



March 2012

Case Study: Introducing recycling into the operating theatres

Summary

The Oxford University Hospitals Trust has reduced the amount of waste going to landfill or incineration by introducing recycling into the operating theatre setting. Previously all waste from clinical areas was disposed of via orange clinical waste bags. There are now recycling bins in every anaesthetic room of the three largest operating suites, as well as in recovery and staff rest areas. Waste segregation has become routine for many members of staff and approximately 22% of theatre waste is now recycled.

Positive outcomes of the project: Diversion of waste from landfill and incineration to recycling, saving money and carbon; engaged and empowered theatre staff across the OUH Trust in a successful change management project

Savings per year: £1319.38 (NB this is a partial result, based on only 1 out of the 3 participating theatre suites)

Carbon Savings per year: 8,886 kg CO₂e (NB this is a partial result, based on only 1 out of the 3 participating theatre suites)

Implementation costs: £700 (cost of purchasing bins across 3 sites)

Time of volunteers – working to collect questionnaire data, educate, assemble bins

Start date: February 2011 (bins introduced October 2011)

Project status: ongoing

Implementation

1. Engaging colleagues / changing behaviour

The project was initiated by an anaesthetic trainee and operating department practitioners (ODPs) working together. To engage colleagues, they began by presenting a survey about recycling to ALL staff working in the three largest operating suites in the Trust.* The aims of this survey were to:

- Survey current waste segregation behaviour at home and work
- Highlight the differences in behaviour between home and work

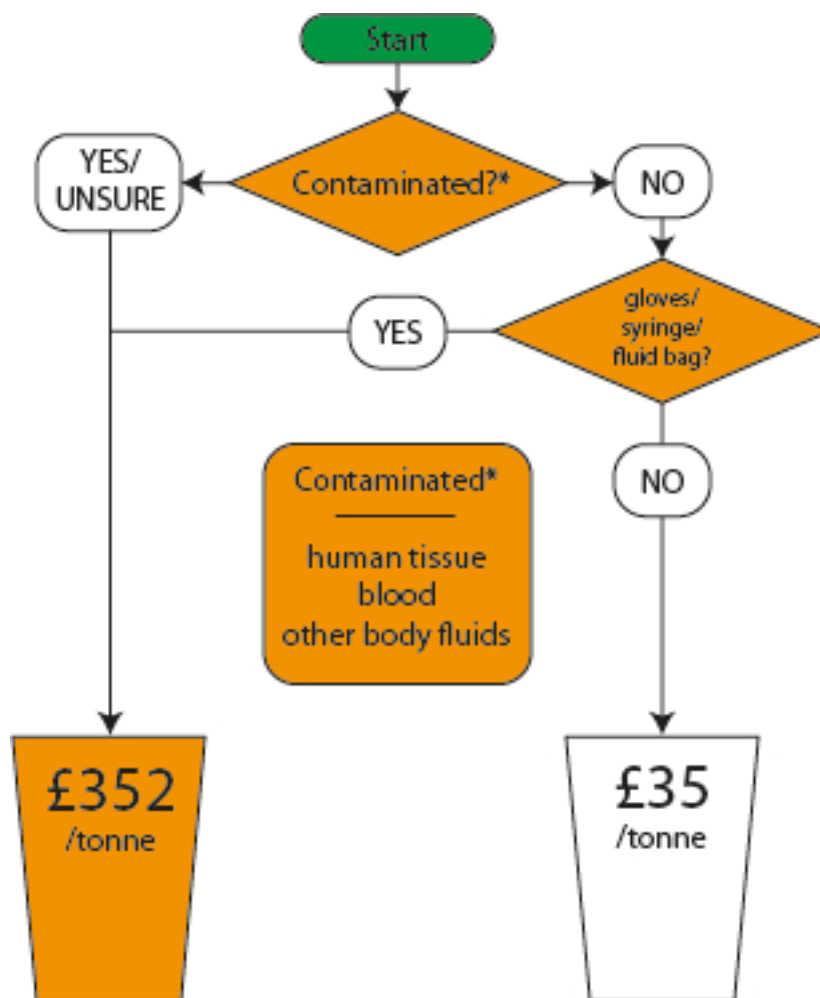
- Identify barriers to recycling at work

The survey therefore acted both as a tool for data collection and an intervention. Results showed that while 96% of staff recycle at home, only 60% do so at work - and to a lesser extent.

Next, they observed workflows to identify the main disposers of physical waste in theatres. These key groups were subsequently targeted for education at clinical governance days:

- anaesthetic nurses
- operating department practitioners (ODPs)
- circulating/scrub nurses

A flow chart algorithm was placed by each of the new recycling bins as an aide memoire.



**The staff survey was adapted from a questionnaire obtained from the Green Nephrology Network: <http://sustainablehealthcare.org.uk/green-nephrology/resources/2012/03/staff-recycling-questionnaire>*

2. Infrastructure

In October 2011, 70 corrugated plastic recycling bins were purchased and were placed in every anaesthetic room, and in recovery and staff rest areas of the three largest operating suites. Funding for the first 20 bins came from one of the Operating Department budgets, with subsequent bins paid for by Estates.

3. Measuring impact

In February 2012, four months after introduction of the new bins, the extent of recycling was assessed via a one-day waste audit conducted in the John Radcliffe (JR) main theatre suite.

On the day of data collection theatre orderlies were asked to leave all waste in a certain place so that it could be counted prior to placing in the large wheelie bins. At regular intervals throughout the day the bags were counted and the numbers of orange clinical waste bags and clear recycling bags were recorded. Black bin bags for domestic waste are only provided in recovery and staff rest areas (not in anaesthetic rooms or operating rooms), and these were not recorded. There were nine theatre lists running, and data was collected from 8am to 6pm during which time most of the elective lists had finished operating. In total there were 31 orange and 18 clear waste bags.

The average weight of an orange clinical waste bag was calculated by weighing 20 bags. Similarly, the average weight of a clear recycling bag was calculated from 10 bags:

- Orange clinical waste bag = 1.785kg
- Clear recycling bag = 0.87kg

Total waste produced on day of collection*:

- **Clinical waste** = 31 bags x 1.785kg = **55.335kg (78%)**
- **Recycled waste** = 18 bags x 0.87kg = **15.66kg (22%)**

**NB - this is likely an underestimate as some theatres would not have finished operating and deposited their waste by 6pm*

Cost savings

The main JR theatres run an average of 46 lists per week, which equates to 2392 lists per year. On the day of data collection there were nine lists running, so an average weight of the waste produced per list could be calculated:

- **Clinical waste/list** = $55.335/9 = 6.15\text{kg/list}$
- **Recycled waste/list** = $15.66/9 = 1.74\text{kg/list}$

By multiplying by 2392 an approximate value for the amount of clinical waste produced per year can be obtained:

- **Clinical waste per year** = $6.15 \times 2392 = 14706.81\text{kg} = \mathbf{14.70681 \text{ tonnes}}$
- **Recycled waste per year** = $1.74 \times 2392 = 4162.08\text{kg} = \mathbf{4.16208 \text{ tonnes}}$

Disposing of clinical waste costs £352 per tonne, compared with £35 per tonne for mixed recycling. Assuming that all waste that is currently recycled would previously have been disposed of as clinical waste, the financial savings over a year can be estimated:

- Previous cost of disposing clear bag waste (as clinical waste), per year = $4.16208 \times £352 = £1465.05216$
- Current cost (as recycled waste), per year = $4.16208 \times 35 = £145.6728$

Cost saving = £1319.38 per year

Carbon Savings:

Greenhouse gas (GHG) conversion factors for waste disposal were obtained from the *2011 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting* (Table 9d).

The GHG for incineration of clinical waste was taken as 1,833 kg CO₂e emitted per tonne of waste (DEFRA emissions factors for incineration do not specifically account for clinical waste, which is commonly undertaken at higher temperatures. To reflect the increased emissions that are likely to result from the incineration of clinical waste, the highest available emissions factor for incineration was applied).

The GHG for recycling of waste was taken as -302 kg CO₂e / tonne. This is based on conversion factors for paper (-157 kg CO₂e / tonne) and plastic film (-447 kg CO₂e). We assumed a composition by weight of 50% paper and 50% plastic to produce a combined conversion factor of -302.

Using these factors we estimated the GHG savings per year:

- Previous GHG emissions from disposing clear bag waste (as clinical waste), per year = $4.16208 \text{ tonnes} \times 1833 \text{ kg CO}_2\text{e per tonne} = 7,629 \text{ kg CO}_2\text{e}$
- Current GHG (as recycled waste), per year = $4.16208 \times -302 \text{ kg CO}_2\text{e per tonne} = -1,257 \text{ kg CO}_2\text{e}$

Saving = 8,886 kg CO₂e per year

Reasons for project:

The primary aim of the project was to reduce the carbon footprint of theatres whilst proving that the Trust could save money with minimal financial investment. The secondary aim was to encourage staff to challenge their own working practices using the paradigm of “reduce, reuse, recycle”. Whilst recycling of physical waste offers a *relatively* easy initial target, it is hoped that this project will lead to more ambitious ones, e.g. novel equipment and drug stock management (“reduce”), carbon footprinting care pathways (“reduce”).

The main benefits of the project are to the environment through the reduction in carbon emissions and pollution from waste incineration, to the Trust which gains an economic benefit by reducing waste disposal costs, and to the staff through their participation in a successful change management project. Indirectly this benefits the patient through the money saved, and via contribution to a healthy environment.

Barriers to implementation:

- Financial

Locating suitable bins for use in clinical areas and subsequently finding the money to buy them were the largest obstacles.

Many bins fulfilled the requirements of the Trust waste management policy (easy to clean, lidded, etc.), but proved too expensive. It was, eventually, one ODP’s visit to donate blood that proved fortuitous: she noticed that the National Transfusion Service were already using corrugated plastic bins for recycling in their clinical areas in Oxford – each bin cost £15 (eventually reduced to £8 with bulk ordering).

Despite these cheap bins, financial pressures within the Trust were a significant barrier. This, coupled to protectionism of departmental budgets, almost halted the project. Eventually, the initial purchase of 20 bins came from one of the operating department budgets, despite any return on investment going to the Estates budget. However, this proved to be the snowflake that started the avalanche – the volumes of recycled waste produced from one operating suite, were such that, the return on an £8 investment meant all subsequent bin purchases were made by the Estates department.

- Infection Control

Infection control is an ongoing barrier. The fear of placing contaminated waste into recycling bins has led to some being reluctant to even start segregating waste – especially within operating theatres. This is despite a permissive waste management policy coupled to education and support from Infection Control.

- Behavioural

Changing behaviours and workflows can be difficult. Some individuals were very early to change their waste disposal behaviour – they were either able to appreciate the financial implications or, more often, were simply transferring home behaviours to work. Often the example of these earlier

adopters shifted the behaviours of the vast majority of staff, especially those not initially identified as key, e.g. anaesthetists.

There still remain individuals who are averse to change and remain sceptical over the value of recycling. However, they are in the minority and there are no specific plans to address this group, unless they prove disruptive rather than passive in their opposition.

Ongoing plans to further embed the changes include displaying current recycling data for each operating suite in order to introduce an element of competition between them. This will drive us closer to the theoretical maximum of 40% of theatre waste (Hutchins & White, BMJ 2009;338:b609).

- Logistical

In some of the smaller anaesthetic rooms there is the issue of space for the extra bin. The essential problem being that the clinical waste bin is too large relative to the amount of clinical waste actually produced. An ideal long term solution would be to have a combined bin with capacities reflecting the relative amounts of different waste produced. However, in the meantime the bins are being moved into convenient positions as required.

Ongoing plans:

- Embed waste segregating behaviour in the operating theatres.
- Introduce competition between operating suites.

Negative outcomes (disbenefits):

None identified.

For further information, please contact:

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