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Central Delivery of Acid for Haemodialysis

By: Bradford Teaching Hospitals NHS Foundation Trust

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Positive outcome(s) of project:
Reduced acid wastage: only the actual acid required for any given treatment is ever used. Reduced solid waste: in 2008, 29,540 used canisters were disposed of as clinical waste. Saving on storage space and manual handling by nurses and porters: it is no longer necessary to transport 90 full canisters from ground- to first floor every day. Resilience to disruption of supply: the unit now has 3 weeks' supply of solution at any one time.

Savings per year:
£22,900 (Actual)

CO2 savings per year:
16.03 tonnes CO2e per year (Estimated)

Description:
The dialysis unit was previously supplied with 6 litre plastic cans of dialysate acid solution through weekly orders. These were delivered on pallets and could not be stacked to save on storage space.

The Problem:

1. Acid Wastage

As dialysis patients are prescribed different flow rates (either 800ml/min or 500ml/min) there is generally always an element of acid wastage. More so is this seen with patients on a 500ml/min dialysate flow with approximately 2.14 litres not used out of the 6 litre can per treatment. Throughout one year this equated to a total wastage to drain of 50,142 litres. When considering the total order for St Lukes was 147,700 litres for 2008, this amounted to a high percentage of waste.

2. Waste Disposal:

Empty canisters weighed approx. 143 grams and were disposed of via the clinical waste stream at a cost of £500 per ton. This amounted to an annual cost of approximately £2,363 per year.

The Solution:

In 2009, the renal technicians proposed a move to central acid delivery. This is acid delivered to a dialysis unit in bulk load through fortnightly/monthly deliveries and pumped into holding tanks (delivery frequency depends on the size of holding tanks installed). This acid is then distributed to all dialysis machines via a piped loop system with outlets at each dialysis station. They noted that all the dialysis machines in use had the capability to be retrofitted with central delivery acid systems at minimal expense.

The new two-acid, two-loop system was installed in 2011, at a cost of £40,000. This comprises a 7000 litre storage tank for the main acid solution, a 4000 litre tank for the low calcium solution, and a pressurised loop to deliver the acid to the dialysis machines. The Trust also paid an additional £3,900 for enabling works – a bund system connected to an outside drain, in case of leakage.

Benefits to the environmental sustainability of kidney care (section updated November 2012)

1. Reduced Acid Wastage

Using 6 litre cannisters, the average acid wastage per dialysis session for a patient on a 500ml/min flow rate was 2.14 litres. Throughout one year this equated to a total wastage to drain of 50,142 litres.

At £0.38/ litre, the predicted savings were £19,054 exc. VAT per year. Actual savings achieved were £19,372 per year.

Multiplying this cost saving by the emissions factor for pharmaceuticals (2012 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting, Annex 13) produces an estimate of carbon savings from avoided supply chain activities: 0.43 x 19,372 = **8,330 kg CO2e per year**

2. Reduction in packaging waste

29540 empty canisters were previously disposed of per year (in 2008), each weighing 142.6 grams, amounting to 4.2 tonnes of plastic waste per year. The carbon savings from avoiding disposal of this waste via the clinical waste stream can be estimated at

4.2 x 1,833 (life-cycle GHG emissions factor for incineration)* = **7,699 kg CO2e**

** 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 (Table 9d, 2011 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting)*

[Combined savings = 16.03 tonnes CO2e per year]

Financial appraisal

Investment: £40,000 for storage tanks and piping; £3,900 for enabling works. Total: £43,900.

Actual savings: £19,372 per year from reduced acid wastage; £3,700 from reduced waste disposal. Total: £23,072 per year.

Return on investment at 5 years:

((Total saving to date - total cost to date) / (total cost to date)) * 100

((£23,072 * 5 - £43,900)/£43,900) * 100 = **163%**

Location:
Renal Dialysis Unit, St Luke's Hospital, Bradford

Reasons for project: To reduce acid wastage, packaging and money

Partner:
Support from the Bradford Green Nephrology Local Representative, Dr John Stoves (consultant nephrologist)

Start date: 14/02/2011

Status: completed

Report published: Report published in the Trust newsletter ("Trust Today" March 2011, p8). Green Nephrology Awards 2012 - award entry poster available to download from http://sustainablehealthcare.org.uk/green-nephrology/resources/2012/09/green-nephrology-award-entries-2012-posters-d

Implementation costs: £40,000

Barriers in project implementation:
Storage space: the tanks are large and heavy. We were fortunate to find suitable storage space by relocating the stores of peritoneal dialysis fluid. There were no concerns about the capacity of the floor to withstand the load since it was a basement floor made from reinforced concrete. A bund was created to contain any potential leakage, connected to an outside drain.

Maintenance: there is no need to clean the tanks since the acid is sterile and is not open to the air (therefore no risk of crystallisation). The loop is also sterile, but is purged once per year as a precaution. An initial low pressure leak (dribble) from the loop was fixed in-house with no need to disconnect the patients from dialysis machines.

Investment costs: these were covered from the capital replacement budget, with 20% of savings returning to the renal department under the Trust's Cost Improvement Programme. The involvement of the procurement team was important to obtaining the best price for the acid system, since quoted prices varied from £40,000 to over £100,000.

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Green nephrology