

Healthcare waste disposal: an analysis of the effect of education on improving waste disposal

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Abstract. *Background:* Inappropriate disposal of clinical waste has a considerable environmental and financial impact. Other studies have shown substantial opportunities for improvement in healthcare waste disposal. This study aims to show these opportunities through a clinical waste audit and to gain a greater understanding into approaches required for successful waste disposal behaviour change.

Methods: A clinical waste audit was conducted in an eight-bed intensive care unit in Melbourne. A baseline audit was followed by a questionnaire and education (in-services and signage). A follow up audit was performed to analyse the effect of education.

Results: Results of the initial clinical waste audit showed 41% clinical waste, 44% general waste and 14% sharps waste. Post-education, clinical waste was slightly greater than general waste and sharps waste had markedly decreased to 3.5%, however, study limitations were present. The marked decline in sharps waste appears to mainly be due to the clarification of a misnomer regarding disposal of glass. Questionnaires showed a lack of knowledge but a desire to learn, and a preference for learning through signage and in-services.

Conclusion: The study shows that more than one in-service and increased signage is needed for successful behaviour change. This supports findings that active staff involvement is essential to achieve sustainable waste management.

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Introduction

The Victorian healthcare system produced 41 674 tonnes of waste in 2010 to 2011, of which 10% is clinical waste.¹ The approximate cost of disposing this clinical waste is \$11.3 million.² Clinical waste must be transported to a specialised facility for treatment, such as shredding and chemical disinfection, before disposal into landfill. It is widely observed among clinical staff in the healthcare system that waste disposed into clinical bins includes general and sharps waste. Clinical, sharps and general waste is defined as follows according to the Victorian guidelines. Clinical waste is material contaminated with blood or body fluids and any waste from patients with a known or suspected communicable disease.³ Sharps waste is defined as objects 'having sharp points or protuberances capable of cutting or piercing the skin or container in which they are packaged'.⁴ General waste is any waste not classified as clinical or biohazard waste.⁴ Disposal of general waste as clinical waste creates an unnecessary pressure on the environment and carbon emissions through its specialised treatment as well as additional strain on financial budgets. At the study hospital, clinical waste is 4.5 times more expensive to dispose of than general waste; however, this cost difference is lower than in other hospitals.⁵ Sharps waste

disposed as clinical waste creates an occupational health and safety issue to all employees handling waste.

Many healthcare organisations throughout Australia have undertaken waste management projects to monitor and improve appropriate waste disposal. Common approaches to improve waste disposal include education (at orientation and on the ward), changing the location and type of bins, improving signage, consultation, establishing waste representatives, teams or green ambassadors, establishing feedback pathways, and ongoing education and awareness.^{6,7} Studies have sought to understand barriers to sustainable waste management and methods for effective behaviour change. While there are few or no Australian studies, many studies have been conducted in the United Kingdom. Tudor *et al.* found key barriers to social change are staff habits, poor acceptance of waste issues, perceptions that all waste is infectious and perceptions of the waste issue being someone else's problem.⁸ Grose *et al.* found that bin locations and high turnover of patients produce competing pressures, making waste disposal not a priority.⁹ Tudor *et al.* and Nichols *et al.* argue that active staff involvement from motivated individuals in departments is necessary to change behaviour and that effective communication is essential to achieve

this.^{9,10} The Wesley Hospital (Qld) also found that effective communication with all involved staff is necessary for successful reduction of clinical waste (unpubl. data).

Some Australian hospitals have made significant reductions in their clinical waste. The Austin hospital (Victoria) reduced their clinical waste by 19% over nine months, the Children's Hospital at Westmead (NSW) reduced their clinical waste by 52% and Wesley Hospital (Qld) reduced their clinical waste by 60% over two months. Common approaches for the reduction of clinical waste within these hospitals are as identified in the previous paragraph. The waste reduction figures are encouraging as they demonstrate substantial opportunities for improvement. Despite this, there are few published healthcare waste audits in Australia. Therefore figures showing percentages of clinical, general and sharps waste in clinical waste bins are not available. Thus, it is not possible to quantify previous and ongoing opportunities for improving waste disposal.

This study aims to quantify the opportunities for sustainable waste management through a clinical waste audit. It also aims to gain further understanding into approaches required for successful waste disposal behaviour change.

Method

Participating subjects

Participants comprised all clinical staff in the intensive care unit (ICU) at a metropolitan private hospital, Melbourne. The ICU contains eight beds and is staffed by 6 medical registrars, 32 permanent nurses, 16 nurses employed casually by the hospital and a varying number of agency nurses. Cleaners and orderlies were not included in the study as they produce minimal waste.

Ethical approval

The study was approved by the hospital's Human Research Ethics Committee. The study was also approved by the ICU nurse educator, Director of Clinical Services, Group Manager Occupational Health and Safety, and Hospitality Services Manager. Participants were informed of the study at the monthly staff meeting, through an information sheet left at the main desk and through periodic reminders during unit handover. The information sheet informed staff of participant confidentiality.

Study design

Pre audit

Clinical waste audits were performed at the end of May 2012 over one week on Monday, Tuesday, Thursday and Saturday. Each audit involved analysis of the waste from the previous 24 h period. To minimise accidental co-mingling of waste from other departments the clinical waste bin was brought down from ICU to the waste storage area just before conducting the audit and the bin was labelled 'ICU'. Each bag was weighed and then sorted into clinical, general and sharps waste. Sharps were disposed straight into a sharps container.

Personal protective equipment was worn for safety. Bags containing gowns used in isolation rooms were classified as waste from infectious rooms. To minimise exposure to infectious material, waste from infectious rooms was not analysed. After waste separation, the clinical and general bags were weighed and then disposed back into the clinical waste bin.

Questionnaires

During the second week participants were encouraged to fill out an anonymous questionnaire. Questionnaires were left at the nurses' desk with an information sheet about the study. To gain maximum participation in the questionnaire the study and questionnaire was discussed in the monthly staff meeting at the beginning of the week, the questionnaire was intermittently handed to staff during unit handover and the nurse in charge intermittently informed staff of the study and questionnaire.

Education

The study focussed solely on the effects of education on behaviour change as resources were limited with regard to time and number of investigators. The third week focussed on education through increased signage and in-services. Seven A4 waste segregation posters were placed in strategic places around the unit (bed cubicles, above the blood analyser machine, above a hand washing sink and at the main desk). These posters defined clinical, general and sharps waste. In-services were conducted on Monday, Tuesday, Thursday and Friday. On these days two in-services lasting ~15 minutes targeted day and night staff. The in-service covered audit results (percentage of clinical waste in clinical bags, and types of general and sharps waste found in clinical bags), definition of clinical waste, importance of correct disposal and the additional waste segregation posters.

Post audit

During Week 6 a second waste audit was conducted using the same method as the pre-audit.

Results

Pre-audit

The initial audit analysed 42.3 kg of clinical waste (Fig. 1). An extra 1.8 kg of clinical waste was generated from an infectious room and therefore was not analysed. General waste was slightly higher than clinical waste, and sharps waste was a substantial 14%. Clinical waste mainly consisted of syringes of blood, blood-stained dressings and intravenous tubing containing blood. General waste mainly consisted of packaging, intravenous tubing, fluid bags and hand towels. There were also odd items such as a box of tissues and a nappy. Sharps waste mainly consisted of 500 mL Albumex glass bottles and intravenous fluid bag spikes. Vacutainer blood collection needles, scissors and intravenous drug glass bottles were also present. Some fluid bags (100 to 1000 mL) and

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