological components will likely be the product of the employee's experiences and thoughts throughout their lifetime. The relative importance of waste management and other environmental issues to the employee is a theme which highlights the difficulty in understanding a simple behaviour such as waste management. Being able to split this idea

into a few constituent components that have been drawn from the data, beyond what previous research has achieved, is one more step towards being able to understand the behaviour better and then develop effective and appropriate interventions.

One omission from the HWMBIF that highlights the progress this study has made towards better understanding health and social care waste management behaviour is the absence of attitudes. The term 'attitude' is used by psychologists to amalgamate a large number of complex hypothetical psychological factors or constructs that are not yet understood under one convenient heading. The ideas behind attitudes and the questionnaires used to measure them are so ingrained in the social sciences that they are simply assumed to exist. It is further assumed that by measuring attitudes using these questionnaires, all the constituent parts that make up an attitude can be included and the behaviour to which the attitude relates to can be better understood. This is an illogical assumption; if you design a questionnaire to measure something that you assume to exist, it will be found and be measurable, because an answerable question has been devised by a human researcher who has expectations of what the answer should be. This has propagated the use and measurement of the concept of attitudes. What this study sought to do was to create a picture of the health and social care waste management phenomenon in the context of the participating sites, without making any theoretical assumptions. The novel mixed methods design of this study facilitated this process and allowed the HWMBIF to be derived from the data so that the constructs present in the framework could also be found in the data.

The term 'attitudes' is not found in the HWMBIF because it was not pertinent within the data. Other factors were described more strongly by the data. These factors may be some of the hypothetical psychological constructs that contribute to the construct of attitudes, but it is more useful to have a greater number of more specific factors than using one overarching term which is difficult to define. The term is also omitted from the most recent psychological studies of sustainable workplace behaviour. In the case of Ruepert et al. (2013), the constructs of values and social norms have been used. The ability of this study and the resulting HWMBIF to describe behaviour without using the term 'attitude' is a step forward and towards a better understanding of health and social care waste management behaviour.

10.3 Importance of the research

10.3.1 Contribution to clinical practice

As discussed in the introductory chapter to this study (Chapter 1), the NHS has challenging carbon footprint reduction targets to meet by 2050, (NHSSDU 2009). Waste management is one aspect of health and social care services provision where improvements to current practices will result in not only greenhouse gas emission reductions, but also monetary savings for the service provider. This can be described as a 'win-win' scenario for the health and social care provider, because will reduce their carbon footprint and save money at the same time. There is also a 'win' for the environment, because anthropogenically produced greenhouse gas emissions can be reduced. The improvement of health and social care waste management has not been optimally successful thus far, due to a lack of research and understanding about human behaviour-waste management system interactions (Grose et al. 2012). The current study has sought to address this gap in the literature, and the way in which it contributes to clinical practice will now be discussed.

Previous research on health and social care waste management has focused mainly on the composition of waste. It was an important part of this study that the composition of the waste at the participating sites was also studied, in order to check the findings of the previous research in this area such as Tudor et al. (2008a). The investigation of the social care waste composition was a novel part of this research, as a comparison between healthcare and social care waste compositions had not been undertaken previously. What this particular area of study highlighted was the great potential for recycling in both of these settings. It also demonstrated that the majority of recyclable waste was to be found in the domestic waste stream. The implications of these findings for clinical practice are that while both clinical and domestic waste streams should be targeted for waste reduction interventions, the domestic waste stream should receive particular attention, because that is where the majority of the recyclable waste will likely be disposed.

This study investigated not only the waste composition of the participating sites, but also the waste management behaviour of health and social care employees. In Line with the suggestions of Grose et al. (2012) and Richardson et al. (2009) the use of qualitative and quantitative re-

search methods provided a more complete picture of employee waste management behaviour than has previously been available. This is important information for health and social care providers, because there needs to be a coherent understanding of behaviour and the context in which it occurs, before that behaviour can be changed. The HWMBIF is a simplified outline of the behavioural process. On its own this framework would probably not be very useful for health and social care providers, because it only describes the behavioural process. In addition, the framework provides information on points of intervention and intervention ideas. Figure 9.3 identifies points of intervention in the HWMBIF framework, and Chapter 9 Section 9.2 outlines some possible intervention strategies based on the findings from this study in relation to the HWMBIF.

The suggested interventions in Chapter 9 Section 9.2 were designed to have the greatest impact while accounting for key strategic considerations such as minimising the financial cost to the health or social care provider (Epstein and Roy 2001). These interventions have the potential to reduce both the carbon footprint of waste management and the financial cost associated with waste disposal. This will help the health and social care providers that participated in this study achieve greenhouse gas emission targets and reduce service costs. These interventions can also have an indirect impact on patient care. The money that is saved through improved waste management practices could be reallocated to patient care. This money could then be used for more equipment or employees, which in turn would improve patient care and the patient experience.

The HWMBIF and the interventions described herein still require further testing and refining. What this study has done is to provide a solid starting point for this process. Future research, outlined in Section 10.5, provides a research agenda for providing robust and proven intervention strategies based on the current study. This research agenda outlines a clear pathway to the improvement of health and social care waste management practices, which is important to the future of health and social care.

10.3.2 Contribution to research and theory

The findings of this study contribute to the literature on health and social care waste management. With a small existing body of research in this area, the findings from each sub-study, as summarised in Section 10.1, improve understanding of and knowledge about this phenomenon. The current study has also made a number of other contributions to the fields of health and social care services research, psychology and mixed methods research.

The mixed methods multi-strategy concurrent triangulation design of this study, and the research methods utilised within the study design, represents a novel combination of methodological design and research methods. The study demonstrates how the mixed methods approach can be successfully applied to health and social care settings and the study of waste management behaviour. This novel study design also represents a useful change in approach for the social sciences as a whole. Mixed methods is becoming a more accepted approach in the social sciences, particularly in psychology, where qualitative and quantitative approaches were once thought to be incompatible. What has been slow to develop is an agreed-upon methodology and philosophical basis for the application of mixed methods designs. This study was based philosophically on the realist approach which Olsen (2010) stated was a sound basis for reconciling the dualistic nature of knowledge debate and methodologically on the work Creswell (2009). The ways in which the study, the individual sub-studies and the triangulation process were conducted demonstrate the successful amalgamation of the systematic nature of quantitative methods and the iterative nature of qualitative methods. The study as a whole stands as a template for the appropriate use of mixed methods in the exploratory study of psychological phenomena in applied situations.

This study was an exploration of waste management behaviour in the context of the four participating health and social care sites. It was an 'exploration' because there was little available research about health and social care waste management behaviour (Grose et al. 2012; Richardson et al. 2009). As discussed in Chapter 1, the only study of health and social care waste management behaviour, and a theoretical explanation of the phenomenon, was based on a theory which by the author's own admission was unreliable and invalid. The rationale behind the

design of the current study was to enable the production of a data-driven theory of health and social care waste management behaviour. The HWMBIF bears little resemblance to the theory of planned behaviour (TPB) or to variations in TPB by Tudor et al. (2008b) and Young et al. (2013). This lack of similarity highlights the importance of not making assumptions about the psychological constructs underlying behaviour in under-investigated research areas such as health and social care waste management.

The HWMBIF provides a novel theoretical insight into the psychological constructs underlying waste management behaviour at the sites who participated. It is an empirically derived theoretical position from which to continue investigating this phenomenon. As discussed in Section 10.2, the HWMBIF has brought together psychological factors that have not been considered in previous research going beyond the theoretical frameworks of Tudor et al. (2008b) and Young et al. (2013) which were based on factors relating to the theory of planned behaviour (Ajzen 2001). One of the most important findings was the need to account for both conscious and habitual aspects of the behaviour when studying and designing interventions for health and social care waste management.

The omission of attitudes from the HWMBIF was also an important finding, in that it highlights both the usefulness of this type of exploratory mixed method design and the danger of making theoretical assumptions when investigating under-researched topics. The HWMBIF has been able to break down health and social care waste management behaviour into more useful constructs, without the need to refer to the amalgamated term 'attitudes'. While it is highly likely that the constructs within the HWMBIF can themselves be broken down further into simpler constructs, it does represent a step towards improving our understanding of health and social care waste management behaviour.

10.4 Study strengths and limitations

10.4.1 Strengths

The main strengths of this study stem from the research design. The use of qualitative and quantitative methods facilitated the creation of a more complete picture of health and social care

waste management behaviour than has previously been available. The quantitative methods supplied a general overview of health and social care waste management through the quantitative aspects of the observational sub-study, the waste audit and the decision-making questionnaires sub-study. The qualitative methods employed in the qualitative aspects of the observational sub-study and the management interviews sub-study brought a greater level of detail to the study, which in turn provided a deeper level of insight into the phenomenon of health and social care waste management behaviour than would have been possible with only a quantitative approach.

The concurrent mixed methods design of the current study allowed for the investigation of the health and social care waste management phenomenon within the same temporal and spatial frames. The concurrent aspect of the research design meant that all of the sub-studies within the project were carried out over the same time period and all of the sub-studies were conducted at all of the participating sites. This design had the advantage of gathering multiple perspectives on the same phenomenon, and the approach enhanced the ability of the study to produce a more complete picture of health and social care waste management behaviour. This was necessary due to the exploratory nature of the study. Taking more than one perspective on the phenomenon under investigation strengthened the ability of the study to explore the phenomenon thoroughly.

All of the different perspectives on health and social care waste management would not have been useful had they not been brought together through the triangulation process, which was a hybrid systematic-iterative process reflecting the mixed methods nature of the study. Data triangulation was also central to the theory development process, because by bringing together findings from the various studies through a comprehensive and traceable process, the most important and consistent factors from the data could be identified. The links between the themes were also identified during this process, and as a result of triangulation, the main factors and the links between those factors constructed the theoretical HWMBIF.

The strength of this study is its ability to start with little information about health and social care waste management, create a broad and detailed picture of the phenomenon and then summarise these findings in a useful theoretical framework derived from the data.

10.4.2 Limitations

For all of the strengths of this study, there are also some limitations. If the study used a purely quantitative approach it would have been more systematic and reduce the potential introduction of bias into the analysis. Furthermore, because the study did not use a purely qualitative approach, there may have been some detail that was missed out during the data collection process. These limitations are balanced by the inclusion of both qualitative and quantitative research methods through the mixed methods approach. If only qualitative methods had been used, then the study would have lacked generalised findings and the rigour of the systematic approach. Conversely, if the project had only used quantitative methods, it would have lacked detailed insights into the phenomena. The mixed methods approach minimised the limitations of using only the singular methodological approach and enabled the research question to be answered more effectively.

The mixed methods approach also enabled the construction of the HWMBIF, even though it is thus far only a starting point. The HWMBIF currently includes the constructs found in the data and the most important links/relationships between the constructs, but it does not yet include information about the direction and strength of the relationships between the constructs, which might have been possible to include in a fully quantitative study. If the study had been solely quantitative, then, as previously discussed, the study would have lacked the detail that was central to the production of the HWMBIF. In Section 10.5, the next steps for the testing and refinement of the HWMBIF will be discussed.

There were also some limitations to the individual sub-studies carried out in the current study. In the observational sub-study only two observation locations were used at each site. The two observation locations at each site were chosen to be representative of the waste management at each site. Due to the discrepancies between the quantitative observational findings and the waste audit findings, the observation locations were not completely representative of each site's waste management approach. If there had been more time, or if more observers had been employed, then more locations at each site could have been observed. This was not practical in the current study, due to time and financial limitations. A large amount of data was collected using just

two observation locations. If more than two observation locations had been used, then the data analysis would have been more difficult and the datasets more unwieldy. In the context of this study, two observation locations were appropriate for studying the phenomenon without making data collection and analysis unmanageable.

The waste audit sub-study might have benefited from the collection of more data; for instance, individual item weights would have been a useful piece of data to include in the sub-study. Also, the sampling of a greater number of waste bags would have increased the representativeness and accuracy of the sub-study sample. The waste audit as described in Chapter 5 was a demanding data collection process without the addition of collecting individual item weight data and sampling an increased number of waste bags. Increasing the amount of data beyond what were collected during the current study would have required more time and more manpower. In the context of this study such increases were not feasible, and so future waste audits building on this study might seek to include individual item weights and a larger sample size.

The decision-making questionnaires sub-study in the current study was undertaken as a pilot with a small sample. With more time it would have been advantageous to carry out a study with a larger sample and a direct behavioural measure to test the ability of the TPB and SRHI questionnaires to predict behaviour. Due to time constraints it was not feasible to carry out this type of sub-study within the current study. Conducting a larger-scale health and social care waste management decision-making study will be discussed further in Section 10.5.

The management interviews sub-study might have benefited from the inclusion of a broader range of health and social managers, which would have allowed for more information and more diverse perspectives from health and social care management on the topic of waste management for inclusion in the sub-study. The current sub-study focused solely on managers directly responsible for the waste management at the participating sites. The decision to narrow the scope of this study in that manner was due to Grose and Richardson (2013) having already conducted an interview study with a broad range of healthcare management-level employees on the topic of sustainability, including waste management. Had there been more time and resources available for the current study, then the range of management-level employees included in the

sub-study could have been extended.

One of the main limitations of this study is the generalisability of the findings. The current study was limited to four health and social care sites in the south-west of England. The limited number and geographical location of the sites participating in the study mean that the findings should not currently be generalised beyond the scope of the participating sites. To be able to generalise the findings beyond this limited scope a greater number and variety of health and social care sites could have been included in the sample. This was not feasible to do within the context of the current study, due to resource and time limitations. Future studies might aim to apply the research design used in the current study to the study of other health and social care sites in more diverse geographic locations.

Data collection for the current study was conducted over a three-month period. Health and social care is known to be subject to seasonal variations in activity. To improve the temporal generalisability of the study findings it might have been conducted over a full 12-month cycle. This would again have required greater resources and more time than were available to this study.

The next section in this chapter will outline a future research agenda that has the potential to overcome many of the limitations of the current study discussed above.

10.5 Recommendations for future research

10.5.1 Testing the HWMBIF and interventions

Further research on the HWMBIF is essential to establishing the validity of the framework and testing the strength and direction of the relationships between the constructs. Once the HWMBIF has been tested and refined, the interventions to be used within the framework should also be refined and tested. A large-scale intervention will be possible when the HWMBIF and associated interventions have been fully tested and can be shown to improve health and social care waste management practices effectively. This process can be described as a three-stage process.

Stage 1 - Experimental studies testing and refining the HWMBIF

The first stage will involve carrying out a series of experimental studies on the constructs described by the HWMBIF. These will need to be controlled studies, likely taking place under laboratory conditions, due to the need to establish cause-and-effect relationships between the various constructs. The most effective way to test the HWMBIF will be to use direct measures of health and social care waste management behaviour. Future studies should not rely solely on self-reporting measures of behaviour, due to the biases introduced by this type of measure and the well-documented behaviour intention gap. Novel experimental designs will be required to study the impact of one HWMBIF construct on another with direct measures of behaviour. This represents an exciting opportunity to design novel psychological experiments and to test a novel theoretical framework.

By testing the influence of one construct on another in the context of health and social care waste management behaviour with direct behavioural measures, all of the relationships between the constructs of the HWMBIF can be mapped. It is suggested that perhaps a structural equation modelling approach be applied to the findings from the experimental studies. Using structural equation modelling the direction and strength of the construct relationships can be examined in relation to the framework as a whole. This will provide a system for identifying the most important constructs and their relationships. This information can then be used to identify better optimal points of intervention for improving health and social care waste management behaviour.

Stage 2 - Developing and initial testing of interventions

Once the HWMBIF has been refined and the optimal points of intervention identified, the interventions themselves can be designed. Using the experimental designs from stage 1, interventions can be applied and tested under controlled conditions to determine which will most likely be effective when applied to a real-world health and social care setting. Following this initial development of the interventions, small-scale testing of the interventions can begin through pilot studies in a variety of health and social care departments. By testing a variety of interventions and combinations thereof, and then measuring the resulting behavioural change as a result of

the intervention, an optimal intervention strategy can be determined.

Before testing any intervention strategy on a large scale, it will be advantageous to apply the process of agent-based modelling (ABM) to the improvement of health and social care waste management. Using the data already collected, aligned with historical waste quantity data, it will be possible to create simulated agents, two or more levels of a simulated environment in which they can interact and a set of parameters within which the interactions can take place. The agents in this instance can be thought of as health and social care employees and the environments as the workplace and outside of the workplace. The parameters within which the interactions between agents and other agents, and agents and the environment, take place would be derived from the data collected through previous studies. This will be a mathematical simulation that can be designed to take place over any period of time. Procedural generation can also be used, thereby allowing natural and random variations to occur within the simulated system.

The ABM process would allow the researcher to test the effectiveness of the interventions across larger spatial and temporal dimensions than would be possible during the intervention development phase. Testing the interventions computationally prior to the large-scale and longitudinal testing of the interventions will allow the researcher to determine more accurately the effectiveness of a large-scale longitudinal intervention than they would from small-scale, short-term intervention data. If there were any irregularities in the simulation, the simulation would provide data on areas of concern. The researcher should be aware of these areas of concern as they test the interventions on a large scale, and then alter the intervention strategy, if necessary.

Stage 3 - Large-scale longitudinal intervention

Once stages 1 and 2 have been completed and the experimentally optimal intervention strategy or strategies for the improvement of health and social care waste management behaviour has been determined, large-scale longitudinal testing can commence. At this point the researcher should be confident that the intervention strategy will be effective at improving behaviour. It would be advantageous to test the intervention strategy at as many health and social care sites as is feasibly possible and to monitor waste management behaviour over a minimum of 12 months, in order to account for seasonal variations. The longer the period of time that the progress of

the interventions can be tracked, the more data will be available for understanding the change in behaviour over time and further improve the intervention package.

Data collected during this stage of the research process can be compared to the ABM data, to determine the accuracy of the simulation. It can then be used to update the ABM parameters and improve the ability of the simulation to predict future health and social care waste management behaviour. A process of qualitative feedback should be used throughout stages 1, 2 and 3, to gather information about the user experience during the development, implementation and long-term use of the altered waste management systems. This information could be used to inform a continuous improvement process.

The process of developing an intervention strategy for the improvement of health and social care waste management behaviour, as described above, may seem excessive to some. Furthermore, it may seem that some of the stages could be reduced in complexity or removed altogether. This would be a false assumption. Large-scale behaviour improvement/change interventions are expensive and time-consuming to implement, so improving health and social care waste management behaviour has the potential to dramatically reduce the carbon footprint of health and social care services in the United Kingdom and across the world. These improvements will also save these same organisations millions of pounds, which can then be reinvested to improve patient care and save lives. It would be counter-productive to invest in a strategy to improve behaviour only to have it not meet targets by not performing optimally, as this would be a waste of money. The research programme that seems economically viable in the short term will likely not be the economically sustainable solution for the long term. A well-developed intervention strategy developed through a process like the one described above will have the best chance of successfully improving health and social care waste management behaviour.

10.5.2 Other research recommendations related to the current study

As discussed above in Section 10.4.2, it would be useful to replicate the current study across a larger number and variety of health and social care sites, as it would help to improve the generalisability of the findings. The design of the current study could also serve as a template for studies of other research topics, where little or no research has previously been carried out.

The researcher has begun a project to provide the most accurate calculations to date of greenhouse gas emissions and the financial cost of health and social care waste disposal. This is a complex project the scope of which will continue over the coming years. The calculation programme has the potential to simulate waste amounts from a single healthcare site to all the sites within an entire country, from relatively small datasets. The calculations produced by this tool will be instrumental in supporting the argument for further improving health and social care waste management behaviour. The programme will also be useful for tracking changes in waste management over time and could be used as part of an intervention strategy for improving health and social care waste management. The continuation of this project will be central to the continued improvement of health and social care services in the UK.

One of the key constructs of the HWMBIF was visual cues. The provision of information to health and social care employees will likely be a component of any intervention strategy. The creation of effective health and social care waste management info-graphics will be one area where further research is needed, because nothing currently exists in this respect. The use of alternative mediums of information provision also need to be explored. The researcher is developing a project that aims to create a cost-effective method of audible information provision at the point of waste disposal. Future research should look to compare the effectiveness of different mediums of information provision for improving waste management behaviour.

One aspect of health and social care waste management behaviour that was not able to be studied in any great detail in the current study was the influence of waste management contractors on behaviour. Private waste management contractors are responsible for supplying equipment and collecting waste from health and social care sites. It was highlighted in the current study that they determine what waste can be disposed of in which bins, at least to a certain extent. They are also relied on by health and social care managers for waste management guidance, information and feedback on performance. Their role and ability to influence behaviour will be necessary to inform the practicalities of changing health and social care waste management behaviour.

An investigation into availability and the potential for the creation of local markets for recyclable materials may be useful, to further encourage the adoption of recycling by health and

social care providers. If there is a demand for recyclable materials such as paper, plastics and organic waste, then there is the potential for waste management companies to profit from the increased collection of recyclable materials. If health and social care providers can access these local markets directly, there is also the potential for them to sell their recyclable materials directly to consumers and profit from the collection thereof.

Health and social care products and their packaging could be redesigned to help improve their recyclability, which in turn would reduce the need to dispose of waste in the clinical and domestic waste streams, thereby reducing financial costs and greenhouse gas emissions. Going one step further would involve redesigning health and social care products so that they are re-usable. This would require the reversal of the single-use culture in health and social care that is so popular with product manufacturers. This is a more difficult problem to begin to solve, though, as it is replete with many political and economic factors. It is likely to take more time before the demand for re-usable products in health and social care can overcome these external factors. This is, however, an important research topic that this current study was unable to address, but it certainly deserves more attention in future research.

10.6 Final conclusion - Contribution to knowledge

The novel application of mixed methods, and the combination of methods within the mixed methods design, enabled this study to provide many useful insights into waste management behaviour at the four health and social care site that participated in the study. Using both qualitative and quantitative methods concurrently in the research design, the study was able to provide detailed insights into the situation and phenomena under investigation, thereby deepening our knowledge. By conducting a number of sub-studies concurrently, in order to investigate different aspects of health and social care waste management behaviour, the project was able to produce a broad picture of the situation and phenomena.

This study was especially important for providing insight into social care waste management behaviour, because it is the first time that this subject has been studied in detail (Richardson et al. 2009). The novel investigation carried out during this study means that it is also the first time that health and social care waste management behaviours have been studied in tandem and

comparisons between the two settings made, thus broadening and deepening our knowledge.

The individual sub-studies each singularly contributed to a number of important and useful insights. For instance, the health and social care domestic waste streams at the four participating sites were found to contain high amounts of recyclable waste. This finding was confirmed through both the waste audit sub-study and direct observations of waste disposal behaviour and confirmed those of Tudor et al. (2008a), adding additional evidence to the argument that recycling would be a useful and worthwhile undertaking in health and social care settings.

A useful method for assessing health and social care waste management behaviour, and for determining the potential for recycling, was measuring the appropriateness of the disposal behaviours being performed during the observational sub-study. This measure of appropriateness not only described what waste was being disposed of but also how well it was being disposed of ultimately. Appropriateness took into account national legislation i.e. The List of Wastes England Regulations 2005, local waste management policy and the facilities available to the employee at the site. The measurement of appropriateness added an additional dimension to the observation and assessment of waste management across the four sites.

The observational sub-study represents the first time that qualitative observational research methods have been used to investigate health and social care waste management behaviour. This sub-study provided a considerable amount of detail and insight from the perspective of the health and social care employee and was instrumental in understanding the extent of employee knowledge about health and social care waste management and related issues. It provided further insight into how employees prioritise waste management tasks and consider them in the context of their daily workplace routines. The use of different data collection methods, such as photography and diagrammatic sketches, helped in understanding how the physical environment and the organisation provide employees with waste management information and facilitate their behaviour. The qualitative findings from the observational sub-study contextualised many of the findings from other sub-studies, further demonstrating the usefulness of the mixed methods approach and the data triangulation process.

The study of conscious and unconscious decision making in relation to health and social care

waste management was key to determining if employee behaviour should be described in terms of a single or a dual process model. The finding that both conscious and unconscious decision-making processes are independently active in waste management behaviour at the four study sites has opened up new research possibilities for the development of interventions to improve behaviour in this respect. It will be important to assess the applicability of the theory of planned behaviour (Ajzen 2001) and goal directed automaticity (Aarts 2000) in more focused and detailed future studies. Understanding which aspects of health and social care waste management behaviour are subject to conscious and unconscious decision making will enable interventions to be designed so that they account for these different decision-making processes.

The HWMBIF consolidated all of the study findings into a novel framework for understanding health and social care waste management behaviour at the four participating sites. It brought together different aspects of health and social care waste management that influence employee behaviour, including the task, internal factors and external factors, in a way that is more psychologically based and specific than the framework of Tudor et al. (2008b) and the e-PEB framework of Young et al. (2013) have been able to achieve. This was due to the exploratory design of the current study, which provided both broad and detailed data that could be used to develop a data-derived theoretical framework.

Several intervention strategies for improving waste management behaviour at the participating health and social care sites were suggested based on the HWMBIF and the study findings. With further refinement and testing of the HWMBIF, using a strategy such as that suggested in Section 10.5, the HWMBIF will provide an even better understanding of health and social care waste management behaviour and become an even more effective basis for the design of intervention strategies. It will be crucial to continue the study of the psychological determinants of the behaviour in further detail. By understanding the psychological underpinnings of health and social care waste management behaviour, intervention strategies can be tailored to this context and become more effective.

Designing effective interventions to improve health and social care waste management behaviour will facilitate the great potential for recycling in the health and social care settings;

the better the interventions, the greater the extent to which waste management efficiency in health and social care can be achieved. Efficient waste management, including recycling, will have both financial and environmental benefits, as they will reduce many financial costs which can then be reallocated to services impacting directly on patient care, improving the patient experience and potentially saving lives.

Efficient waste management and recycling practices in health and social care will reduce the greenhouse gas emissions that result from waste disposal and in turn reduce the contribution of these services to anthropogenic climate change. Health and social care services are important for the functioning of modern society, and so improving their efficiency in terms of waste management practices will positively benefit the functioning of health and social care organisations and the lives of all.

Appendices

Appendix A

Summary table of theoretical framework structural differences

Structural Differences			
Structural difference	**Tudor et al. 2008b Framework**	**Young et al. 2013 e-PEB Framework**	**Summary discussion**
Sideways links between sub-factors	Sideways interactions between the factors are present prior to them being amalgamated into a behavioural intention	No sideways links between the four main factor groups (`individual', `external', `group' and `organisational factors')	This is a weakness of the e-PEB framework because behavioural factors are rarely singular in purpose and lead to this framework likely being an over-simplification of the phenomenon.
Presence of `behavioural intentions' as a mediating variable between the determinant behavioural factors and the actual behaviour performed by the individual	'Behavioural intentions' present as a mediating variable between the framework factors and actual behaviour	'Behavioural intentions' removed from the e-PEB framework.	Removal of `behavioural intentions' from the e-PEB framework may have resulted from the inclusion of studies that only used direct measures of environmental performance.

Appendix B

Summary table of theoretical framework factor differences

Factor Differences			
Framework factor	**Tudor et al. 2008b Framework**	**Young et al. 2013 e-PEB Framework**	**Summary discussion**
Attitudes	'Attitudes' are a main factor in the TPB and are considered of importance in the Tudor et al (2008b) framework.	Young et al. (2013) did not attribute much importance to 'attitudes'	Young et al. (2013) said that a change in 'attitudes' was not necessary for behaviour change to occur.
Organisational culture Structure Focus and policies	'Organisational culture', 'structure' and 'focus and policies' were highlighted as important determinants of behaviour	'Organisational culture', 'structure' and 'focus and policies' are grouped under 'organisational factors' in the e-PEB framework and given less relative importance than other 'organisational factors'.	Young et al. (2013) views these factors as having a role in the communication of information to the employee but they are superseded by the management support and training factor.
Management support and training	'Management support and training' appears in the Tudor et al (2008b) framework but 'culture', 'structure' and 'focus and policies' are seen as more important.	'Management support and training' supersedes 'organisational culture', 'structure' and 'focus and policies'	Tudor et al (2008b) viewed management support in terms of the attitude of the management towards the implementation of environmental initiatives and sustainable practice. Young et al. (2013) was more specific and said that it was the role of the management to set an example to their employees and effectively communicate the necessary information.

Factor Differences			
Framework factor	**Tudor et al. 2008b Framework**	**Young et al. 2013 e-PEB Framework**	**Summary discussion**
Site/department type and size	An important factor in the Tudor et al (2008b) framework.	This was a factor that was absent from the Young et al. (2013).	This factor was shown in multiple studies to impact on waste management behaviour hence its inclusion in the original framework (Tudor et al 2005, Tudor 2007, Tudor et al 2008b).
Environmental infrastructure	This factor was not included in the Tudor et al (2008b) framework.	Environmental infrastructure appears in the e-PEB framework.	This term is used to capture all of the physical factors that the organisation should provide for the employee to use. Although environmental infrastructure is not included in the Tudor et al (2008b) framework from the previous research (Tudor et al 2005, Tudor 2007), and the e-PEB framework it is clear that both authors do view this as an important factor in determining waste management/ pro-environmental behaviour.

Factor Differences			
Framework factor	**Tudor et al. 2008b Framework**	**Young et al. 2013 e-PEB Framework**	**Summary discussion**
Group factors (financial incentives, feedback)/Group dynamics	Group dynamics is a low priority factor mentioned in the Tudor et al (2008b) framework.	Group factors is included in the e-PEB framework and includes the sub-factors of financial incentives and feedback.	'Group factors' and 'group dynamics' are representative of the normal day-to-day interactions within and between employees and management. Financial incentives is based on a single example of the successful use of financial incentives in the context of pro-environmental behaviour change. Individual and group level feedback provides people with a way to monitor their performance overall and in relation to other people or groups.

Appendix C

Example project consent pack

Consent process information sheet

HEALTH, EDUCATION AND SOCIETY WITH PLYMOUTH UNIVERSITY

1. [Organisation contact] will distribute the study and consent information to each of the participating departments by email. Each department will receive an email containing: A letter to the manager, consent forms, participant information sheets, an observation and waste audit programme for their department and this information sheet.

2. Can the manager please read the “letter to the manager” and “participant information sheet” then sign the consent form in the space provided on behalf of their respective home.

3. The management will then inform all of the staff in their department of the study and distribute the participant information sheet to the staff.

4. Can the management then make the consent form available to all members of staff for them to sign if they are happy to participate in the study.

5. If possible the management will keep a list of all those members of staff who do not wish to participate in the study. This list will then be passed on to the researcher when they next visit the home. This list will enable to the researcher to ensure they do not collect any data from staff not participating in the study.

6. The completed consent forms will then held by the department manager for collection by the researcher when they carry out the first observation at the Hospital.

If there are any questions regarding the consent process or the project in general please feel free to contact the researcher (contact details below), ask the researcher when they are on site or contact [Organisation contact].

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HEALTH, EDUCATION AND SOCIETY WITH PLYMOUTH UNIVERSITY

“How is waste disposed of in the healthcare setting?”

Dear [Site/department manager name]

As previously discussed an observational study of waste management practice is planned to be undertaken at [site name]. Before the study can begin informed consent is required from the staff and yourself. To help with this process, please can you distribute the attached information sheet to all members of staff in the [site/department name].

The information sheet asks them to sign the attached consent form if they are happy to participate in this study. If anybody does not wish to be involved alternative arrangements will be made. Once the information sheet has been distributed please can you sign the attached consent form and ensure the consent form is available for all of the staff in your department to sign.

If you have any questions about the consent process or the study in general please feel free to contact me at any time.

Thank you for your cooperation and help with the consent process.

Kind regards

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HEALTH, EDUCATION AND SOCIETY WITH PLYMOUTH UNIVERSITY

Participant information sheet

"How is waste disposed of in the healthcare setting?"

We would like to invite you to participate in a research study being conducted by the Plymouth University Sustainability, Society and Health research group in partnership with Duchy Hospital and with their expressed consent. Please find below some information about the study and your participation in the study.

The aim of this study is to investigate the environmental, situational and behavioural factors involved in and surrounding the management of healthcare waste. To achieve this aim a series of observations will be conducted by the research team. The observer will be present one day every two weeks for three months and they will mainly be sat out of the way simply observing the day to day occurrences in the department. The researcher may engage you in informal conversation about your work or ask you to fill out a short questionnaire when you have time. Conversations are likely to be recorded using a digital recording device.

You should know that your name will not be used in any published material so complete anonymity is assured. All of the data collected will be held securely and confidentially. It will not be made available to anybody outside of the research team without your expressed consent.

This study is not concerned with evaluating individual's performance and does not aim to pass judgement on anybody. It is an academic piece of research being carried out independently by Plymouth University. The findings will be used to inform the development of an intervention to optimise the management of healthcare waste.

This project aims to improve the waste management process for both the employee and the employer, which will have the overall effect of improving patient care.

Participation in this study is completely voluntary and you may withdraw at any time. If you chose not to participate in this study or withdraw at a later date this will in no way affect your relationship with [site name], the research team or Plymouth University.

If you have any questions or concerns you wish to raise regarding the study please ask a member of the research team when you see them and they will be happy to help. You can also contact the main researcher using the contact details provided below.

If you are happy to participate in this study please sign the consent form your department manager will make available to you. Thank you for taking the time to read this information sheet and your cooperation with this study.

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HEALTH, EDUCATION AND SOCIETY WITH PLYMOUTH UNIVERSITY

Consent form

"How is waste disposed of in the healthcare setting?"

As department manager I confirm that the participant information sheet has been distributed to all staff. I give my consent on behalf of [site name] to [department name] participating in this study. All staff who wish to participate in this study have signed this consent form constituting valid consent.

Name _____ Date ____/_____/_____

Signed _____

Staff Consent

By signing below you give your consent to participate in the study "How is waste disposed of in the healthcare setting?"

Name	Date	Signature

HEALTH, EDUCATION AND SOCIETY WITH PLYMOUTH UNIVERSITY

Staff Consent

By signing below you give your consent to participate in the study “How is waste disposed of in the healthcare setting?”

Name	Date	Signature

Additional staff consent forms following the format displayed above, were attached to the original document.

Appendix D

Participant de-briefing sheet

HEALTH, EDUCATION AND SOCIETY WITH PLYMOUTH UNIVERSITY

Participant de-briefing sheet

"How is waste disposed of in the healthcare setting?"

Thank you for participating in this study, your participation has been valuable and is greatly appreciated.

The aim of this study was to investigate the environmental, situational and behavioural factors involved in and surrounding the management of health and social care waste. Data was collected about the waste disposal events that took place in your workplace. As you are aware recordings were made of the conversations that you had with the observer around the topic of waste management and environmental issues.

All of the data collected during this study will now be analysed. The analysis will seek to uncover waste disposal trends in health and social care waste management. The discussions that you had with the observer will be used to try and understand health and social care waste management behaviour in more detail.

The studies in which you participated are part of larger project. All of the data collected from the study in which you participated and the other studies will be bought together and used to develop a theoretical framework for understanding and improving health and social care waste management.

You should know that your name will not be used in any published material so complete anonymity is assured. All of the data collected will be held securely and confidentially. It will not be made available to anybody outside of the research team without your expressed consent.

This study was not concerned with evaluating individual's performance and does not aim to pass judgement on anybody. It is an academic piece of research which will help to inform the development of an intervention to optimise the management of healthcare waste.

Participation in this study was completely voluntary and you may still withdraw at any time. If you chose to withdraw your participation in this study now or at a later date this will in no way affect your relationship with (organisation name), the research team or Plymouth University.

If you have any questions about the study, concerns you wish to raise or would like more information about the research project please contact the main researcher using the contact details provided below.

Thank you again for your cooperation and participation in this study.

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Appendix E

Ethics application

PLYMOUTH UNIVERSITY
FACULTY OF HEALTH, EDUCATION AND SOCIETY

RESEARCH WITH PLYMOUTH UNIVERSITY

Health Human Ethics Sub-Committee
APPLICATION FOR ETHICAL APPROVAL OF RESEARCH

***Title of research**:*
Sustainable healthcare waste management: How is waste disposed of in the healthcare setting?

1. Nature of approval sought (Please tick relevant box)

(a) PROJECT*: [√] (b) PROGRAMME*: [ ]

If (a) then please indicate which category:

- Funded research project [ ]
- MPhil/PhD project [√]
- Other (please specify): [ ]

.....
.....

**Note: In most cases, approval should be sought individually for each project. Programme approval is granted for research which comprises an ongoing set of studies or investigations utilising the same methods and methodology and where the precise number and timing of such studies cannot be specified in advance. Such approval is normally appropriate only for ongoing, and typically unfunded, scholarly research activity.*

2. Investigators/Supervisors

Principal Investigator (staff or postgraduate student)*: Sean Manzi (School of nursing and midwifery)
…….....

Other staff investigators: Dr. Jane Grose (School of nursing and midwifery), Maria Bennallick (School of nursing and midwifery)
……..

Director of Studies/other supervisors (only where Principal Investigator is a postgraduate student) : Prof. Janet Richardson (School of nursing and midwifery), Dr. Andrew Nichols (School of nursing and midwifery), Dr. Sabine Pahl (School of Psychology)

…… ……..
Please indicate Department of each named individual, including collaborators external to the Faculty.

2 cont..
**Note: Principal investigators are responsible for ensuring that all staff employed on projects (including research assistants, technicians and clerical staff) act in accordance with the University's ethical principles, the design of the research described in this proposal and any conditions attached to its approval.*

3. Funding body (if any) and duration of project/programme with dates*:

Duration: 4 Months
Dates: April 2012 – August 2012

**Approval is granted for the duration of projects or for a maximum of three years in the case of programmes. Further approval is necessary for any extension of programmes.*

4. Research Outline:
Please provide an outline of the proposed research. Information should be given on the background, aims, objectives or questions raised by the research; include information regarding recruitment process and methods used. Please note that this should be a maximum of 2,000 words.

Project Outline: How is waste disposed of in the healthcare setting?

Background

The healthcare sector produces large amounts of waste in the course of its daily operations. The cost of waste disposal to the National Health Service (NHS) for the 2010/11 year was over £86millon (NHS Information Centre, 2011). In response to the greater awareness of the need for a sustainable healthcare service in the United Kingdom (UK) the NHS sustainable development unit (SDU) has outlined a strategy which aims to reduce the carbon foot print of the NHS (currently 21million tonnes CO2e per annum) by 34% over the next 8 years (NHS Carbon Reduction Strategy for England: Saving Carbon, Improving Health, 2009). It is important that the wider healthcare community (including private hospitals, residential care providers and research facilities) also takes action to also reduce their environmental impact.

This project is following on from the work already carried out by Plymouth University Sustainability, Society and Health research team; A systematic review of the literature and an Interview study.

Understanding healthcare waste disposal in the UK is an under researched topic (Barr, Shaw & Coles, 2011). Much of the research on waste disposal in the healthcare setting has focused on determining the total waste outputs of healthcare providers (Tudor, Noonan & Jenkin, 2005; Tudor, 2007), or the development of strategy and good practice guidance with no evaluation of its effectiveness (Department of Health, 2011; McGain et al, 2009; NHS Confederation, 2009;). This study seeks to begin filling several gaps in the literature by conducting a mixed methods study at four healthcare sites in Cornwall, UK.

Research Question

How do healthcare employees dispose of waste in the Clinical setting?

Study Aims

- To review the legislation, policy and guidance on healthcare waste disposal at the EU, national and health provider levels.
- To understand the individual in relation to the waste management process.
- To measure the waste flows of the site
- To determine the decision making processes utilised by employees during waste disposal tasks.

Methods

Legislation, Policy and Guidance Review

A review of the legislation, policy and guidance relating to the disposal waste generated at healthcare sites will be carried out. The data set will include documents from EU directives down to those from the healthcare sites involved in the field observation (Tudor, Barr & Gilg 2007). A coding frame will be developed from the data and based on the information that is relevant to the individual their employing organisation. This stage is essential to understand the operating constraints and the maximum level of information that can be obtained by a healthcare employee (HCE) regarding the disposal of healthcare waste. This stage will also inform the design of any behavioural intervention as such an intervention must not contravene the law pertaining to hazardous waste.

Legislation, Policy and Guidance Implementation Assessment

It will be necessary to carry out an assessment of the waste management training, information and support made available to employees by the healthcare providers taking part in this project. The implementation assessment will provide information on the communication of waste management policy and guidance between the organisation and the individual. This information will inform the researcher about the level of waste management knowledge available to HCE's. The assessment will be carried out using a self-report questionnaire. The questionnaire will be completed by the member of staff responsible for the provision of waste management training and guidance materials at each healthcare site. The questions will seek to understand what guidance materials are available to the HCE's, what training is provided to HCE's and how both the training and guidance is conveyed to the HCE's.

Field Observation

In order to gain an understanding of the actual waste disposal of HCE's at the point of disposal a non-participant field observation shall be carried out based on an ethnographic methodology. Diagrammatic and systematic data collection techniques will be utilised to capture the waste disposal activities of HCE's as they occur. The observer will make sketches of the physical environment where the observation is

taking place paying particular attention to those objects in the environment involved in the waste disposal process. Photographic documentation of the observation locations will be used to support the diagrammatic sketches made by the observer. A systematic record sheet will be used to record individual instances of disposal activities. HCE's will be engaged by the researcher in informal conversation regarding their current waste disposal activity and waste disposal as a general topic. The informal conversation process will provide an insight into the attitudes, beliefs and perceived behavioural control of HCE's regarding waste disposal. A digital audio recording device will be used to document the informal conversations between the observer and HCE's. The recordings will then be transcribed and coded using a descriptive and analytical coding process. Each conversation will be attached to an observation event giving a greater depth of detail to the data collected on the systematic data collection sheets.

Waste Audit

Measurement of the waste flows of each site will be conducted using a waste audit. This process involves sampling the clinical and domestic waste streams of each site. Each bag will be weighed and its volume estimated. The contents will then categorised by item type and material composition then catalogued. This process allows for an estimation of the amount of waste being produced at a given site and an overview of its composition. A photographic record will be kept of the types of waste found in each waste stream. This will provide a visual record that can be used for feedback and future training. An average amount of waste per person can be calculated from the waste audit data (Tudor, 2006). This will provide a baseline measure for a comparison of the site waste flows following should an intervention strategy be implemented at a later date.

Questionnaires

Self-report questionnaires provide a method of understanding the decision making processes employed by HCE's when undertaking waste disposal activities. The self-report habit index (SRHI) provides a valid and reliable measure of goal-directed automatic behaviour (Verplanken & Orbell, 2003). The SRHI can be used in a variety of different contexts to focus on specific behaviours which means it can be adapted for the study waste disposal behaviours in the healthcare setting. To measure the factors associated with the theory of planned behaviour (TPB) (attitudes, beliefs, subjective norms, perceived behavioural control and intentions) the findings from the field observation and literary evidence shall be used to compile a question set of factors affecting intended behaviour (Tudor et al, 2007). From the SRHI and empirically based TPB questionnaire both central and peripheral route decision making processes can be studied and compared for their ability to model the actual waste disposal behaviours of HCE's.

Pilot study

A pilot study to test the field observation method, data collection materials and self-report questionnaires will be conducted prior to the main study taking place. It will be used to ensure that the observation can be correctly implemented in the clinical

setting. The self-report questionnaires will also be assessed for validity and reliability. The pilot study will be conducted in a simulated clinical setting in the Truro Knowledge Spa, clinical skills lab. Permission and guidance will be sought from the clinical skills lead Maria Bennallick. All ethical protocols pertaining to the main study will be utilised during the pilot study.

Sampling - To ensure a fair and representative sample:

Overview: The organisations participating in this study are non-NHS healthcare providers: a private healthcare provider, the Ramsay Group and a nursing and residential care provider, Cornwall care. These two organisations operate sites in Cornwall, UK and have been selected as representatives of their respective specialisms in Cornwall healthcare sector. Four sites within these organisations are participating in this study. The Duchy Hospital is operated by the Ramsay Group and provides a cross sectional insight into the private healthcare industry. The main departments which constitute the Duchy Hospital site are: an outpatients department, x-ray and ultrasound department, three operating theatres, a general ward and physiotherapy department. Cornwall Care operates multiple sites across the county of Cornwall. Three have been chosen to represent the types of nursing and residential care provided by the organisation. Trevana is representing the nursing care portion of the organisation. The Green has been chosen to represent the residential care sector. Athelstan is currently changing from a residential care home to a nursing care home, providing an interesting case study of a care home whose provision of care is in a dynamic state of flux. All HCE's at each of the four sites will be informed of the study taking place by their home/department manager. The home/department manager will then distribute the participant information sheet to HCE's which invites them to participate in the study.

Field Observation: Observations will take place for 7 days at each site over a 14 week period. An observation session will be conducted for each site on each day of the week (Monday – Sunday, inclusive) during the 14 week study period. Each observation session will take place between 09:30 and 16:30 on any given day. This time period represents the peak hours of activity at each site. The observer will make observations for 40 minutes of every hour to allow for regular rest breaks. Three observation locations will be selected at each site to provide an insight into range of waste streams present at each site. As a result of this observations will take place in each of the chosen locations for 80 minutes on any given day. Data will be collected by event sampling with an event being defined as; the performance of any activity connected to the disposal of waste. As the data is being collected by event sampling an individuals' performance is not being assessed. The data will be coded to connect an individual's data points so the effect of individual differences can be controlled for during the analysis.

Waste Audit: Using each healthcare organisation's waste management records from 2010 and 2011 to determine an average waste flow, approximately 10% of the monthly clinical and domestic waste streams will be subject to analysis. Each site will be sampled once a month on a day to be determined by the waste collection schedule of each site.

Questionnaires: Both self-report questionnaires will be administered together via opportunity sampling. All of the members of staff who participate in the field observation portion of the study will also be invited to complete the two questionnaires.

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(*Please expand to requirements*)

5. Where you are providing information sheets for participants please enclose a copy here. The information should usually include, in lay language, the nature and purpose of the research and participants right to withdraw:

Participant information sheet
"How is waste disposed of in the healthcare setting?"

We would like to invite you to participate in a research study being conducted by the Plymouth University Sustainability, Society and Health research group partnership with (company name) and with their expressed consent. Please find below some information about the study and your participation in the study.

The aim of this study is to investigate the environmental, situational and behavioural factors involved in and surrounding the management of healthcare waste. To achieve this aim a series of observations will be conducted by the research team. The observer will be present one day every two weeks for three months and they will mainly be sat out of the way simply observing the day to day occurrences in the department. The researcher may engage you in informal conversation about your work or ask you to fill out a short questionnaire when you have time. Conversations are likely to be recorded using a digital recording device.

You should know that your name or any other means of identifying you will not be used in any published material so complete anonymity is assured. All of the data collected will be held securely and confidentially. It will not be made available to anybody outside of the research team without your expressed consent.

This study is not concerned with evaluating individual's performance and does not aim to pass judgement on anybody. It is an academic piece of research being carried out independently by Plymouth University. The findings will be used to inform the development of an intervention to optimise the management of healthcare waste.

This project aims to improve the waste management process for both the employee and the employer, which will have the overall effect of improving patient care.

Participation in this study is completely voluntary and you may withdraw at any time. If you chose not to participate in this study or withdraw at a later date this will in no way affect your relationship with (organisation name), the research team or Plymouth University.

If you have any questions or concerns you wish to raise regarding the study please ask a member of the research team when you see them and they will be happy to

help. You can also contact the main researcher using the contact details provided below.

If you are happy to participate in this study please sign the consent form your department manager will make available to you.

Thank you for taking the time to read this information sheet and your cooperation with this study.

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6. Ethical Protocol:

Please indicate how you will ensure this research conforms with each clause of Plymouth University's Principles *for Research Involving Human Participants.* Please attach a statement which addresses each of the ethical principles set out below. Please note: you may provide the degree of detail required. Each section will expand to accommodate this information.

(a) **Informed consent:**
Please indicate if a consent form is to be used.
All staff will then be asked to sign a consent form giving valid consent to participate in the study (See Appendix 1). All consent forms will be collected and held confidentially only by members of the research team. The research team members conducting the observations will make themselves available to answer any questions staff may have about the research. If consent cannot be gained from a staff member, the observer will not collect any data which is based directly on those staff members' actions.

(b) **Openness and honesty:**
Openness and honesty will be maintained throughout the study. There will be no attempt by the research team to deceive the participants.

Note that deception is permissible only where it can be shown that all three conditions specified in Section 2 of Plymouth University's Ethical Principles have been made in full. Proposers are required to provide a detailed justification and to supply the names of two independent assessors whom the Sub-Committee can approach for advice.

(c) **Right to withdraw:**
The participant information sheet makes it clear that participants have the right to withdraw at any point during the study or once it has finished.

(d) **Protection from harm:**
Indicate here any vulnerability which may be present because:
- *of the participants (they may be children or have mental health issues)*
- *of the nature of the research process. Indicate how you shall ensure their*

protection from harm.

Does this research involve:

	Please tick
Vulnerable groups	
Sensitive topics	
Permission of a gatekeeper for initial access	
Deception or research which is conducted without full and informed consent	
Research that will induce psychological stress, anxiety or humiliation or cause minimal pain	
Intrusive intervention (eg, the administration of drugs, vigorous physical exercise or hypnotherapy)	

All necessary and reasonable precautions have been taken to ensure that no physical or psychological harm will come to any visitor, patient, employee or organisation as a result of this study. If any sub-optimal behaviour or unsafe practice is witnessed by the observer whilst on site the observer will intervene to prevent any physical harm and report the behaviour to the organisations relevant representative.

(e) **Debriefing:**
Upon completion of the study a full debrief will be provided to all of the heads of the healthcare departments where observations occurred to disseminate to their staff. The researcher will once again be available to answer any questions the participants may have.

(f) **Confidentiality:**
All of the data collected during the study will be held in accordance with University policy. It will be kept securely in a locked filing cabinet and/or on a password protected computer both while the study is active and for ten years after the study has been completed. Names will not be used in any published material and individuals will not be identifiable. All sites and departments in which the observations take place will be identifiable only through codes in any published material. Complete anonymity will be maintained at all times.

(g) **Professional bodies whose ethical policies apply to this research:**

7. Researchers Safety

(a) **Are there any special considerations in relation to researchers safety?**
Waste audit health and safety

(b) **If so what provision has been made *(for example the provision of a mobile phone, or a clear recording of movements)***
Prior to the waste audit being conducted a risk assessment will be carried out and measures will be taken to ensure full compliance with the health and safety at work act (1974) and COSHH guidelines. All necessary personal protective equipment (PPE) will be provided for the researcher carrying out the waste audit. For example: Cut resistant gauntlets will be worn to protect the researchers' hands and forearms. A face shield with a chin guard will be worn to provide adequate protection against flying debris and fluids. The researcher will also be fully aware of and compliant with the legislation and guidance pertaining to the safe handling of healthcare waste.

8. Declaration:

To the best of our knowledge and belief, this research conforms to the ethical principles laid down by Plymouth University and by the professional body specified in 6 (g).

Principal Investigator:	Signature	Date
Other staff investigators:	Signature(s)	Date
Director of Studies (only where Principal Investigator is a postgraduate student):	Signature	Date

Appendix F

Ethics approval letter

RESEARCH WITH PLYMOUTH UNIVERSITY

19 April 2012

CONFIDENTIAL
Sean Manzi
Room 103, 4 Portland Villas
Faculty of Health, Education and Society
University of Plymouth
Drake Circus
Plymouth
PL4 8AA

Dear Sean

Application Title: How is waste disposed of in the healthcare setting?

I am pleased to inform you that the Committee has granted approval to you to conduct this research.

Please note that this approval is for three years, after which you will be required to seek extension of existing approval.

Please note that should any MAJOR changes to your research design occur which effect the ethics of procedures involved you must inform the Committee. Please contact Claire Butcher on (01752) 585337 or by email claire.butcher@plymouth.ac.uk

Yours sincerely

Professor Michael Sheppard, PhD, AcSS,
Chair, Health Research Ethics Committee
Faculty of Health, Education and Society
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Professor Michael Sheppard
CQSW BSc MA PhD AcSS
Chair of Health Research Ethics Committee

Appendix G

COREQ 32-item scale for the qualitative aspects of the observational sub-study

Adapted from Tong et al. (2007).

Checklist Item	Guide questions/description	Reported in section number or information
Domain 1: Research team and reflexivity		
Personal Characteristics		
1. Interviewer/facilitator	Which author/s conducted the inter view or focus group?	4.2.2
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	Front cover
3. Occupation	What was their occupation at the time of the study?	PhD student
4. Gender	Was the researcher male or female?	Male
5. Experience and training	What experience or training did the researcher have?	Undergraduate psychology and masters module in qualitative methods
Relationship with participants		
6. Relationship established	Was a relationship established prior to study commencement?	No
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	2.6.1
8. Interviewer characteristics	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	4.2.2
Domain 2: study design		
Theoretical framework		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Chapter 2 and section 4.2.3
Participant selection		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	4.2.1 referencing 3.2.1
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	4.2.2
12. Sample size	How many participants were in the study?	4.2.3
13. Non-participation	How many people refused to participate or dropped out? Reasons?	N/A
Setting		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace	4.2.2
15. Presence of non-	Was anyone else present besides the	N/A

participants	participants and researchers?	
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	N/A
Data collection		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	4.2.2 and appendix I
18. Repeat interviews	Were repeat inter views carried out? If yes, how many?	N/A
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	4.2.2
20. Field notes	Were field notes made during and/or after the inter view or focus group?	4.2.2
21. Duration	What was the duration of the inter views or focus group?	4.2.1 referencing 3.2.1
22. Data saturation	Was data saturation discussed?	4.2.2
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	N/A
Domain 3: analysis and findings		
Data analysis		
24. Number of data coders	How many data coders coded the data?	4.2.3
25. Description of the coding tree	Did authors provide a description of the coding tree?	4.2.3
26. Derivation of themes	Were themes identified in advance or derived from the data?	4.2.3
27. Software	What software, if applicable, was used to manage the data?	4.2.3
28. Participant checking	Did participants provide feedback on the findings?	N/A
Reporting		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	4.3
30. Data and findings consistent	Was there consistency between the data presented and the findings?	4.3 and 4.4
31. Clarity of major themes	Were major themes clearly presented in the findings?	4.3 and 4.4
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	4.3 and 4.4

Appendix H

Observation period schedule

This schedule was applied to each of the 20 observation sessions.

The observer arrived on site and was ready to begin the observation process by 0930.

The observations took place according to the following schedule (all times 24hr):

Observation period	Start time	End time
1	0930	1010
Break		
2	1030	1110
Break		
3	1130	1210
Break		
4	1300	1340
Break		
5	1400	1440
Break		
6	1500	1540

Appendix I

Activity log for the quantitative and qualitative observational studies

Activity log

Date	Location	Time	Activity

Appendix J

Example informal interview transcript

Date: 19/06/12

Time: 1057

Location: Site1 location B

Activity: A3

O: Sorry I'm just trying to remember is it [Name]?

I: Yes.

O: I don't know if I introduced myself last time but I'm Sean.

I: Yer yer.

O: I was just wondering, the 'Attention please do not put pads in this bin' is that a new sign on there.

I: Yes.

O: Ah right.

I: Do you want to know the reason?

O: Please.

I: Because it makes the corridor smell.

O: Ah right ok.

I: It's not for any reason other than that.

O: No?

I: They can go in there but no we don't want them in there because it makes the corridor smell.

O: Keep it to the toilets.

I: Basically.

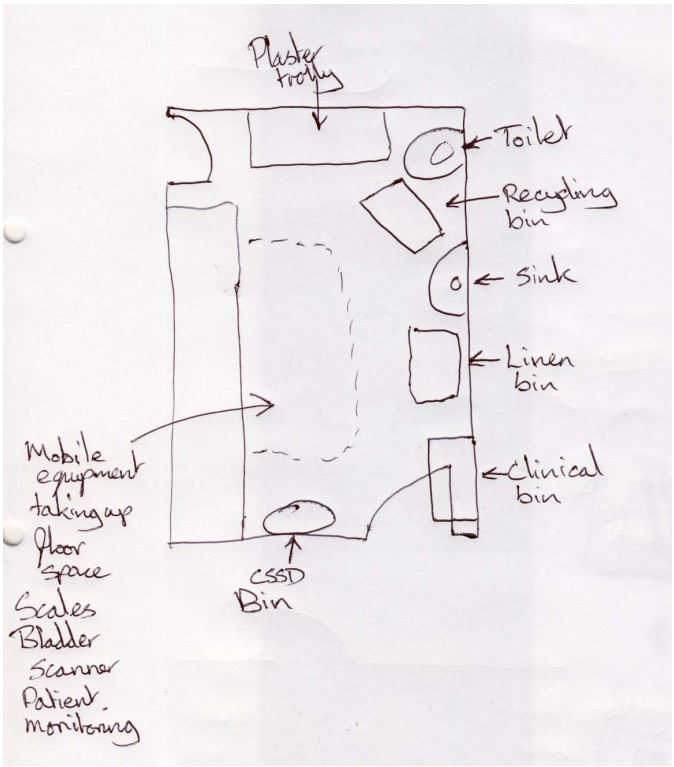
O: They've got the odour neutralisers in there I suppose as well.

I: Yer. Ok?

O: Cool thank you.

Appendix K

Example diagrammatic sketch



Appendix L

Example photograph

Appendix M

Example field notes

Date: 21/05/12 Site1

E1

Housekeeping staff – 3 napkins, 2 empty sauce sachets, paper tray liner disposed of in red tub for domestic waste.

E2

chef – Blue plastic disposed of in domestic waste.

E3

Care Staff – Two egg shells disposed of in the domestic waste.

E4

chef – Plastic wrapping from cooked ham disposed of in domestic waste.

E5

Chef – Onion skins several disposed of in food waste disposal.

E6

Chef – Bread crusts, slice of cucumber, tomato. Disposed of in the food bin for the ponies.

E7

Chef – Plastic wrapper from the cucumber and cling film. Disposed of in domestic waste.

E8

Chef – Bacon fat disposed of in food waste. Plastic bacon wrapper Disposed of in domestic waste.

E9

Chef – Plastic bread loaf wrapper disposed of in domestic waste.

A1

Conversation with [Name] and [Name] about use of doilies/liners on trays. ‘It has always been done like that’, ‘something else for money to be spent on’, ‘purely for presentation’.

E10

Housekeeping staff – napkin from plate used to collect up scraps of fruit from a plate then deposited in the red tub bound for the domestic waste bin instead of the tub for the food scraps.

E11

chef – Plastic milk bottle washed and disposed of in the plastics recycling. Lid put in box for charity collection.

Memo

E10 shows evidence of what can happen when staff have a more difficult disposal decision to make. Napkin used to remove fruit scraps from a plate rather than it being scrapped into the food waste. Housekeeper is then faced with the decision of to dispose of the napkin and food waste confusion. Decision possibilities:

Fruit => food waste	yes
Fruit => domestic waste	yes
Napkin => domestic waste	yes
Napkin => food waste	no

Therefore:

Napkin + food waste => Domestic waste	yes
Napkin + food waste => Food waste	no

P1-4

No bag in clinical waste bin. Plastic wrapping, plastic apron and latex gloves had been put in the bin with no bag in it.

P5

Clean mop head left on top of the bin used for the storage of clinical waste bags. This bin has no pedal so the cleanliness of the lid can not be guaranteed. Nothing should be placed on top of bins especially cleaning equipment especially if that bin is used for the storage of clinical waste.

E12

Nursing Staff – Empty pill box made of cardboard and a sheet of paper disposed of in the domestic waste bin located in the corridor outside of the sluce (see S1 for location details).

A2

Conversation with [Name] – Lead housekeeper regarding the use of paper doilies/tray liners.

E13

Chef – A large bowl of cooking apple peelings disposed of in the fruit and vegetable waste for pony feed.

FN1

Chef – Fat from meat is drained off and thrown away except from the juices from the beef joints which is used for roasting potatos in.

A3

Chef – Conversation regarding meat juice waste.

E14

Lead housekeeper – Napkins disposed of in the red tub for domestic waste bin. Banana skin disposed of domestic waste tub. Other food waste disposed of in food waste tub.

P6

Red tub for food waste

P7

Red tub for domestic waste

FN2

No bag has yet been put in the clinical waste bin in the sluice and the apron, gloves and plastic wrapping observed earlier are still in the bin.

FN3

The clinical waste bin outside the nurses office is no longer holding the door open.

E15

Care staff member – Two full bags of clinical waste deposited in the large green bin in the sluice. This bin is used to store bags of clinical waste before they are transferred to the exterior clinical waste bin. The staff member who brought the clinical waste bgs to the bin was wearing gloves while depositing the bags into the bin. These gloves were then folded up and put in the staff members pocket. If there was a risk of contamination from these bags that warranted the wearing of gloves, then upon completion of the disposal activity the gloves should have been disposed of in the clinical waste as well.

Memo

Used latex gloves present on a blue tray next to a jug of water on top of the nurses medicine trolley. The incorrect disposal of gloves by both care and nursing staff indicates a need for training and monitoring of gloves use and disposal across all staff at Cornwall Care.

Memo

Ask staff how they transport full clinical waste bags and what they do with the gloves afterwards. If they do not wear gloves do they sanitise their hands?

E16

Lead housekeeper – One bowl and two small side plates of food waste disposed of in the food waste tub.

E17

Lead housekeeper – Empty yoghurt pot disposed of in the domestic waste bin. Red domestic waste tub not present beside the sink.

E18

Lead housekeeper – Full red tub of food waste disposed of in food waste disposal. One napkin found and removed from the waste and disposed of in the domestic waste bin.

A4

Lead housekeeper – Conversation about the movement of clinical waste bags and the correct use of gloves. Falling into bad habits also discussed.

FN4

Lead housekeeper – conversation about the pressures of the lead housekeeper position. Employed as a full time member of staff but as the home has less than 60 beds it is not technically allowed to employ a full time lead housekeeper. As a result Claire must cover 16hrs of housekeeping shifts per week as well as forefilling the lead housekeeper role.

A5

Lead housekeeper – and a member of housekeeping staff about household recycling. [Name discourse on a film simulating a nuclear holocost raised an interesting idea about the use of simulated (catastrophic) events as a method of provoking thought, increasing the saliance of an idea and/or invoking behaviour change. The level of realism required for such fear motivated appeals to be successful or even elicit a lasting emotional reaction is high (e.g. george Orwells war

of the worlds or The thread – a nuclear holocost programme). Story telling as a method of effecting behaviour change in a population?

FN5

Still no clinical waste bag in the sluice clinical waste bin. The waste observed in there earlier is still present.

Memo

Need to ask nursing staff what they normally do with medicine cups and spoons after use.

A6

Nursing staff – Reuse of medicine cups and spoons. Interpretation of hazardous waste act.

Memo

When asking about legislation use a more nieve approach. Simply ask what legislation and guidelines are concerned with the disposal of waste or if there are any legislation or guidelines about disposing of waste.

Appendix N

Assessing the prevalence of the primary themes within the data

The analytical codes were often related to two or more of the primary themes, which provided an opportunity to assess the relationships between the primary themes. The process of assessing the relative importance of the primary themes was not used to analyse the data, but only to organise the primary themes to help in the production of the coding models. The researcher went through the analytical codes, assigning them to the relevant primary themes. The number of times any two primary themes were both applicable to any one analytical code was calculated and converted to a percentage of the total number of relationships between codes.

It is useful when diagrammatically modelling primary themes from a qualitative dataset and their relationships to be able to distinguish between the primary themes according to their relative importance within the data. Using the data from The Oak as an example, it is possible to see that the total percentage occurrence of each primary theme with a relationship to another theme, when calculated, did not sufficiently distinguish between the primary themes (Table N.1), and neither did the total number of relationships that a primary theme had with another primary theme (Table N.2).

Table N.1: The Oak primary themes and percentage occurrence with a relationship with another theme (a)

Primary Theme	a
Practice	36.99
Priority/concern	28.83
Classification	27.04
Awareness	25.77
Uncertainty	15.31
Education	11.48
Confusion	11.22
Subjective perception	8.93
Inconsistency	8.67
Guidance	8.67
Spatial layout	6.89
Social influence	4.08
Attitude	2.55
Observation	2.55

Both measures also provided different results for the hierarchical importance of the primary

Table N.2: The Oak primary themes and number of relationships with other primary themes (n)

Primary Theme	n
Practice	13
Priority/concern	13
Awareness	13
Subjective perception	12
Education	11
Inconsistency	11
Uncertainty	10
Classification	9
Confusion	9
Guidance	9
Attitude	8
Social influence	8
Spatial layout	6
Observation	6

themes. In order to determine more successfully the hierarchical importance (b) of each primary theme (k) with respect to the data, the researcher multiplied the two measures of relationship representativeness within the data: total percentage occurrence (a) by the number of relationships (n).

$$a_k \times n_k = b_k$$

This had the effect of combining the two individual measures, reconciling the disparity between the hierarchical importance ratings and magnifying the differences between the primary themes, to produce a clear measure of hierarchical importance (Table N.3). The measure of relative hierarchical importance of the primary themes was then visualised in the three dimensional models to be found in the next section. A three-dimensional model was used in an attempt to visualise the interconnectedness of the primary themes alongside their relative importance within the dataset. Below are the tables displaying primary themes and their relative heirarchical importance ratings for each of the four sites individually and a table with all of the themes brought together for the general coding model.

Table N.3: The Oak primary themes and relative hierarchical importance ratings (b)

Primary Theme	b
Practice	480.87
Priority/concern	374.75
Awareness	334.95
Classification	243.37
Uncertainty	153.06
Education	126.28
Subjective perception	107.14
Confusion	101.02
Inconsistency	95.41
Guidance	78.06
Spatial layout	41.33
Social influence	32.65
Attitude	20.41
Observation	15.31

Table N.4: The Pine primary themes and relative hierarchical importance ratings (b)

Primary Theme	b
Practice	418.18
Priority/concern	290.91
Equipment	263.64
Knowledge	231.82
Segregation	211.36
Memory/cognition	181.82
Subjective perception	157.50
Re-use	77.73
Time	77.73
Physical environment	32.73

Table N.5: The Oak primary themes and relative hierarchical importance ratings (b)

Primary Theme	b
Practice	480.87
Priority/concern	374.75
Awareness	334.95
Classification	243.37
Uncertainty	153.06
Education	126.28
Subjective perception	107.14
Confusion	101.02
Inconsistency	95.41
Guidance	78.06
Spatial layout	41.33
Social influence	32.65
Attitude	20.41
Observation	15.31

Table N.6: The Beeches primary themes and relative hierarchical importance ratings (b)

Primary Theme	b
Practice	351.14
Awareness	259.09
Equipment	225.00
Subjective perception	112.50
Inconsistency	102.27
Spatial layout	78.41
Time	71.59

Table N.7: The Maple primary themes and relative hierarchical importance ratings (b)

Primary Theme	b
Practice	351.79
Priority/concern	255.05
Awareness	237.46
Knowledge	199.35
Equipment	183.23
RRR	158.31
Subjective perception	148.05
Inconsistency	133.39
Spatial layout	87.95
Time	40.39

Table N.8: General model primary themes and relative hierarchical importance ratings (b)

Primary Theme	b
Practice	400.49
Priority/concern	306.90
Awareness	277.17
Classification	243.37
Equipment	223.95
Knowledge	215.58
Segregation	211.36
Memory/cognition	181.82
Uncertainty	153.06
Subjective perception	131.30
Education	126.28
RRR	118.02
Inconsistency	110.36
Confusion	101.02
Guidance	78.06
Time	63.24
Spatial layout/physical environment	60.10
Social influence	32.65
Attitude	20.41
Observation	15.31

Appendix O

Example weight record sheet

Date:

Site:	Waste Stream: C/D	
Bag Number	Bag Weight KG	Additional information

Appendix P

Example contents record sheet

Date:

Site:		Waste Stream: D/C	
Bag Number	Item	Material	Number (tally)

Appendix Q

Self report habit index (SRHI) questionnaire for decision making study

In relation to your behaviour **only at work** please indicate your level of agreement or disagreement with each of the following statements by circling the corresponding number. The meaning of each number is shown below.

1	2	3	4	5	6	7
Strongly agree	Agree	Slightly agree	Don't know	Slightly disagree	Disagree	Strongly disagree

Disposing of waste's at work is something…

I do frequently

1 2 3 4 5 6 7
Strongly Agree Strongly disagree

I do automatically

1 2 3 4 5 6 7
Strongly Agree Strongly disagree

I do without having to consciously remember

1 2 3 4 5 6 7
Strongly Agree Strongly disagree

That makes me feel weird if I do not do it

1 2 3 4 5 6 7
Strongly Agree Strongly disagree

I do without thinking

1 2 3 4 5 6 7
Strongly Agree Strongly disagree

That would require effort not to do it

1 2 3 4 5 6 7
Strongly Agree Strongly disagree

That belongs to my daily routine

1 2 3 4 5 6 7
Strongly Agree Strongly disagree

I start doing before I realise I'm doing it

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

I would find hard not to do

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

I have no need to think about doing

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

That's typically "me"

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

I have been doing for a long time

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

Appendix R

Theory of planned behaviour questionnaire (TPB) for decision making study

In relation to your behaviour **only at work** please indicate your level of agreement or disagreement with each of the following statements by circling the corresponding number. The meaning of each number is shown below.

1	2	3	4	5	6	7
Strongly agree	Agree	Slightly agree	Don't know	Slightly disagree	Disagree	Strongly disagree

I think disposing of waste is easy

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

My colleagues think I should put rubbish in the correct bin

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

I know which bin to put the different types of waste in

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

I dispose of clinical waste…

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

I put rubbish in the correct bin…

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

I recycle everything I can

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

I decide which bin a piece of rubbish should go in

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

It is easy for me to put rubbish in the correct bin

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

The people I care for think I should put rubbish in the correct bin

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

It is important I know which bin to put waste in

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

I ensure waste goes in the right bin

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

I dispose of domestic waste…

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

I put rubbish in the wrong bin…

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

The company I work for thinks I should put rubbish in the correct bin

1	2	3	4	5	6	7
Strongly Agree						Strongly disagree

Appendix S

Demographics questionnaire for decision making study

Name_____ (Anonymity will be maintained your name will not be used in connection with the data)

Gender ☐ Male ☐ Female

Age (Please circle the applicable age group)

16-25 26-35 36-45 46-55 56-65 66-75 76+

Job description (Please tick the appropriate box)

- ☐ Housekeeping/domestic staff
- ☐ Care staff
- ☐ Nurse
- ☐ Doctor
- ☐ Consultant
- ☐ Manager
- ☐ Deputy Manager
- ☐ Administrator
- ☐ Other Health Professional (Please state)

_____

Length of time working in health and/or social care
(Please tick the appropriate box)

- ☐ Less than 1 year
- ☐ 1 to 5 years
- ☐ 5 to 10 years
- ☐ 10 to 15 years
- ☐ Over 15 years

Length of time working in current job position
(Please tick the appropriate box)

- ☐ Less than 1 year
- ☐ 1 to 5 years
- ☐ 5 to 10 years
- ☐ 10 to 15 years
- ☐ Over 15 years

Appendix T

COREQ 32-item scale for the qualitative aspects of the observational sub-study

Adapted from Tong et al. (2007).

Checklist Item	Guide questions/description	Reported in section number or information
Domain 1: Research team and reflexivity		
Personal Characteristics		
1. Interviewer/facilitator	Which author/s conducted the inter view or focus group?	7.2.2
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	Front cover
3. Occupation	What was their occupation at the time of the study?	PhD student
4. Gender	Was the researcher male or female?	Male
5. Experience and training	What experience or training did the researcher have?	Undergraduate psychology and masters module in qualitative methods
Relationship with participants		
6. Relationship established	Was a relationship established prior to study commencement?	Yes
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	2.6.1
8. Interviewer characteristics	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	N/A
Domain 2: study design		
Theoretical framework		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Chapter 2 and section 7.2.3
Participant selection		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	7.2.1
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	7.2.2
12. Sample size	How many participants were in the study?	7.2.1
13. Non-participation	How many people refused to participate or dropped out? Reasons?	N/A
Setting		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace	7.2.2
15. Presence of non-	Was anyone else present besides the	N/A

participants	participants and researchers?	
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	N/A - ethically could not be provided due to small sample and risk of identification of participants
Data collection		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	7.2.2 and appendix S
18. Repeat interviews	Were repeat inter views carried out? If yes, how many?	N/A
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	7.2.2
20. Field notes	Were field notes made during and/or after the inter view or focus group?	N/A
21. Duration	What was the duration of the inter views or focus group?	7.2.2
22. Data saturation	Was data saturation discussed?	N/A
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	N/A
Domain 3: analysis and findings		
Data analysis		
24. Number of data coders	How many data coders coded the data?	7.2.3 referencing 4.2.3
25. Description of the coding tree	Did authors provide a description of the coding tree?	N/A
26. Derivation of themes	Were themes identified in advance or derived from the data?	7.2.3
27. Software	What software, if applicable, was used to manage the data?	7.2.3
28. Participant checking	Did participants provide feedback on the findings?	N/A
Reporting		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	7.3
30. Data and findings consistent	Was there consistency between the data presented and the findings?	7.3 and 7.4
31. Clarity of major themes	Were major themes clearly presented in the findings?	7.3 and 7.4
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	N/A

Appendix U

Interview schedule for management interviews study

Implementation assessment interview schedule

Training (e.g. e-learning, taught sessions, practical learning)

Is training provided to staff?

What training do staff receive?

Do all staff receive the same training

What is included in the training?

What form does the training take?

Management of clinical waste

Management of domestic waste

Management of recyclable waste

Regularity of training

Testing of understanding

How often is the training programme reviewed and/or revised?

Guidance (e.g. posters, information sheets, signage)

Is guidance provided to staff?

What guidance is provided to staff?

How is guidance provided to staff?

Where does the guidance information come from?

Who decides what guidance should be provided?

How is the decision made as to what guidance to provide to staff?

How often is the guidance reviewed and/or revised?

Policy (Company derived policy)

Is there a waste management policy?

Where does the policy come from?

Who decides what is included in the policy?

How do they decide what to include in the policy?

What sources are used to inform the design of the policy?

What is included in the policy? Clinical, domestic, recyclable wastes

How is the policy distributed to staff?

Is staff adherence to the policy monitored?

How often is the policy reviewed and/or revised?

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A non-participant observational study of health and social care waste disposal behaviour in the South West of England

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Abstract

Introduction: The National Health Service in England has a large carbon footprint. Waste production and disposal contributes to this carbon footprint and costs the National Health Service England over £82 million per annum. This study builds on existing work regarding health care waste management in the United Kingdom where the potential for recycling has begun to be studied. The study focuses on a private hospital and social care organizations, and provides a more detailed study of the behaviour of individuals across a variety of waste management systems.

Methods: The study was an overt observational study at four health and social care sites in the South West of England. Systematic observations were made of the waste disposed of by employees in which the observer recorded: a description of the waste item; the bin into which the waste was placed; the type of employee who disposed of the waste; the material the waste comprised and the appropriateness of the disposal behaviour.

Results: The domestic waste bin was found to be most commonly used by employees to dispose of waste (51%), and the materials observed being disposed of most often were paper (26%), organic wastes (19%) and plastic (19%). There were significant differences between the four sites indicating that the activities performed at each site may have been influencing the waste being disposed of.

Conclusion: It was concluded that the transfer of waste from the domestic waste stream to the recycling waste stream should be a central focus for the design of new health and social care waste management systems. Employees will require guidance and training in identifying and classifying waste materials for recycling.

Keywords

health care, non-participant observation, social care, waste management

Introduction

Effective waste management has been highlighted in the literature as a way of reducing the environmental impact of society.[1] The National Health Service (NHS) in England, being the largest health care organization in the country, was reported as having a carbon footprint of around 20 million tonnes CO_2e in 2011/2012.[2] Waste contributes to this figure with the NHS producing over 286,221 tonnes of waste in 2010/2011.[3] These figures, while large, do not include the private health care organizations or social care sector operations in the UK, and there is an absence of information regarding waste in these areas.

Improving health and social care waste management is an appealing target for organizations seeking to reduce costs and emissions. This is due to the immediacy of the change that can potentially be achieved and the low risk of interfering directly with patient care.[4–6] One barrier to achieving such improvements is that changing systems and behaviour can be complex. There is little information for service managers to base effective strategies and interventions on in order

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to improve waste management in health and social care.[7]

Much of the previous literature has focused on assessing the composition of the various waste streams in health care which has been instrumental in demonstrating the potential for improvements to waste management.[8–11] Daschner and Dettenkofer[12] highlighted that only approximately 3% of clinical waste is contaminated with infectious materials. By providing insight into the material composition of the waste streams, Tudor et al.[13] were able to show that there are large quantities of waste in health care that are disposed of by incineration and landfill that could potentially be recycled.

This study, therefore, seeks to investigate the waste management behaviours of health and social care employees through direct non-participant observation. The interaction of the individual with the waste management system is the focus looking specifically at the bins in which the waste is placed, which employees are disposing of the waste, the material composition of the waste and the appropriateness of the waste disposal behaviour. This study seeks to complement the existing literature by carrying out further investigation of health care waste composition while also studying social care waste composition about which there are few data. Furthermore, it compares and contrasts the waste disposal behaviours at each site across a range of variables.

Methods

Sample

Four health and social care sites in the South West of England, selected through purposive sampling, participated in this study. One was a private hospital, the second was a residential care home, the third a nursing care home and the fourth was a residential care home that was transferring to nursing care. These four sites were operated by two health/social care providers and represented a cross section of their operations in the South West of England.

Each of the four sites was sampled five times over a three-month period from 1 May to 31 July 2012 resulting in 20 data collection sessions. The data collection schedule was predetermined using a partially stratified sampling method to ensure that each site would be sampled once on each day of the week (Monday to Friday) during the three-month study period with no repeats.

Data collection

Ethics approval for this study was granted by the Plymouth University faculty of health and human sciences ethics committee and informed consent was gained from the organizations and employees who participated in the study.

Overt observations of the waste disposal behaviours were conducted at each of the four sites. Two locations were selected at each site with the aid of the management team and lead housekeeper. The observation locations were where the majority of waste disposal was thought to take place and included outpatients sluice, general ward sluice, dining/lounge areas and sluice/bathing facilities.

The observations were undertaken systematically. The observations began at 09:30 and finished at 15:30. The observer spent 40 min at the first location, took a 20-min break, then moved to the second location and made observations there for a further 40 min. This process was repeated so that observations were made at each location three times, resulting in a total of six observation periods during any given session. This allowed each site and each location at any site to be fairly represented in the final dataset.

During each observation period the observer used event-based sampling to collect data on employee waste disposal behaviour. Every time a piece of waste was disposed of by an employee, the observer recorded the following information on an activity log: the date; the site; the observation location and the time of the event. The observer then recorded five more pieces of data regarding the disposal events according to a predetermined protocol:

1. a brief description of the waste providing sufficient information to identify the specific item
2. bin type – the bin types common to each site were clinical, domestic (municipal) and recycling bins. Any bin used to dispose of waste other than these three were included in an 'other' category
3. employee type – this could not be predetermined and so was kept simple using information provided by staff
4. material type – these could not be predetermined and so were kept simple
5. disposal behaviour appropriateness – categorized as appropriate, inappropriate or uncertain. 'Uncertain' was used when the observer was unable to ascertain whether the disposal behaviour was correct or incorrect. Appropriateness was judged based on the availability of bins at a site and the contamination status of the waste within the context of national legislation and local site policy.

The categories described above had to allow for easy visual identification due to the speed with which the disposal events took place. The use of simple categories minimized the possibility of the observer making a

mistake. When two or more disposal events occurred at the same or in similar time frames, the observer recorded the data in chronological order dealing with one disposal event before moving to the next.

Results

Bin use

The most commonly used bin overall was the domestic waste bin. This was also found to be the case at sites 1, 3 and 4. The second most commonly used bin overall was the recycling bin which was the most commonly used bin at site 2 (Table 1). The distribution of bin use between the sites was significantly different (χ^2, $p < 0.001$; Cramer's V, 0.26).

Employee type

Housekeeping staff were observed performing the most disposal, and were closely followed by care staff and nursing staff. Only at site 1 were housekeeping staff also observed disposing of more waste than the other employee types. At site 2 nursing staff disposed of the most waste, and care staff at sites 3 and 4 disposed of the most waste (Table 2). There was a significant difference between the sites and the distributions of employee types disposing of waste (χ^2, $p < 0.001$; and Cramer's V, 0.61).

Material type

The three most commonly disposed of materials were paper, organic waste and plastics. There was a significant difference between the material compositions of the waste streams across the sites (χ^2, $p < 0.001$; Cramer's V, 0.31). However, the most commonly disposed of materials at each of the four sites were similar. Paper was the most commonly disposed of material at sites 1, 2 and 4 with organic waste being equally common at site 4, and the most often disposed of material at site 3. Plastic and mixed material wastes also accounted for considerable proportions of the material composition of the waste stream at all the four sites (Table 3).

Appropriateness

Similar proportions of appropriate and inappropriate disposal behaviour were observed overall and at sites 1, 3 and 4. At site 2, a larger proportion of appropriate waste disposal behaviour was observed (Table 4) accounting for the significant difference between the sites regarding their distributions of appropriate and inappropriate waste disposal behaviour (χ^2, $p < 0.001$; Cramer's V, 0.26).

Bin use by employee type

Overall there was a significant relationship between the bin in which waste was disposed of and the employee type disposing of the waste (χ^2, $p < 0.001$; Cramer's V, 0.37). Nursing staff were more likely to dispose of waste in the clinical and recycling bins. Care staff disposed of more waste in the domestic waste bins and less in the recycling bins.

Bin use by material type

There was a significant relationship between the bin in which the waste was disposed of and the material it was made from (χ^2, $p < 0.001$; Cramer's V, 0.52). Latex, nitrile, mixed material and detergent wipes were more commonly disposed of in the clinical waste bin than the other bin types. More paper was disposed of in the domestic waste bin than expected while cardboard and glass were more often disposed of in the recycling bins.

Bin use by appropriateness

There was a significant relationship between the bin type and the appropriateness of the disposal behaviour

Table 1. Percentage bin type used to dispose of waste within each site and overall (%).

	Bin type			
	Clinical	Domestic	Recycling	Other
Site 1	10	61	15	13
Site 2	34	2	63	0
Site 3	35	57	4	4
Site 4	14	82	1	3
Overall	20	51	22	7

Table 2. Percentage employee type that disposed of waste within each site and overall (%).

	Employee type				
	Care	Catering	Housekeeping	Nursing	Other
Site 1	11	28	55	3	3
Site 2	0	0	9	89	2
Site 3	72.5	0	27.5	0	0
Site 4	64	0	22	11	2
Overall	29	11	32	26	2

Table 3. Percentage of materials disposed of within each site and overall (%).

	Material										
	Cardboard	Detergent wipe	Glass	Latex	Metal	Mixed	Nitrile	Organic	Paper	Plastic	Rubber
Site 1	6	0	0	6	3	10	0	23	26	25	1
Site 2	25	4	3	1	0	15	8	1	27	16	0
Site 3	18	2	0	6	0	20	10	24	22	18	0
Site 4	13	0	0	8	1	15	1	29	29	13	0
Overall	19	0	1	5	1	14	3	19	27	19	0

Table 4. Percentage appropriateness of the waste disposal behaviours within each site and overall (%).

	Appropriateness		
	Appropriate	Inappropriate	Uncertain
Site 1	49	51	1
Site 2	77	14	9
Site 3	43	57	0
Site 4	49.5	49.5	1
Overall	55	42	3

(χ^2, $p < 0.001$; Cramer's V, 0.47). Larger proportions of appropriate waste disposal behaviours were performed at the clinical, recycling and 'other' waste bins, while larger proportions of inappropriate waste disposal behaviours were performed at the domestic waste bins.

Material by employee type

The relationship between the material being disposed of and the employee type disposing of the waste was significant (χ^2, $p < 0.001$; Cramer's V, 0.31). Nursing staff were observed disposing of more cardboard and glass than the other staff types and less organic waste. Care staff disposed of more organic waste and less cardboard waste while housekeeping staff disposed of more organic and latex waste along with less mixed, metal and nitrile waste.

Appropriateness by employee type

The appropriateness of the disposal behaviour was significantly related to the employee type disposing of the waste (χ^2, $p < 0.001$; Cramer's V, 0.22). Nursing staff performed more appropriate than inappropriate disposal behaviours while the other staff types all performed similar proportions of appropriate and inappropriate behaviours.

Appropriateness by material

The appropriateness of the disposal behaviours and the materials being disposed of were significantly related to one another (χ^2, $p < 0.001$; Cramer's V, 0.55). Plastic and paper wastes were more commonly disposed of inappropriately than appropriately. The materials that were more often disposed of appropriately were cardboard, organic, mixed, latex and nitrile wastes. Glass waste was the material type that was most often classified as uncertain.

Discussion

The researcher observed a wide range of different wastes being disposed of during this study. Clinical waste appeared to be most diverse at the health care site. A range of intravenous bags, lines and minor operation equipment was disposed of, alongside packaging and consumables. Most of the clinical waste at the social care sites appeared to comprise four items: incontinence pads, wet wipes, plastic aprons and paper hand towels.

The bin type that was most commonly used to dispose of waste varied between the sites, but was similar at three of the sites. Particular employee types disposed of different proportions of waste, particular employees used different bin types and distinct materials were disposed of in different bins. This may be indicative of the disparate tasks carried out by particular employees. It is also possible that particular employee types were using distinct locations to dispose of the waste that they produced. These findings support previous research which found that waste type varied by site and department (location).[12,13]

One limitation to be considered when conducting overt observations is the Hawthorne effect, where the participant under observation alters their behaviour due to a change in the environment. The participants in this study performed a large number of inappropriate waste disposal behaviours. This indicates that if the

participants did change their behaviour, attempting to always perform appropriate waste disposal behaviours, they were unsuccessful. The highest proportion of inappropriate waste disposal was performed at the domestic waste bins. Waste that could have been recycled was disposed of in the domestic waste bins, especially the three most commonly disposed of materials: paper, plastics and organic wastes. Such behaviour could be the result of a lack of awareness and knowledge on the part of both the employee and the organization regarding effective practice. There is a particular need for organizations to provide effective guidance to their employees.[1] In order to improve recycling rates, this might focus on material classification and segregation allowing for the transfer of waste from the more expensive clinical and domestic waste streams to recycling.

The possible impact of any regional differences in the availability of recycling services or attitudes towards waste disposal and recycling was controlled for. Each of the participating organizations adhered to a local waste management policy based on legislation and guidance set by the Department of Health, the Care Quality Commission and the Royal College of Nurses. The observer was familiar with the local waste management policies at each site and was able to judge the appropriateness of the waste disposal behaviours in relation to the relevant policy.

Calculation of the financial and carbon emission savings that could result from improvements to health and social care waste management is one line of research that could follow this current study. This study was designed to identify the general patterns of employee waste disposal behaviour, not to produce an accurate estimate of the cost of disposal and carbon emissions resulting from disposal. Future research will need to capture data about the weight of every item disposed of by the employees to produce emission figures which could be used to inform behaviour changes interventions. A second potential line of future research is the investigation of the most effective contents of, and means by which, to disseminate waste management information.

This paper contributes to literature on the composition of healthcare waste confirming the work of Tudor et al.[13] and Daschner and Dettenkofer.[12] It goes further in beginning to assess the composition of social care waste and explores the potential for recycling while making comparisons with the healthcare setting. The direct observational design and combination of variables used in this study provide a novel method for investigating health and social care waste disposal behaviour. Furthermore, the study explores relationships between waste disposal behaviour and other variables that through further research have the potential to lead to more effective waste management strategies.

Declaration of conflicting interests

The authors declare that there is no conflict of interest.

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