

Coming round to recycling

Increasing numbers of people are trying to reduce and recycle their domestic waste, but hospitals have been slower to get the message. **David Hutchins** and **Stuart White** look at the potential environmental and financial benefits



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Both the UK government and the British Medical Association have recently published strategies for “greener” health care.^{1,2} An audit of anaesthetic waste at our hospital found that about 40% of all waste (roughly 950 kg/theatre/year) was potentially recyclable paper, card, plastic, and glass, and only 4% by weight of sharps bin contents was true sharp waste. Although recycling has potential environmental and financial benefits, it is hampered by convenience, technology, lack of knowledge, concerns about environmental safety, and statutory regulation. We discuss how clinicians might cut the amount of waste they produce by reducing, reusing, and recycling resources and suggest ideas for future research.

Anaesthetic waste

The NHS produced 408 218 tonnes of waste in 2005-6, 29% of which was clinical waste, and spent nearly £73m (€80m; \$103m) on its disposal. This is equivalent to 5.5 kg of waste per patient per day. By comparison, France and Germany, which historically have a greater cultural, political, and statutory commitment to waste minimisation and recycling,³ produce only 1.9 kg and 0.4 kg/patient/day, respectively.⁴

Over the past 5-10 years, concerns about the risk of prion transmission and sterility have led to large increases in both the amount of anaesthetic packaging and the use of disposable devices. Most of the waste is incinerated, although some of it is potentially recyclable.

We recently completed a two week audit of the waste produced by six operating theatres at the Royal Sussex County Hospital in Brighton. The results were striking: 540 kg of sharps and non-sharps anaesthetic waste was produced

(about 2300 kg/theatre/year), 40% of which was potentially recyclable paper, card, plastic, and glass. Sharps waste accounted for 54 kg. Analysis of the contents of five sharps bins found that only 4% by weight was true sharp waste (needles, broken glass): 57% was glass and 39% was other (packaging, plastic, metal, fluid). A similar analysis in 1998 found 14% of waste was sharps.⁵

Recycling anaesthetic waste across the trust would save an estimated £21 000 annually (about 30% of the hospital's annual budget for disposing of clinical waste), although with waste disposal and landfill costs expected to rise, this sum could increase. An estimated 7 million operations are performed annually in England and Wales,⁶ and our data suggest that clinical anaesthesia accounts for 10 000-20 000 tonnes of NHS solid waste annually.

Waste management in the NHS

The UK generates 100 million tonnes of solid waste each year, 85% of which ends up in landfill sites in England and Wales. These sites are reaching capacity,⁷ and have been linked with environmental and health problems.^{8,9} One alternative for hazardous waste is incineration, but its use is limited according to the EU Waste Incineration Directive 2000/76/EC to minimise the negative environmental effect of noxious and other emissions.

Less than 10% of total NHS waste is recycled. However, a comprehensive, coordinated approach to NHS waste management could have both financial and environmental benefits—namely, a reduction in surface and deep landfill, incineration, manufacturing waste, and total energy expenditure.¹⁻¹⁰

Barriers to improvements

Three main barriers exist to improved management of clinical waste:

Social attitudes—Higher rates of recycling rely on healthcare workers doing the initial segregation of waste. However, staff are often unsure what can be recycled safely or may believe that all clinical waste is contaminated. Staff education is therefore important. Institutional influences, particularly the priority given to waste management, also affect staff behaviour.¹¹

Logistical and institutional barriers—Waste management systems in theatre suites need to be redesigned to facilitate recycling. For example, different receptacles are required to segregate waste appropriately, and these should be ergonomically arranged so that the default waste disposal method is to recycle. Education of hospital waste managers should encourage them to introduce recycling measures that comply with waste management law, without exposing the hospital or themselves to legal liability.

Legal barriers—The disposal of clinical waste (waste that consists wholly or partly of human or animal tissue, blood or other body fluids, excretions, drugs or other pharmaceutical products, swabs or dressings, syringes, needles, or other sharp instruments) is regulated by a number of complex statutes and statutory regulations that fall broadly into three categories: environment and waste legislation, health and safety legislation, and transport legislation. All waste is now classified according to the European Waste Framework Directive (incorporated into law as the Hazardous Waste (England and Wales) Regulations 2005). Recently published guidance¹² provides a framework for hospitals



Petri dishes in a clinical waste bin marked with a biological hazard symbol. The dishes contain agar, which has been used to culture microbes in a hospital pathology laboratory, and must be incinerated

that companies reconsider their packaging strategies without compromising product sterility or performance.

Reuse

Continuing concerns about cross infection have resulted in the phasing out of reusable anaesthetic devices in favour of single use, disposable items. It remains unclear whether the risk of infection is real or perceived,¹⁶ particularly with regard to prion transmission,¹⁷ and whether what is required is more effective sterilisation procedures rather than disposable equipment.¹⁸ Reusing single use devices has been shown to save money, provided no

adverse events occur,¹⁹ and would also reduce packaging and clinical waste. However, there could be legal ramifications²⁰: the Medicines and Healthcare Products Regulatory Agency has stated that “Anyone who reprocesses or reuses a device intended by the manufacturer for use on a single occasion, bears full responsibility for its safety and effectiveness,” exposing doctors and hospitals to civil liability.²¹

Recycling

Recycling, the process of transforming one item into another usable item, is less energy efficient than reduction or reuse because it takes energy to transport and transform

to train staff in waste segregation at source, for more environmentally sound disposal. Essentially, medical waste is non-hazardous (and therefore potentially recyclable) if it is not come into contact with a patient or their secretions and has not been in contact with a medicine. Uncontaminated packaging waste and easily recyclable materials (paper, glass, metals) are subject to less stringent legal controls and are therefore recyclable.

Decreasing waste in clinical practice

Clinicians have an important role in reducing hospital waste and should not be discouraged by either lack of knowledge or the threat of legal liability. The fundamental principles of decreasing waste at work are the same as those at home—be responsible, reduce, reuse, recycle.^{13 14} For each of these targets, input is required from a number of actors, including hospital trusts, hospital employees, patients, and drug and medical instrument companies.

Responsibility

Concerns about safety, which have restricted recycling initiatives, might be countered by clinicians acting as guarantors for the contents of disposed waste, by signing labelled bags of recycling waste before disposal.

Reduce

The most efficient method to reduce waste is to decrease the amount of resource used in the first instance. For example, single wrapping of sterilised instruments has been found to be as effective as double wrapping in preventing bacterial contamination.¹⁵ The NHS, which has considerable financial power concerning drug and equipment purchase, could insist

How clinicians might reduce the environmental impact of medical practice

Reduce

- Paperless practice (electronic recording of notes, results, departmental communications)
- Purchase durable, upgradable equipment where possible
- Buy equipment and drugs in bulk
- Use rechargeable batteries and refillable ink cartridges
- Use oral medications rather than intravenous preparations
- Fill sharps bins full before disposal
- Use small aperture sharps bins
- Use large waste receptacles
- Unpack equipment only when it is needed
- Consider whether equipment is actually needed
- Keep ward and theatre temperature to a safe minimum
- Turn off electronic equipment that isn't being used
- Avoid the use of nitrous oxide
- Avoid plastic bags for collecting dry waste

Reuse

- Use unpackaged but unused equipment if it is safe to do so
- Consider reusing devices with low risk of passing infection (eg, calf compressors)
- Drink from china cups not plastic disposable cups
- Consider using washable sharps bins and waste containers, emptied into a central hospital collection point
- Consider schemes where companies collect and refill used receptacles

Recycle

- Segregate potential recyclable material—cardboard, paper, plastic, glass
- Consult waste recycling firms about recycling waste, identifying hospital areas for compaction and collection

Rethink

- Redesign the ergonomics in clinical areas so that it is easier to recycle than to dispose
- Ask supply managers to preferentially tender drug and equipment contracts based on companies' environmental credentials
- Engage with hospital managers to develop greener waste management policies
- Organise staff training on waste management
- Take responsibility for the contents of recyclable waste



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materials. However, given the sterility concerns about reducing packaging and reusing equipment, recycling is important for medical waste. The initial segregation of waste is essential because medical waste cannot be recycled once it is contaminated.

All cardboard and paper waste is potentially recyclable and should be separated at source and flat packed for transfer. About 30% of theatre waste is plastic, mainly from packaging.²² Recycling plastic is expensive, but plastic has a high recycling potential, and financial savings are possible. Recycling plastic reduces the demand for oil (4% of annual global oil use is as a raw material for plastic; another 4% provides energy for the production process), and reduces the hazardous waste pollutants produced by de novo plastic production.

The recycling of glass is more advanced than that of other materials. In 2007, the UK recycled 57% of the glass it used. Glass can be recycled an unlimited number of times without adversely affecting quality. Reduced quarrying and transport costs and lower furnace temperatures mean that for every tonne of recycled glass produced, 1.2 tonnes of raw materials are conserved, compared with the production of virgin glass. Glass products used in anaesthesia are contaminated with hazardous materials (drugs). Nevertheless, contaminated glass may be safe to recycle because of the high furnace temperatures (1500°C) used in the recycling process. In practice, recycling of anaesthetic bottles has been found to be achievable and financially viable.²³

An integrated, sustainable approach to managing hospital waste involving improved disposal systems, waste reduction, recycling, and staff training, has financial and environmental benefits. Cornwall NHS Trust, for example, reduced domestic bag and clinical waste by about 15% and estimates that waste could be reduced by up to 30%, with a similar percentage saving in disposal costs.²⁴

Rethink, research

We suggest considering two further “R”s in any future process of NHS waste management—namely, rethinking and research. Rethinking is required at several levels. Nationally, we need to reconsider some of the stringent statutes that inhibit individuals and organisations from innovating in this area. Hospitals need government support to change current waste management strategies (with major emphasis on waste reduction and recycling), and to consider, for example, entering into partnerships with local recycling firms and accepting input from environmental groups. New NHS hospitals must incorporate recycling facilities. Waste contracts

should be given to contractors with the most comprehensive environmental practices.

Professional bodies and medical publishers also have an important role: the BMA and *BMJ* have recently highlighted how doctors can fight climate change, but published guidance—for example, from the royal colleges—would also be welcome. Web based discussion groups and forums allow for the rapid spread of ideas and solutions.

Waste management is a relatively new and potentially rewarding field of healthcare research. In anaesthesia, for example, research topics might include redesign of equipment and packaging, investigation into new sterilisation techniques and their environmental impact, re-evaluation of airway equipment infectivity, calculations of energy balance (the energy costs of reuse or recycling compared with single use or incineration), investigation of the by products of incineration, and the ergonomic redesign of sharps bins, waste receptacles, and anaesthetic rooms.

Medicine has a considerable environmental impact. Increases in landfill and incineration costs, coinciding with financial recycling incentives, and additional to our social and moral responsibilities, should encourage clinicians to improve clinical waste management, as long as the quality of patient care remains unaffected. Over the past 60 years, the NHS has set a worldwide example in free high quality healthcare at the point of contact. It should continue to set an example by developing and integrating a national medical waste management policy, in order to reduce its environmental impact.

USEFUL WEBSITES

Health Care Without Harm. The campaign for environmentally responsible healthcare.

www.noharm.org/europe

NHS Sustainable Development Unit.

www.sdu.nhs.uk

Health and Sustainability development network.

www.healthandsustainability.net

The Carbon Trust. www.carbontrust.co.uk

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