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The Precautions of Clinical Waste: Disposable Medical Sharps in the United Kingdom

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Abstract
This article deals with recent changes in UK guidance on clinical waste, in particular a shift to disposable, single-use instruments and sharps. I use interviews conducted with nurses from a GP practice and two clinical waste managers at alternative treatment and incineration sites as a springboard for reflection on the relationship between the legislation on clinical waste management and its implementation. Scrutinizing the UK guidance, European legislation and World Health Organization principles, I draw out interviewees' concerns that the changed practices lead to an expansion of the hazardous waste category, with an increased volume going to incineration. This raises questions regarding the regulations' environmental and health effects, and regarding the precautionary approach embedded in the regulations. Tracing the diverse reverberations of the term 'waste' in different points along the journeys made by sharps in particular, and locating these questions in relation to existing literature on waste, I emphasize that public health rationales for the new practices are not made clear in the guidance. I suggest that this relative silence on the subject conceals both the uncertainties regarding the necessity for these means of managing the risks of infectious waste, and the tensions between policies of precautionary public health and environmental sustainability.

Keywords Clinical Waste, EU Regulation, Hazardous Waste, Incineration, Medical Sharps

In 2006 the United Kingdom Department of Health issued new guidance on the management of healthcare waste (Department of Health, 2006). This guidance made important changes to previous advice on the management of such waste (Health Services Advisory Committee, 1999); a significant impact in clinical settings was a shift to disposable, single-use instruments, including sharps. The guidance emerges from a range of European Union (EU) environmental, waste, and health regulations, themselves informed by World Health

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Organization (WHO) principles. These changes have received relatively little attention. In the autumn of 2008, I conducted semi-structured interviews with two nurses from a general practice (GP) surgery and two waste managers in England. In what follows I describe the concerns that arise for these individuals in their encounters with clinical waste—and with sharps in particular. I propose to use these conversations as a springboard for reflections on larger questions regarding the relationship between legislation and implementation; and regarding the tensions between and within environmental and public health regulations.

Clinical waste has been defined in the UK as waste produced in healthcare or related settings that poses a risk of infection, or waste that may prove hazardous. (I discuss the changing definitions in more detail below.)[1] It comprises bodily wastes, which is the subject of a proliferating literature on our social, economic and ethical relationships to the tissues, substances and organs of myriad biotechnologies (e.g. Franklin and Lock, 2003; Scheper-Hughes, 2002; Waldby and Mitchell, 2006). It also increasingly includes a wide range of equipment that comes into contact with patients and healthcare workers—syringes, needles, blades, specula, swabs, tubes, plasters and so on, items deemed risky as regards infection and cross-infection.

Risk is of course a key rubric in clinical waste legislation and practice. I am interested here in how, in practice, some risks are emphasized in some contexts and then de-emphasized in others; in how one kind of risk (e.g. an environmental one regarding the 'waste' of plastic equipment) can be obfuscated in public health guidelines and in the clinic to which these dictate, re-emerging later as a rhetorical force in an industrial context, where these by-products of a public health emphasis on disposal become not so much a problem as a valuable, and ethical, environmental resource. Much has been written about the selectivity of individuals, policy-makers and legislators in assessing risk; we tend to ignore certain risks, and to overemphasize others, worrying more about air travel than about the cab-ride to the airport, or about terrorist attacks than about the minutiae of government accountability—with, as Cass Sunstein (2002) has argued, paradoxical and often harmful effects (see also Kahneman *et al.*, 1982). What follows touches upon this literature, in that I draw out how the UK legislation on clinical waste shapes a lopsidedness in risk thinking that entrenches unacknowledged but problematic tensions between public health and environmental concerns. It is also in conversation with an intersecting scholarship on waste, dirt and pollution, scholarship that is curious about what kinds of risks and dangers are conceptualized as such; that has emphasized concepts of dirt, for example, as the effect of classificatory gestures of order-making; and underscores the symbolic and ritual content and use of such orders and classifications (Douglas, 1995 [1966]; Douglas and Wildavsky, 1982; see also Bauman, 2004; Hacking, 2003; Hawkins, 2006). And in thinking about the different roles and meanings of 'waste' in two contrasting spaces inhabited by clinical sharps, I draw together, in ways hitherto under-examined in the literature, the related, conflicted and obfuscated stakes of public health and environmental discourse around these items.

1 It was only in the 1980s that clinical (or biomedical) waste began to be segregated from general waste.

The general practice

In October 2008 I conducted a joint interview with a practice nurse and a nurse practitioner from a GP surgery in England. I had explained to them that I was interested in discussing recent changes in practices relating to disposable sharps. Sharps include needles, syringes with needles attached, broken glass ampoules, infusion sets, scalpels and other blades—items, in other words, that can cause cuts or puncture wounds.[2] The WHO (2005: 568) states that while sharps waste is 'produced in small quantities', it is highly infectious. It also states (Pruess *et al.*, 1998: 21–22) that contaminated sharps (particularly hypodermic needles), along with concentrated cultures of pathogens, are: 'probably the waste items that represent the most acute potential hazards to health. Sharps may not only cause cuts and punctures but also infect these wounds if they are contaminated with pathogens.' Because of this double risk, they are considered a 'very hazardous waste class', with particular concern about HIV and hepatitis B and C infections through injuries from syringes needles contaminated by human blood (1998: 22). Sharps, if poorly managed, expose healthcare workers, waste handlers and the community to infections. A review of HIV epidemiology in healthcare facilities in poor and rich countries of the world found an 'alarmingly high' rate of healthcare-worker-related infections in low-income countries (Ganczak and Barss, 2008). Contaminated needles and syringes 'represent a particular threat and may be scavenged from waste areas and dump sites and be re-used' (WHO, 2005: 568).[3]

The Hazardous Waste (England and Wales) Regulations 2005 classifies waste kinds anew, in accordance with the European Waste Framework Directive (75/442/EEC), discussed further below. A new hazard group—'H9' (infectious waste)—in the regulations covers substances containing viable microorganisms or their toxins, which are reliably believed to cause disease in man or other living organisms. The 2006 Department of Health guidance, *The safe management of healthcare waste*—which I shall refer to henceforth simply as *Safe management*—divides clinical waste into two categories: waste posing a risk of infection and medicinal waste. Clinical waste, it urges, must be segregated from other types of waste. Separate systems are advised for sharps that are contaminated with cytotoxic/cytostatic medicinal products, and for sharps not thus contaminated. Those not contaminated 'may be treated to render them safe in suitably licensed or permitted facilities prior to final disposal'; they should be placed in orange receptacles, which take precisely those sharps that can be subjected to alternative treatments, such as 'plastic single-use instruments and non-medicinally contaminated sharps', while contaminated sharps:

> . . . should be placed in suitably coloured receptacles (yellow/purple) and disposed of in suitably authorized incineration facilities. . . . For sharps to be considered for alternative treatments, the producer must demonstrate that they have robust segregation procedures in place to separate those sharps that require incineration from those

2 Disposable syringes began to be manufactured and used in significant numbers in the middle of the twentieth century. Uptake, however, was slow until the early 1990s, when concern about the spread of HIV and AIDS began to change the landscape.

3 Concerns about scavenging recur in the media; see the *Sunday Times* (2009a, 2009b).

> suitable for alternative treatment. Where robust segregation of sharps contaminated with cytotoxic or cytostatic products cannot be guaranteed, all sharps should be incinerated. (Department of Health, 2006: 35)

These sharps go into yellow receptacles, which take waste requiring disposal by incineration only, such as sharps with medicinal products or undischarged or partially discharged sharps.[4]

The surgery in which the nurses worked had changed over in 2006 to the new system outlined by the guidance published that year. The nurse practitioner explained that the yellow sharps bins were for 'any instruments or anything potentially sharp, anything disposable—because everything is single-use items now'.[5] The orange sharps bins for non-contaminated sharps were not mentioned. Here, the nurses had decided to include, as sharps, instruments for fitting and removing coils:

> ... these are quite long, and actually getting rid of them has been a bit problematic because they won't fit into an ordinary sharps bin, they're too.... Well, we made an assumption that we shouldn't put them into the yellow bags because they're hard firm instruments and some of them are a bit pointy so we put them in the sharps bins.

Thus the category of sharps requires significant interpretation, and is quite wide and flexible. Moreover, an instrument's disposability after a single use is not determined simply by their being sharps; it also applies to 'anything that comes into contact with a patient'. In fact, it is also circular: the nurse practitioner stated that 'anything disposable—because everything is single-use items now' goes into the sharps bins. Disposable items are disposed of because they are disposable, and the sharps bins are their destination. It is not the nature of these objects as sharps, or their potential infectiousness that determines, here, an instrument's marshalling into the sharps bin; it is disposability.

Before the new practices were introduced in this surgery, an autoclave was used for sterilizing specula or any surgical instruments, which 'was the norm in general practice'. The nurse practitioner thought the changes were:

> ... because of CJD as well as HIV, but CJD was a big thing that made them change to recommending single-use instruments. Although it's not made in stone, you can still have an autoclave, but you have to provide sort of evidence to the Infection Control Team in yearly audits ... to make sure you're utilizing your equipment properly.

Previously, you would have to test the autoclave every so often: 'It was a hassle, wasn't it? It was really a hassle.' With the autoclaves, the issue arose that items perhaps:

> ... weren't being washed effectively, and the thing with CJD is you need to get rid of the spores.... [I]t wasn't just about sterilising them ... it was about physically getting rid of, brushing off things ... so they suggested getting in these cleaners that

4 The suggestions in the guidance as to how to accomplish certain regulatory aims are not compulsory.

5 All the following quotations are taken from an interview conducted on 29 October 2008.

> you could immerse instruments in a special cleaner to agitate them and clean, but *they're* expensive ...

The new practices become more obvious and feel more right as time goes on: many practices found that the cost of maintaining the autoclave was very high:

> ... at the end of the day it probably worked out the equivalent cost to get disposable equipment ... and you know that you're doing the right thing, you know that you're not ... there's no sort of margin for error, you don't use it on any other patient.... I remember GPs having a little pot of sterilizing solution, there was probably no evidence behind it that it was any good or doing anything, they'd just be soaking these little earpieces, and I'm only going back a few years, just before I came here ... three years ago ... GPs I was working with were just doing that, might still be doing that for all I know ... they weren't the best ...

The new practices 'absolutely' make sense; and it is:

> ... very simple now, you know what it is, you know it's sterile, and you know it's got rid of immediately. It's been out for 10–15 minutes, it's gone.

A precautionary approach, in other words, has become second nature. The Nurse Practitioner, describing a probe for syringing ears, explained that:

> ... you might use that ... only for a few seconds ... we used to re-use them, patient after patient after patient, it was the norm to re-use them. And really, when you think about it, there was no really stringent way of sterilizing them, so it's good. It was awful when you think about it, when you look back and you think 'What a terrible thing', and it's only a few years ago.

However, the instruments, designed to be disposable, and thrown away after a single use, are of high quality: specula 'used to be metal and we used to wash them'; the new disposable ones are:

> ... *amazing* ... when we first got them, we thought: 'You can't chuck that away after you've used it once, it's too good!'

Similarly with metal scissors that are thrown away after one use:

> ... they're really good, they cut really well ... mouthpieces for people blowing into a machine, we just chuck them away ... everything's disposable.... When we were talking [with others in the practice] about your research, they were saying 'What a waste of the metal'; when you think about, it's kind of, we need to do it, for cross-infection, it needs to be done, but then it doesn't fit comfortably with recycling and everything, although we do try and recycle paper and stuff here.

The practice nurse explained that they used to let the yellow sharps bins 'get to three-quarters full, didn't we, but then we've been told recently to do it [i.e. dispose of the bins] more often than that'. The nurse practitioner concurred:

> Yes, there's some infection control guidelines through from [the] PCT [primary care trust] that ... recently we had to do an Infection Control Audit and one of the things

> they said was that we had to change the yellow bags daily. I did question that, because throughout the summer it's so quiet here, there may be nothing, there might be one little thing in the bottom of the bin, and they did say just use our own, use your common sense, but they wanted us to change them regularly.

Moreover, the plastic packaging that the each disposable instrument comes individually wrapped in goes into the general waste.

Incineration

The sharps boxes are placed in a large lockable container outside the surgery; the local council does a weekly pick-up, transporting the boxes to treatment and incineration sites. In December 2008 I visited a small site for alternative treatment of hospital waste, where soft waste was treated prior to going to landfill. The sharps boxes that arrive here courtesy of the local council (from sites that include the surgery I visited) are put aside ('quarantined') and then transported to a major incineration plant nearby, run by a multinational waste management organization with a significant presence in the UK. The site manager (referred to henceforth as RL) at the alternative treatment site told me that the system of segregating sharps at source from other clinical waste is imperfect, with needles turning up in the bagged waste.

From here, the sharps end up at a large incineration plant, where I was shown around the domestic and clinical waste incinerator facilities. The organization that runs this plant describes itself as providing: 'integrated waste management and environmental services to local communities and industry'. Running services such as refuse collection, recycling, waste treatment and street cleaning for 100 UK local authorities, it employs 12,500 employees and runs 123 landfills and 6 'energy recovery facilities'. The clinical operations manager here (whom I shall refer to as CG) emphasized the environmental nature of his organization: the waste incinerated here gets re-used for energy, as the incineration process generates electricity, and the ash from the process is re-burnt to make aggregates (from which roads are built). What is more, the metal (e.g. surgical stainless steel from clinical waste) is extracted after incineration and recycled. The organization's website does not in fact mention incineration, emphasizing rather the organization's role in reducing dependence on landfill and in cutting emissions of greenhouse gases by enabling energy recovery and producing renewable energy for the National Grid, which reduces the use of fossil fuels.

CG, however, told me that clinical waste is 'a minefield'—partly because there are not enough incinerators to process the sharps: there are only 14 in the UK, with many having shut down because of costs.[6] CG sees *more* hazardous waste coming for incineration because all manner of waste is 'lumped together' as hazardous.

6 Many hospital onsite incinerators judged inefficient were closed down from the 1990s onwards, with the NHS having exported wastes off-site to private contractors. Tudor *et al.* (2005) state that the UK Environmental Protection Act ushered in a greater segregation of healthcare waste and stricter requirements for incinerators accepting such waste. High costs of implementing these restrictions led to the closure of several incineration plants in the late 1990s (Tudor *et al.*, 2005). According to a 2005 article in *Waste Management*, the number of: 'licensed and operational incinerators continues to decrease. The ownership of the clinical waste incineration capacity in the UK is now dominated by two private companies' (Fisher, 2005: 572).

One reason for this expansion of hazardous waste is cost-related: it is more expensive, said CG, for hospitals to segregate different kinds of clinical waste rigorously. The *Safe management of healthcare waste*, as we saw, states that

> For sharps to be considered for alternative treatments, the producer must demonstrate that they have robust segregation procedures in place to separate those sharps that require incineration from those suitable for alternative treatment. Where robust segregation of sharps contaminated with cytotoxic or cytostatic products cannot be guaranteed, all sharps should be incinerated. (Department of Health, 2006)

In the surgery I visited, there were no orange boxes which could take those sharps that can be subjected to alternative treatments rather than incineration. This is not seen by everyone in the chain of clinical waste management as a problem: the strategic waste manager of the local council told me: 'You shouldn't be seeing the orange boxes, everything pretty much should be going in the yellow boxes.' He recounted giving blood and the sharps being put in an orange box: 'but they had no way of knowing that the blood was not infected, so they shouldn't have done that'.[7] A second reason for the expansion of hazardous waste may therefore be a precautionary public health attitude—to which I shall return below.

A third reason is the expansion of the category of hazardous waste. Cytotoxic sharps used to be processed before going to landfill, but now go to incineration as hazardous waste. More sharps are therefore incinerated. Technically, many of these sharps would not be considered hazardous but nonetheless go into the hazardous waste stream for incineration. This expanding of the boundaries of hazardous waste applies not just to sharps. Wood, explained CG, is treated with creosote, so it has to go to incineration. Some perfumes are hazardous, others not; it is complicated for producers (whose responsibility it is) to work out which is and which is not, so all types get put together as hazardous. The result is that more items are incinerated.

Other kinds of waste also emerge. Both RL and CG expressed concern over the sharps boxes getting incinerated along with their contents. RL, at the alternative treatment site, described his attempts to devise a system whereby this plastic can be recycled; there is a financial incentive—the plastic 'can go for £400 a tonne'. And incinerating the boxes requires 'more wasting of emissions'. CG is also preparing a shredding project; the sharps bins are not necessarily full when they arrive: 'A box with 2 sharps going to incineration is wasteful' (note the echo with the nurses being instructed to empty the boxes before they are three-quarters full); a shredder project would reduce the volume by 15 percent before incineration. Both managers also were concerned with the possibility of stripping down packaging and raw materials to be diverted from incineration—yet again, they said, costs compromise this possibility.

Regulations

The UK Controlled Waste Regulations of 1992 had defined clinical waste as waste produced in healthcare or related settings that poses a risk of infection, or waste that may prove hazardous. It is:

7 Telephone interview, 11 November 2008.

> '(a) any waste which consists wholly or partly of human or animal tissue, blood or other bodily fluids, excretions, drugs or other pharmaceutical products, swabs or dressings, syringes, needles or other sharp instruments, being waste which unless rendered safe may prove hazardous to any person coming into contact with it; and (b) other waste arising from medical, nursing, dental, veterinary, pharmaceutical or similar practice, investigation, treatment, care, teaching or researching, or the collection of blood for transfusion, being waste which may cause infection to any person coming into contact with it.'

In July 2005, the Hazardous Waste (England and Wales) Regulations 2005 replaced the Special Waste Regulations in England and Wales. (The Special Waste Regulations remain in place in Scotland, but now include clinical waste as special waste.) These regulations (which I'll refer to henceforth as HW Regulations), made under the Environmental Protection Act of 1990, were designed to implement the European Hazardous Waste Directive (91/689/EC). The Directive's requirements were in fact already largely transposed in England under the special waste regime—through the requirements that movements of hazardous waste be documented in consignment notes, and that records of disposal and recovery of such waste be kept. The HW Regulations, however, replaced the domestic special waste regime with a more transparent transposition of EU obligations by referring instead to hazardous waste. Along with the Landfill (England and Wales) Regulations 2002 and the List of Waste (England) Regulations 2005, the Hazardous Waste Regulations require that producers adequately describe their waste using a written description and the appropriate European Waste Catalogue (EWC) codes.

The EWC codes are a list of wastes produced by the European Commission in accordance with the European Waste Framework Directive (75/442/EEC), in order to provide common terminology for describing waste throughout Europe. The Directive incorporated the European Hazardous Waste List pursuant to the Hazardous Waste Directive (91/689/EEC). Each member state has discretion regarding the means by which Directives' aims are enacted.[8]

Under the previous Special Waste Regulations, much of the responsibility for the waste fell on the consignor—the person causing the waste to be removed from the premises where it was held (this may be the waste management contractor rather than the person producing the waste). The HW Regulations instead shifted the focus of control and responsibility further up the waste management chain from waste managers to waste producers.

The regulations define hazardous waste (HW) as waste containing hazardous properties that may render it harmful to human health or the environment. They stipulate a range of recording, identifying and tracking procedures with which those who dispose of, collect or transport waste must comply. HW is tracked from source to final disposal. Different categories of HW must not be mixed together, and nor must HW be mixed with non-HW. The regulations shift the regulatory focus from administration to assessment of compliance, with emphasis placed on the waste producer.

The adoption of the new hazard group 'H9' (infectious waste) in the HW Regulations means that more clinical waste is likely to be classified as hazardous. In fact the use of the EWC codes has resulted in clinical waste being by definition classified as hazardous

8 For the role of Europe as a principal engine of health and safety regulations affecting the UK, including in hazards and environmental matters, see Majone (1997) and Baldwin (1996).

waste. A Department for Environment, Food, and Rural Affairs (DEFRA) Final Regulatory Impact Assessment of the Hazardous Waste Regulations notes that: 'implementation of the revised Hazardous Waste List will significantly increase the number of hazardous waste producers, and the number of hazardous waste consignments' (2005: 3).

The guidance on the Safe Management of Healthcare Waste introduces several key changes:

- The introduction of a new term, 'healthcare waste', defined as waste from natal care, diagnosis, treatment or prevention of disease in humans/animals.
- The division of clinical waste into two categories: waste posing a risk of infection, and medicinal waste.
- The classification of medicinal waste into two categories: cytotoxic and cytostatic medicines, and medicines other than these.
- The definition of infectious waste as waste that contains viable microorganisms or their toxins, which are known or reliably believed to cause disease in man or living organisms, and a method for its classification. *Clinical waste that is non-medicinal is therefore co-extensive with infectious waste.*
- The introduction of a new term 'offensive/hygiene waste', defined as non-infectious, non-hazardous waste which does not require specialist treatment or disposal, but which may cause offence to those coming into contact with it. This waste type includes waste previously described as 'human hygiene' or 'sanpro' (sanitary towels, tampons, nappies).

The guidance urges that clinical waste be segregated from other types of waste and be treated/disposed of appropriately in suitably permitted, licensed or exempt facilities on the basis of the hazard it poses. (The HW Regulations place a duty on waste producers to segregate hazardous and non-hazardous waste at source.)

The EWC codes classify waste whose collection and disposal is subject to special requirements in order to prevent infection as hazardous. If waste is infectious, it is subject to such requirements, and is therefore hazardous waste by definition. Waste previously known as 'clinical waste' on the basis of infection risk is thus infectious waste, which is hazardous. The *Safe management* guidance states that: 'if an item of healthcare waste is considered to pose a risk of infection it should be considered clinical waste, it should be classified as hazardous waste and should be transported as an infectious substance' (Department of Health, 2006). Only infectious waste requires treatment at specialist facilities; therefore, if waste is being sent to a facility to render it safe, disinfect, sterilize or incinerate it due to its infectious nature, it should be considered infectious waste.

Note here that this phrasing suggests that the guidance is concerned with helping individuals to recognize infectious waste who lack an understanding of the grounds on which a type of waste may be considered infectious. It emphasizes, that is, how to reason backwards from the way the waste is being managed, to its classificatory identity. I will return to this below.

Precautions

As I explained above, the recent changes in clinical waste management emerge from European Directives on waste. Underlying this European legislation are international

agreements and principles, in particular the formulations of the World Health Organization, which outline four principles relating to healthcare waste:[9]

(1) The *duty of care principle*: 'any organisation that generates waste has a duty to dispose of the waste safely'. It is 'the HCF [healthcare facility] that has ultimate responsibility for how waste is containerized, handled on-site and off-site and finally disposed of'.
(2) The *polluter pays principle* states that: 'all waste producers are legally and financially responsible for the safe handling and environmentally sound disposal of the waste they produce.... If pollution results from poor management of health-care waste then the HCF is responsible. However, if the pollution results because of poor standards at the treatment facility then the HCF is likely to be held jointly accountable for the pollution with the treatment facility. The fact that the polluters should pay for the costs they impose on the environment, is seen as an efficient incentive to produce less and segregate well'.
(3) The *precautionary principle* states that: 'one must always assume that waste is hazardous until shown to be safe'. Where it is 'unknown what the hazard may be, it is important to take all the necessary precautions'.
(4) The *proximity principle* recommends that 'treatment and disposal of hazardous waste take place at the closest possible location to its source', in order to minimize the risks involved in its transport.

The WHO also cites the Basel Convention as guiding its policy on healthcare waste. This Convention aims to: 'minimize the generation of hazardous wastes in terms of quantity and hazardousness; to dispose of them as close to the source of generation as possible; to reduce the movement of hazardous waste'. A central goal of the Convention is to: 'protect human health and the environment by minimizing hazardous waste production whenever possible'. It means addressing the issue through an 'integrated life-cycle approach' involving 'strong controls from the generation of a hazardous waste to its storage, transport, treatment, reuse, recycling, recovery and final disposal'.[10]

The four principles—like the UK guidance—place the onus on the waste generator to refrain from endangering the public. This onus, in the form of liability for irresponsible management of waste, fosters the precautionary approach that is also one of the WHO principles. The precautionary principle has been very influential in policy and regulation at the European level especially, and in particular in environmental policy. The principle can be formulated in various ways, and can be used both to justify decisive action and inaction. At its core, however, it states that regulatory and legislative steps should be taken against *potential* harms, even when causal relationships between particular actions and harmful outcomes are not clear, and when we do not know if those harmful outcomes in fact result.[11] However, as Cass

9 See http://www.healthcarewaste.org/en/128_hcw_categ.html ('The ten categories of health-care risk waste') and http://www.healthcarewaste.org/en/130_hcw_intagreemts.html ('Two international agreements') on the WHO website (accessed February 2009).

10 Quotes in this paragraph are from the WHO website: http://www.healthcarewaste.org/en/130_hcw_intagreemts.html ('Two international agreements', accessed February 2009).

11 See for example Sunstein (2005). On the precautionary principle, see also Adams (2000).

Sunstein has underlined, precautions against some risks have consequences, some of which may themselves constitute other risks. The combined effect of the onus being placed on the producer and the salience of a precautionary approach (which aim to reduce the health risks of healthcare waste) is to undermine attempts to produce less healthcare and general waste. It also undermines the attempt to segregate waste carefully. One example is the shift to disposable single-use instruments, which in itself generates more packaging waste (a problem given the lacklustre market for recycled and reusable plastic in the UK), countering the aspiration to minimize waste in general within the NHS. The Department of Health states that:

> ... waste does not have to be disposed of: it can be reviewed for its resource value and potential.... [The NHS] now more than ever needs to be prudent with its use of resources and to save money wherever opportunity permits. Materials or equipment deemed to be waste can often be a valuable commercial commodity elsewhere: consider potential for recovery, reuse or recycling.... Waste, irrespective of its disposal method has the potential to pollute land, air and water. In order to protect the environment, measures such as prevention, minimisation and recycling should be explored. (Department of Health, 2008)

Similarly, the classification of hazardous waste (of which infectious waste is a component) is widened to include more types of waste. And a precautionary approach on the ground—as we saw with the practice nurses—results in more items being placed into the hazardous waste stream. As they said: 'You know that you're doing the right thing.... There's no margin for error.' Segregation is a tricky business in which, because of public health priorities and their own liability, waste producers would rather be safe than sorry. The precautionary approach that is indeed part of nursing practice and part of the new guidance may caution against including sharps in ordinary waste for fear of health risks incurred; but it also helps to drive waste that might not be hazardous into the hazardous waste stream. As CG (at the incineration plant) emphasized, the hazardous waste stream has expanded.[12] And the disposal techniques—specifically, incineration—that deal with such waste are not uncontroversial.

Incineration

The number of incinerators has grown in Europe in the last decade. In the UK, however, landfill has been more widely available than incineration. The EU Landfill Directive (implemented in the Landfill [England and Wales] Regulations 2002) shifted the territory, requiring the UK to implement a landfill tax and the Landfill Allowance Trading Scheme, designed to reduce the release of greenhouse gases produced by landfills through the use of alternative waste treatment methods. Incineration is playing a growing role in the treatment of municipal waste and in energy supply in the UK, although, as noted above,

12 The DEFRA Final Regulatory Impact Assessment stated that it is estimated that: 'if all clinical waste was to be classified as infectious under the hazard property H9, this would make the costs to the NHS in England in the region of £90m per annum compared to £50m now' (2005: 20).

many incinerators have closed down and capacity is a problem. The Landfill Directive prohibited the landfilling of infectious hospital and clinical waste from medical or veterinary establishments. The Landfill Regulations require all waste to be treated before landfill for new and hazardous waste sites from July 2004—with the aim of reducing its quantity or the hazards it poses to human health or the environment. They also prohibit the co-disposal of hazardous and non-hazardous wastes by the same date.

The incineration plant I visited downplays incineration in its promotional materials; the clinical operations manager was emphatic that incineration was not a significant problem, underscoring the company's role in 'energy recovery', renewable energy and reduction of landfill. Incineration is framed, that is, as environmentally responsible. The Environment Agency, in a position statement on *Waste incineration in waste management strategies* in October 2003, states that 'we live in a throw-away society', with each household generating around 1.2 tonnes of waste every year in England and Wales:

> We must urgently find affordable solutions to the management of municipal waste that minimise its effect on the environment including human health and maximise its use as a resource.... [W]e need to start creating less waste, recycle more and dispose of the remainder in a safe and environmentally friendly way.... [I]ncineration has a role in waste management ... it may be appropriate for local authorities to include incineration in a particular strategy provided that it does not undermine the prevention or minimisation of waste, or other waste management options such as re-use, recovery or recycling [and that] it represents the Best Practicable Environmental Option (BPEO) for managing the specific waste stream. (Environment Agency, 2003a)

The Environment Agency monitors emissions concentrations of pollutants such as sulphur dioxide, oxides of nitrogen, carbon monoxide and volatile organic compounds. Since 1996, it states, there have been substantial cuts in emissions from incinerators in cadmium, lead and dioxin emissions. Research on the health effects of municipal waste incinerators was based on emissions from older incinerators that had much higher pollutant emissions levels. The agency: 'is not aware of any studies that conclusively link adverse health outcomes to incinerator releases'. The Department of Health's independent advisory Committee on the Carcinogenicity of Chemicals in Food Consumer Products and the Environment (COC) advised in 2000 that it is not possible to conclude that the small increase in primary liver cancer documented was due to emissions of pollutants from incinerators; 'any potential risk of cancer due to residency (for periods in excess of 10 years) near to municipal incinerators was exceedingly low and probably not measurable by the most modern epidemiological techniques' (Environment Agency, 2003). In 2008, the Environment Agency states that space in landfill is limited: 'and more waste will have to be diverted away from landfill to comply with the EU Landfill Directive'. Since 1990, it states, emissions to air have fallen. 'Incinerators also produce ash that may be recycled; for example, in aggregates' (Environment Agency, n.d.).

There have indeed been technological advances in incineration since the 1970s. Proponents of incineration argue that problems regarding dioxins can be technically solved, and that—as the company I visited suggests—the generation of electricity reduces the use of

fossil fuels, contributing to a net reduction in the greenhouse effect. Moreover, it is claimed that incineration emissions are insignificant in relation to total air pollution in developed economies, and that toxins can be reduced by separating plastics from the rest of the waste stream through recycling (see Gandy, 1993).

Incineration, on this view, is a solution to the risks associated with landfill. However, the Environment Agency's confidence notwithstanding, concerns about incineration remain, in particular about dioxins and furans (Gandy, 1993: 35–38, 1994; Gille, 2007: 157–159).[13] The WHO itself makes a characteristically cautious assessment, noting that small-scale incinerators operate at temperatures (below 800 °C) that: 'may lead to the production of dioxins, furans, or other toxic pollutants as emissions and/or in bottom/fly ash' (WHO, 2005: 568). Long-term:

> ... low-level exposure of humans to dioxins and furans may lead to impairment of the immune system, and impaired development of the nervous system, the endocrine system and the reproductive functions. Short-term high level exposure may result in skin lesions and altered liver function.

However, while dioxins are classified by the International Agency for Research on Cancer as a 'known human carcinogen', most of the evidence documenting the toxicity of dioxins and furans is:

> ... based upon studies of populations that have been exposed to high concentrations of dioxins either occupationally or through industrial accidents. There is little evidence to determine whether chronic low-level exposure to dioxins and furans causes cancer in human. Overall, it is not possible to estimate the global burden of diseases from exposure to dioxins and furans because of large areas of uncertainty. (2005: 568)

A complex and inconclusive picture, then. However, the emphasis on incineration as 'energy recovery' extends the concept of recycling so as to address environmental concerns while taking for granted the existing waste stream. Energy recovery from incineration is not waste reduction, pre-consumer recycling, or product re-use (elements of the UK Waste Hierarchy),[14] but rather the recovery of energy from post-production and post-consumption waste. The use of incineration plants integrated into combined heat and power systems does not, therefore, challenge the growing waste stream, but deals with already existing pollutants (Gandy, 1994: 18–21). This 'recycling'—in the form of energy recovery from waste—therefore potentially causes increased risks, given concerns about the environmental and health risks of incineration. Public health concerns, as implemented through a precautionary approach, and where segregation is constrained by questions of costs, lead to an increased waste stream and increased volumes of incineration.[15]

13 Kaiser *et al.* claim that: 'pollutants with the potential to have harmful effects on human health have been identified with health care waste. Two of these substances, mercury and dioxin, have been detected in significant amounts in air and ash emissions from medical waste incinerators' (2001: 205).

14 See DEFRA: http://www.defra.gov.uk/environment/waste/topics/ (accessed February 2009)

15 This situation is not dissimilar to one described by Tim Cooper (2009) regarding seventeenth-century Britain, where frequently sources of environmental and health nuisances were themselves attempts to use waste products (Cooper, 2009).

Environmental historians have thus argued that the notion of recycling has been co-opted into technocratic responses to environmental critiques, responses which preserve the pursuit of economic growth and its concomitant growth in waste. Waste is cast as a source of raw materials, an opportunity rather than an environmental problem—an approach first emphasized by Victorian recycling enthusiasts proclaiming that there was no such thing as waste (Cooper, 2009). Consumption itself, that is, is not queried. Contemporary waste management has focused on market-based policy initiatives; since the 1970s, waste has been demunicipalized in the UK, with private companies dominating waste management. This phenomenon, argues Matthew Gandy, works against a focus on recycling or the reduction of waste in production and consumption. The regulatory environment, in the form of landfill taxes for example, has failed to have a significant impact on recycling costs or on a re-use ethos. The focus on incineration—an 'end-of-pipe' technology—sits uncomfortably with a sustainability agenda. Waste is seen as an endless industrial and financial resource whose profitability disincentivizes a concern with waste production.

The raising of emissions standards on health and environmental grounds by Western countries has also had paradoxical effects: it is now almost impossible to site new incineration facilities in countries regulated by new emissions standards (such as the UK). As Zsuzsa Gille writes:

> Wastes are transported for treatment to those countries that have the loosest emissions standards, until the regulations in the country or region 'catch up' with those of others. The gap in regulatory standards is also a key cause of hazardous waste exports from Western Europe to developing countries and to Eastern Europe. (2007: 158)

An emphasis on rapid disposal has been characteristic of thinking about waste since the nineteenth-century's 'refuse revolution' (Cooper, 2007). Growing industrialization and urbanization in Britain during that century led to waste production outstripping its re-use, re-consumption, recycling. A growing sense of crisis developed into a critique of capitalist claims of progress, with filth and capitalism seen as disturbingly intertwined. The sanitary and public health movements were responses to the challenge of waste, and emphasized the need to *remove* rather than re-use waste, since proximity to it was health-threatening. Recycling—prolific before waste became a significant problem—returned as a solution to polluting wastes, for example in the form of attempts to recycle sewage waste. This solution, however, was one that reconciled capitalist progress with limited natural resources. And since the late nineteenth century, argues Tim Cooper (2009), recycling has consistently been represented as an innovative technological solution to problematic waste production.

Here we see the entangled relationship of public health and waste disposal. 'The privileging of public health in decisions on how to treat urban waste was one of the key reasons why disposal triumphed over reuse in municipal waste management,' writes Cooper (2009). Public health concerns urge us to dispose of waste. However, the solutions to the health problems of waste have had worrisome consequences, as in the over-reliance on landfill. Moreover, the public health concerns about waste run counter

to the aspirations to waste minimization and indeed recycling (where recycling is taken to mean re-use rather than energy recovery from waste). So while end-of-pipe technologies may sit uncomfortably with sustainability, as environmental historians have argued, sustainability itself sits uncomfortably with public health and the precautionary principle which shapes policy. And this is a tension manifested in the management of clinical waste in particular.

Waste, biomedical rationales and sustainability

Clinical waste is effectively treated, regulatorily and discursively, as an unproblematic component of hazardous waste to be disposed of as dangerous. This is problematic, for it eclipses the tensions that exist in principle between the drive to minimize, re-use, or recycle waste, and the drive to minimize as far as possible the potential risks to health posed by clinical waste. An environmental agenda urging a shift from a culture of disposability within the healthcare sector, as in any other realm, comes up with a bump against a precautionary public health agenda. The guidance encouraging clinical waste producers to treat as hazardous those healthcare wastes that pose a risk of infection—and placing the onus on producers to make this assessment—works against guidance encouraging facilities to reduce waste: the options for re-using or recycling needles are limited to say the least. We have seen, in the case of the practice nurses, how a precautionary approach becomes second nature and ethically compelling. Infection control priorities urge the nurses to let sharps bins get only three-quarters full, with the result that more sharps boxes are incinerated; but this, and the increase in packaging through use of disposable instruments, seem to many to be an acceptable cost.[16] The choice becomes that between taking undue health risks by not disposing of hazardous waste appropriately, and being over-precautionary with waste that is potentially hazardous. In other words, the reflex towards rapid disposal and the precautionary reflex overlap. The so-called 'throw-away' culture is closely intertwined with a precautionary public health regime. The question of sustainability then becomes a potential threat to the primacy of public health.

Waste minimization in healthcare settings is hampered by a tendency to perceive *all* healthcare waste as contaminated (Tudor *et al.*, 2005). It is, of course, *not* all contaminated, but is also not *known* to be *un*contaminated, hence the sway of precautionism.[17] Sustainable waste management is, argue Tudor *et al.*: 'a difficult challenge for the UK, where the traditional approach has been to concentrate on disposal to a cheap landfill and government supported recycling' (2005: 607). Waste management practices in the NHS, they write, have displayed a lack of strategic waste minimization planning that would involve long-term scrutiny of the question of waste. 'Holistic waste management' is at a low level in the NHS. The authors argue for a movement away from the concept

16 An audit of anaesthetic waste collected from six theatres in one teaching hospital in the UK found that only 4 percent by weight of the sharps bins content was true sharps waste (needles and broken glass); 57 percent was glass and 39 percent was 'other' (packaging, plastic, metal and fluid). See Hutchins and White (2009) and *British Medical Journal* (2009).

17 Another obstacle is the lack of viable markets for recyclables in parts of the UK.

of 'waste management' to one of sustainable decision-making regarding resource use (e.g. packaging waste). Important measures include tackling waste at generation, through implementation of 'greener' forms of procurement, and the investigation of local purchasing and the 'take back' arrangements with suppliers. What this article does not spell out, however, is the core tension between policy regarding public health risks and policy regarding waste. How does one minimize waste without counteracting the precautionary principle that is at the heart of policy around clinical waste as a subset of hazardous waste?

The problem that clinical waste management poses to the sustainability and recycling agenda is much elided in the guidance, legislation, and literature I have scrutinized. I noted above that the UK guidance is not very explicit or informative about the grounds on which certain kinds of waste are to be classified as infectious and hazardous; the reasoning it encourages waste handlers to engage in is bureaucratic, making inferences on the basis of how waste is dealt with rather than engaging with biomedical rationales. Such rationales for waste classification and procedures are rather elusive in the *Safe management of healthcare waste* (Department of Health, 2006) document—the document which the nurses and the incineration managers I spoke with invoked as their reference point for procedure. This document explains the changes in classification and disposal of clinical waste in terms of alignment with 'hazardous waste regulation and guidance published by the regulatory agencies', stating that the previous classification of clinical waste was 'no longer felt to be appropriate', not easily equating 'to the use of the European Waste Catalogue Codes' now mandatory for all waste transfer documentation (Department of Health, 2006: 1). One has to work back to the EU legislation, and indeed the WHO documentation, to find more significant information on rationales for aspects of the legislation and guidance.

A document published by the Environment Agency in 2003, before the new system was put in place (*Technical guidance on clinical waste management facilities*) did provide some information on the risks of clinical waste: 'the potential microbiological risks associated with clinical waste may be unfamiliar, and their assessment may sometimes require expert advice'; and clinical waste 'has the potential to cause offence, for example, human body parts. Past incidents of inappropriate disposal of, for example, sharps and anatomic waste have caused public concern.' Moreover, 'the perceived risks and potential for offence make it undesirable to open containers of clinical waste to inspect the contents' (Environment Agency, 2003b: 19).

> [W]here clinical waste is collected under a manual bag handling system, rather than contained in larger rigid packaging, there are risks of needlestick injury and infection from spillages or incorrectly packaged waste to all those involved in the chain from point of production to final disposal. (2003b: 24)

Municipal waste:

> . . . contains higher numbers of microorganisms capable of causing respiratory illnesses and gastro-intestinal infections, for example *Escherichia coli* and *Salmonella enteritidis*. The frequency of pathogenic viruses such as HIV and hepatitis B is higher in clinical waste, whereas the frequencies are similar for both waste types for

> microorganisms capable of causing skin and soft tissue infections such as *Staphylococcus aureus* and *Streptococcus pyogenes*. (2003b: 74)

The possibility of harm to those handling the waste; the possibility of unauthorized materials recovery, particularly of sharps, and the ethical inappropriateness of some wastes, for example body parts, for landfill disposal, all make landfill of limited acceptability for clinical waste disposal (2003b: 69). For risks to be realized to health and/or the environment—for example, for HIV, hepatitis B or C infection to develop from a needle-stick injury—pathogens must be present; they must be released from containers or processes; they must survive and be mobile after release; they must be present in sufficient numbers; there must be a pathway to the host; the host must intake the pathogen; the host must be susceptible to the pathogen; the host must not take prophylaxis.

> The risk assessment will determine the likelihood of these events taking place, the controls needed at waste management facilities, and the requirement for environmental monitoring and for site decontamination at completion. *This will need to be done on a site specific basis and where there is uncertainty a precautionary approach may be justified*. It must be recognised that an infected 'host' may spread the disease to the community and the environment, so harm may not be localised. (2003b: 74, italics added)

'Where there is uncertainty, a precautionary approach may be justified.' This sentence indicates the spirit in which clinical waste guidance has been and is being taken—and arguably must be taken, given practical constraints on risk assessment and a public health orientation reluctant to take any risks. A sense of the difficulties facing anyone making a decision as to whether a particular waste poses a risk is conveyed by the document's following claim:

> ... the question of what is infectious is not absolute. ... The decision as to whether a waste may be infectious must therefore be based upon one or both of: a clinical judgement; the source of the waste. The first of these may not be available in a tangible form to the waste holder or regulator to assist them to make a decision with certainty that they will, respectively, avoid prosecution or secure a conviction. The latter can offer more certainty, but means treating waste as infectious whether it is or not. It may also be difficult, for example, for a regulator faced with potentially illegally deposited waste to establish what its original source was (2003b: 75–76)

It is very difficult to establish on-site whether waste is infectious or not; it is therefore more 'certain'—and more ethical?—to treat waste as infectious whether it is or not.

The WHO provides more detail than the UK guidance on the health grounds for waste management systems. In 1998 it published a document called *Safe management of wastes from healthcare activities* (Pruess *et al.*, 1998). It states that a range of kinds of infections can be caused by exposure to healthcare waste, including gastroenteric infections such as *Salmonella*, *Vibrio cholerae* (faeces and/or vomit); respiratory infections such as *Mycobacterium tuberculosis* and the measles virus (inhaled secretions or saliva); genital infections such as the herpes virus (genital secretions); skin infections

such as *Streptococcus* spp (pus); AIDS (blood and sexual secretions); septicaemia (blood), viral hepatitis A, B and C (blood, faeces and body fluids). There is particular concern about infection with HIV and hepatitis viruses B and C, for which there is strong evidence of transmission via healthcare waste (generally through injuries from syringe needles contaminated by human blood). Concentrated cultures of pathogens and contaminated sharps (particularly hypodermic needles) are 'probably the waste items that represent the most acute potential hazards to health. Sharps may not only cause cuts and punctures but also infect these wounds if they are contaminated with pathogens.' Because of this double risk: 'sharps are considered as a very hazardous waste class' (Pruess *et al.*, 1998: 21–22).

Individual cases of accidents—occurring especially to healthcare workers—and subsequent infections caused by healthcare waste are well documented, but the:

> ... overall situation, however, remains difficult to assess, especially in developing countries. It is suspected that many cases of infection with a wide variety of pathogens have resulted from exposure to improperly managed healthcare wastes in developing countries. (1998: 24)

The document discusses the rates of injuries from sharps for healthcare personnel, and the survival of different pathogenic microorganisms in the environment (the hepatitis B virus can survive for several weeks on a surface, and is resistant to brief exposure to boiling water, where HIV is much less resistant). Bacteria are less resistant than viruses, and 'much less is known about the survival of prions and agents of degenerative neurological diseases', such as CJD, 'which seem to be very resistant'.

> [V]ery few data are available on the health impacts of exposure to health-care waste, particularly in the case of developing countries. Better assessment of both risks and effects of exposure would permit improvements in the management of health-care waste management [sic] and in the planning of adequate protective measures. Unfortunately, the classical application of epidemiology to the problem is difficult because of methodological complications and uncertainties regarding evaluation of both exposure and health outcome. The great diversity of hazardous wastes that can be involved and of circumstances of exposure is a particularly problematic feature of all such evaluations. It prevents not only the development of a unified analytical approach to the assessment of exposure and health outcome but also the generalization of any statistical inferences drawn about a specific waste-exposed population.... Within health-care establishments, the surveillance of infection and record-keeping are important tools that can provide indications of inadequate hygiene practices or of contamination of the immediate environment (including that caused by health-care waste). Surveillance allows an outbreak of infection to be recognized and investigated and provides a basis for introducing control measures, for assessing the efficacy of those measures and of the routine preventive measures taken by the establishment, and for reducing the level of avoidable infection. (Pruess *et al.*, 1998: 28–29).

In other words, surveillance and record-keeping are important not because they can avert risks that are known in detail, but because they are a means to manage an as yet rather unknown quantity—and possibly to yield further data.

The document concludes by stating that: 'further research is necessary to increase knowledge of: the extent to which health-care waste is contaminated; the risk level for contamination of the exposed population by digestive, respiratory, and percutaneous routes', and 'growth and survival of pathogens in waste during storage' (1998: 28–29). The suggestion is thus that there is a lot more we could know about the risks of clinical waste. The unknowns relating to clinical waste—the unknowns left unspoken by the UK guidance—are reiterated in a statement by the WHO in a 2005 special edition of *Waste Management* on the management of healthcare wastes. This article states that healthcare activities:

> ... lead to the production of waste that may lead to adverse health effects. Most of this waste is not more dangerous than regular household waste. However, some types of healthcare waste represent a higher risk to health. These include infectious waste (15–25% of total healthcare waste), among which are sharps waste (1%), body part waste (1%), chemical or pharmaceutical waste (3%), and radioactive and cytotoxic waste or broken thermometers (less than 1%). (WHO, 2005: 568)

It explains that sharps waste, although produced in small quantities, is highly infectious, exposing health workers, waste handlers and the community to infections if it is poorly managed. It points out the healthcare waste management options 'may themselves lead to risks to health' and that 'no perfect readily achievable solution to manage healthcare waste exists' (2005: 568). Indeed, the problem is not only that the desire to manage the risks of clinical waste increases waste, but that the desire to *investigate* these risks, if carried out in such a way as not to cause further risks of health, can also increase such waste (and its risks). The WHO states that until 'countries in transition and developing countries have access to healthcare waste management options that are safer to the environment and health, incineration may be an acceptable response when used appropriately' (2005: 569). Therefore, it is implied, incineration is not ideal. And one of the WHO's medium-term strategies is to conduct 'risk assessment to compare the health risks associated with: (1) incineration; and (2) exposure to healthcare waste' (2005: 569). This latter claim is intriguing; it acknowledges that not enough is known about either of these risks to know whether the costs associated with incineration are worth paying for the benefits in strict regulation of exposure to healthcare waste. And, in effect, what this raises is the possibility that the precautionary principle, when applied to healthcare waste, is in fact counterproductive—if, in managing healthcare waste, it is sending more waste to incineration.

It also suggests that part of what is at work here is what Lianos and Douglas (2000) have called 'dangerization', whereby future events and interactions are conceived in terms of danger, rendered subject to a system of automatic controls that seek to extract the danger in question and foster safety, which is understood as the normal state. Moreover, the legislation presents the question of clinical waste management *not* as a question about real, actual or concrete harms; its rhetorical drive is rather that of an unarticulated and symbolic threat of pollution that, intuitively, *must* be averted at all

costs. Ian Hacking (2003) notes, that in the years since Douglas and Wildavsky's (1982) groundbreaking work, the topography of risk has changed. Discussing what he calls 'sectarian groups' concerned with pollution, he points out that 'perceived risk and danger are not essential to them' (2003: 46). I suggest that something similar operates in the clinical waste guidance and the practices it enjoins. The mandatory nature of managing the risks of clinical waste rings out loud and clear; and, as I suggest above, a precautionary principle becomes internalized in those on the ground who unwrap the plastic items and throw them into the sharps bins after a single use. However, what kinds of risk they pose, and how, remains obscure, almost irrelevant, black-boxed within the enactment of procedures that, despite their opacity, are understood as a moral imperative of good public health. The point is not that there are no real risks in clinical waste—as Douglas's work underscored, literal pollution can be invested with symbolic content. But quite what these are is not conveyed, nor explicitly related to the practices enjoined in the guidance.

Conclusion

As a recent *British Medical Journal* editorial (2009) recently stated, the direct contribution of the health sector to environmental degradation is not well analysed and debated. In addition, the relationship between the different regulatory priorities governing waste in general, hazardous waste, and the specific subset that is healthcare waste—a relationship which is, as we have seen, complicated and potentially conflicting—is not drawn out within the legislation and guidance I have discussed. The same applies to the larger question of the relationship between (hazardous) waste disposal and public health guidelines, perhaps especially those making use of a precautionary framework. The relative silence within the UK legislation on these points of tension reveals the lack of attention being drawn to the important question of the relationship between different regulatory and governance priorities and mechanisms. The silence within the documentation, however, is undone by the vivid ways in which these tensions are manifest in practices on the ground, at both ends of the waste journey: in the 'disposal' of clinical waste in a surgery and the 'disposal' at incineration. In both these locations, the problematic status of clinical waste as waste—as something unwanted, to be discarded and disposed of, *or* as something that is *being wasted*, not re-used or even not prevented from coming into existence in the first place—is highly visible. The nurses I spoke with were ambivalent about the immediate disposal of resources that, while being good materials, are treated as hazardous waste. They were, however, happy to err on the side of caution. Both CG and RL expressed a desire to turn wastes back into resources.

When everything is a risk, everything becomes waste to be disposed of. Waste expands, as we have seen, to include ever more objects. The items themselves are harder to see as resources; and yet the process of energy recovery from waste quarries a resource from such waste. We may worry that this 'waste' relies upon its production, and fails to query the wastefulness with which 'waste' is both produced and not re-used. We may worry about the environmental and health effects of the increased hazardous waste stream. We may worry, in other words, about sustainability. But when does sustainability trump the avoidance of healthcare sector risks? Or when does avoiding

healthcare sector risks trump concerns with sustainability? These are questions which we must ask when tracing the ambivalent journeys of disposables and sharps from the nurse's office to the incineration plant.

Gay Hawkins (2006) has, like many other writers on waste, written that its simplest definition is discarded, expelled or excess matter. She writes that:

> . . .waste is at the heart of so many moral economies that it's hard to find a sense in which it isn't bad. To be unproductive or to excessively expend is a sign of poor discipline and irresponsible conduct. Minimizing waste in the interest of efficiency is regarded as evidence of an effective economy: industrial, moral, and psychic. (2006: viii)

Hawkins approaches waste (as does Bauman, 2004) from the angle of consumption, and she argues that contemporary waste habits 'have become connected to the practice of virtue' (p. ix). A pleasure emerges associated with efficient marshalling, separation, and recycling of waste to environmental ends.

This understanding is unsatisfactory in relation to clinical waste. In the clinical, public health context, we must ask *whose* efficiency and *whose* virtue is relevant, and to what end? Where Hawkins speaks of the injunction to 'waste not, want not', the figure of clinical sharps in the legislation instead urges us, precisely, to 'waste' on ethical grounds. Public health efficiency—where what reigns is the desire to avert infection, and to be able to trace those infections that do occur—requires instead a systematic disposal of material, a disposal which sits uncomfortably with the green mantra of 'reduce, re-use, recycle'. Public health virtue locates the ethical crux of the matter not in an efficient use and re-use of material, or in unnecessary consumption; it locates it instead in seeing ever more items as 'waste'—matter to be separated. In so doing, it creates an ethical injunction to 'waste'. Public health efficiency, then, crucially involves 'waste'.

It is thus helpful to distinguish 'waste' in the sense of the *material* that is deemed in excess, from 'waste' as the *act* of squandering something of potential value. This distinction is especially important when thinking about clinical waste rather than other kinds of waste. The special ethical injunctions relating to sharps raise the interesting question of a dual ethics of waste: the ethical imperative of wasting—squandering—on public health grounds, and ethical imperative of *not* wasting, through an industrial rhetoric of 'energy recovery' of the very items that are now so routinely disposed of.

Disposable sharps are a way to avert risk, in part through a logic of the audit trail. Disposing of them—*wasting* their material—is morally imperative. But it also represents a *waste*, an ethically problematic disposal in a culture addicted to throwing things away. This waste, however, also represents an opportunity to intervene in this wasteful culture, through the virtue of industrial recovery and a rhetoric of environmental harm minimization through incineration rather than landfill. While the cost of disposable sharps must exercise NHS managers, the value represented by the disposable sharps market, and by the increase in waste to incineration, is someone else's value. Again: *whose* waste—and *whose* value?

I stated earlier that, in the nurses' practice, it is not the nature of sharps as sharps, or their infectious risk, that determines their fate in the sharps bin—it is their disposability. Where Hawkins (2006) writes about the virtues and pleasures of recycling, sharps—in the

clinical context—invoke instead the virtues and pleasures of disposal, a routine of ethical risk management. They suggest an injunction *against* the exhortation to reduce waste and to re-use material; they provoke an injunction *for* the act of wasting. Here, the 'waste' (the matter) is a danger, and the *act* of wasting an ethical value. And yet, downstream at the incineration plant, they invoke the alchemical virtues and pleasures of re-use, of transformation and 'recovery'. The same waste, now rendered safe, with public health virtue ensured, is a source of considerable physical and ethical value. The wasting of waste has not, so to speak, been a waste.

The growth in recent legislation on clinical waste makes it an important object of scrutiny. Given that, as Ian Hacking puts it, risk management: 'has taken on a duchy in corporate structure and, to a lesser extent, in the more disorganized and hands-on approaches of politicians and governments' (2003: 32), one important issue regarding clinical waste is therefore the efficiency and joined-up-ness of public health and environmental logic. Moreover, though, the way in which sharps figure differently—and contradictorily—in different locations, within different public health and environmental discourses, is testament to the myriad uses to which particular objects—and rather symbolic ones at that—can be put within a policy context. Sharps convey different virtues at different points in their short lives, moulding themselves to different policy discourses. The language of the legislation and guidance I have examined fosters a rather closed public health discourse in which the proliferation of clinical waste is not framed as a significant problem; the environmental concerns that figure prominently in other legislation and other NHS guidance remain outside of view. The opacity of the rationales for the guidance speaks to an uncertainty about, and tension between, the two different rubrics of infection control and environmental hazard. This uncertainty and tension sits uncomfortably with the exhortative legislation regarding both, and makes itself felt in the engagement of my interviewees with the now eminently—and imperatively—disposable sharps.

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