Pollution Prevention in Hospitals

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Introduction

The cost of waste has become a big part of the cost of doing business. In many cases, the value of the material that becomes waste has not been included in the cost of waste. However, the value of the material is the largest component of the total cost of waste. Tracking the cost of waste as a component of the cost of doing business is in the best interests of all organizations. This is a study of waste at a rural hospital. Much of the waste from a medical facility is designed for single use and subsequent disposal. However, ensuring that what is purchased is received, and that the material purchased is used for the intended purpose offer the potential for significant savings.

Summary and Recommendations

The following table contains the recommendations resulting from an evaluation of a small rural hospital and an estimate of the expected effectiveness of each recommendation in reducing waste (both use of material and cost of disposal). Additional explanation is provided in the following pages.

Table 1 Recommendations

Recommendation	Potential Savings	Effort Required
Include waste issues in the in-service training required of every employee.	High	Medium
Evaluate the alternative technologies for disinfecting infectious wastes and talk with the suppliers of this equipment.	High	Medium
Re-evaluate the solid waste disposal contract to increase the utilization of the dumpster and optimize pickups.	High	Medium
Account for waste and the cost of waste as a function of departmental activities.	High	High
Establish commitments in supplier agreements to enlist their aid in reducing product use and waste. Track performance under these commitments.	High	High
Investigate energy saving options.	High	High
Spot check items received from suppliers.	Medium	Low
Develop a tracking system for waste generation with incentives for improvements.	Medium	Medium
Contact the Community Recycling Services with the idea of collecting cardboard to judge the potential for reducing the solid waste stream through recycling.	Medium	Medium
Consider reusable items with contracts for off-site cleaning.	Medium	High
The character of the waste from the pharmacy and the Chemo Containers should be investigated. All unused pharmaceuticals and empty containers should be returned to the suppliers.	Medium	High
Evaluate the placement and number of receptacles including recommendations from the users.	Low	Low

The Cost of Waste Disposal

The single biggest potential for reducing the cost of waste is to prevent material from becoming waste. In the health care industry, ways to reduce waste generation are limited. For this reason, disposal cost becomes a major component. Present disposal cost is outlined briefly here as a backdrop against which recommendations presented later can be evaluated.

Infectious waste disposal - The average rate for disposal of infectious waste for Fiscal Years 1995 and 1996 was $0.27 per pound.

Table 2 - Infectious Waste Disposal Rates

	Pounds	Cost	Rate $ per pound
*FY 1997	40,212.00	$ 14,286.90	$ 0.36
FY 1996	108,016.68	$ 26,257.92	$ 0.24
FY 1995	104,678.27	$ 28,222.36	$ 0.27
Average	252,906.95	$ 68,767.18	$ 0.27

*** FY 1997 partial year**

The deviation in the partial FY 1997 data probably results from some FY 1996 waste charges being paid in FY 1997. If this is the case, the actual rate for FY 1995 and 1996 would be higher than illustrated here and the rate shown for FY 1997 would be lower. This information is based on the hospital safety committee reports on infectious waste. Since these data do not match the expenditure with the time the service was provided, the cost per ton varies from month to month.

Solid waste disposal - The components of the solid waste disposal charges include a monthly rental for the 30 cubic yard compacting dumpster of $300, a haul charge of $140 on a seven-day pickup cycle, and a disposal fee of $22.25 per ton.

General Waste Reduction Options

Check Purchased Material - It is important for users to check the material received from suppliers to insure that the purchased quantity is actually received. For example, if the contractor laundering linen charges based on his count of the items returned for use and overestimates, the hospital will be overcharged.

Even prepackaged items can be short. A spot-check on new items purchased to insure that when the package says 100 each it contains 100 items can be effective in spotting waste. Even slight deviations can add up to significant cost.

> Recommendation - Spot check items received from suppliers to insure the hospital is getting what it is paying for.

Employee Training - An employee with disposal options will place an item to be thrown away in the closest receptacle. This is true whether the item is recyclable and the closest receptacle is a trash container or the item is trash and the closest receptacle is designated for infectious waste. Without training, the employee will use the least effort required to dispose of waste and rationalize that as a savings to the organization. Training provides the motivation to change this behavior.

The key to encouraging employees to act responsibly in their disposal practices is three fold:

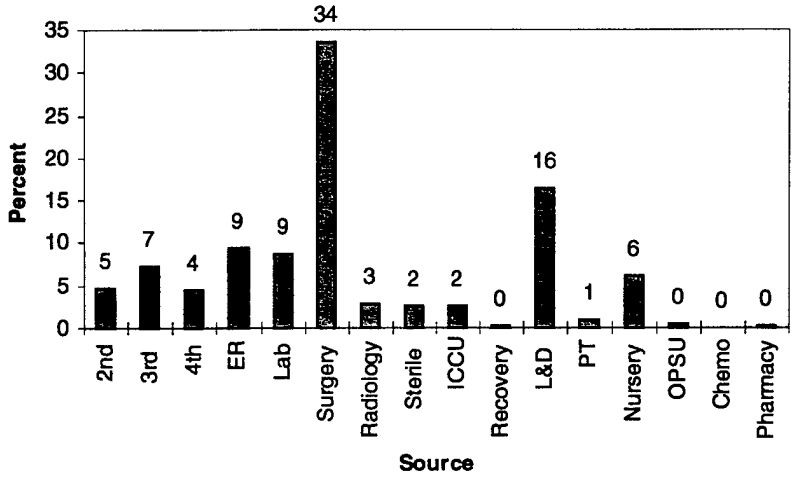
- Promote proper practices by making the receptacles conveniently available.
- Inform by training employees of the importance of proper disposal. It is as important to stress the need to keep non-infectious materials out of the infectious waste as it is to stress the importance of infection control and the proper segregation of infectious waste.
- Reward employees by providing incentives for improvements. This means measuring improvement and tracking problems limiting improvement.

> **Recommendation**: Include waste reduction issues in the in-service training required of every employee. Evaluate the placement and number of receptacles including recommendations from the users. Develop a tracking system with incentives for improvements.

Cost Allocation - The cost of waste includes the value of materials not used as intended in the care and treatment of patients, as well as, the cost of disposal. Departmental material cost are frequently applied back to the department needing the material. For example, it is clear that the cost of infant diapers should be charged against the budget for the nursery. Why then should the cost of disposing of dirty diapers be subsidized by the rest of the hospital?

Tracking and charging waste cost back to the appropriate department allows that department manager to focus on this issue like other budget items and increases the incentive for reducing that cost. The following figure illustrates available information on infectious waste generation by area.

Sources of Infectious Wastes



It is clear that Surgery and Labor and Delivery generate the bulk of the infectious waste and will probably be the best areas to focus a program to reduce the waste generated.

> **Recommendation** - Develop a method of accounting for waste and the cost of waste as a function of the departmental activities and use that information to allocate the cost of waste to the department generating it.

Packaging Reduction - Packaging waste can be reduced by ordering materials in reusable containers. An example would be anesthetic gases typically delivered in cylinders that are returned and refilled repeatedly. Applying this concept to other commodities can result in savings. For example, supplies (excluding sterile items) delivered in bulk rather than individually wrapped would reduce disposal of packaging waste. In fact, packaging for items that become infectious waste often end up in the infectious waste even though they are not infectious.

Work with Suppliers - Considerable waste reduction can be accomplished by working with suppliers to limit the amount of waste. The purchasing agents motto in years past has been that the more suppliers the better to keep prices down. In reality, this very practice can encourage waste and limit the hospitals ability to take control of its own waste generation. By developing a partnering relationship with suppliers, contracts can be used to encourage suppliers to show you how to use less of their product. For example, in return for an exclusive contract to supply syringes, a supplier could be asked to show the hospital how to use the mix of his product lines to reduce the amount of waste and cost of the material. The contract would set a goal based on cost and/or waste reduction that if not met would trigger reevaluation of the contract. Another benefit is that reducing the number of contracts will also reduce the time and effort needed to manage purchasing. Another example might be to evaluate reusable vs. disposable items. Off-site cleaning contracts like for laundering linen could provide the constant source of quality clean supplies at a lower cost.

Return to the Suppliers - A particularly useful technique to reduce waste at the hospital is to enter an agreement with suppliers to return any unused portions of materials purchased. This is particularly appropriate in the Pharmacy for expired or no longer needed pharmaceuticals. Damaged materials that cannot be used for patient care should also be returned. Items such as sponges and syringes, even if not contaminated, are still disposed of as medical waste since they may appear contaminated to the general public.

> **Recommendation** - Establish agreements with suppliers to enlist their aid in reducing material use and waste. Establish commitments in supplier agreements, and track performance under these commitments. Suppliers will have the most and best information on the use of their products. Consider reusable items with contracts for off-site cleaning.

Energy/Utilities Waste Reduction - The local power company has completed a comprehensive review of energy use at the hospital and presented several options for improving energy efficiency. The hospital is also working with Johnson Controls to develop specific alternatives for improving energy efficiency. Based on past experience, the potential for savings in the energy related areas can be high.

Significant savings are possible by effective energy management in hospitals. A hospital in Elkhart, Indiana saved over $100,000 per year on electrical energy with an initial investment of $85,000. Although the Elkhart hospital is a larger example, significant savings should be available through energy waste reduction.

Infectious Waste Cost Containment Options

As indicated under the Cost of Waste, infectious waste is the costliest waste for the hospital. The cost for disposal of this waste is also escalating faster than for other wastes. Training and allocation of costs to the generating departments have the greatest potential to generate savings. Other options that render medical waste safe for disposal in local landfills are discussed below.

Alternate Disposal Technology - The Electric Power Research Institute (EPRI) has published information on technologies to disinfect infectious waste and allow disposal in a sanitary landfill. Some of the technologies handle both sharps and other "red bag" wastes. Others are applicable to only one. This is particularly the case with technologies that handle only sharps. In order to properly evaluate the potential savings from these technologies, the portion of the waste represented by sharps must be known.

Sharps - A product known as a "needle-eater" is available for about $1,000. The product will render 75 to 150 syringes sterile and unrecognizable in a single container that can be disposed of with solid waste. Supplying 5 of these devices for use in the hospital would cost about $5,000. If sharps are only 10 percent of the medical waste poundage, the savings would be $2,500 to $3,000 per year. In addition, fewer red sharps boxes would be used.

Technologies vs. Types of Waste Treated

Technology	Biohazardous	Sharps	Chemotherapy	Cytotoxic	Pathology	Hazardous Chemicals	Laboratory Waste	Pathogenic Waste	Solid Waste (pouch liners)
Bio-Oxidizer	X	X	X	X	X	X	X	X	X
Demolizer	X	X	X	X	X		X		X
Pyroxidizer	X	X	X	X	X	X	X	X	X
TAPS Processor		X							
DSI 40 and DSI 2000		X							
dispoz-all 2000	X	X		X	X		X		X
MedAway-1	X	X		X	X		X		
Redloc System	X	X		X	X		X	X	X
Mark 1	X	X		X	X		X		X
EcoCycle 10	X	X		X	X		X		X
Isolyser Products	X	X				X			
Medzam	X	X	X		X	X	X		
Needle Eater		X							
Ster-O-Lizer	X	X		X	X		X		X

As an estimate of the sharps volume, a box of commonly used 3 cc syringes was determined to weigh about 2 pounds. The most commonly used red sharps box weighs about 2 pounds. An average of 48 such boxes is purchased per month. A red sharps box is estimated to hold over 2 boxes of used syringes. If 48 red sharps boxes are purchased per month, a like number on average will be sent to disposal. Based on this information, about 48 red sharps boxes are disposed of each month weighing about 7 pounds each accounting for a total of 336 pounds per month or 4,032 pounds per year. At a disposal cost of $0.28 per pound, the estimated cost for disposal would be about $1,130 per year. The volume of sharps would be higher since other types are placed in the same containers.

This evaluation does not include the cost of the disposal containers to receive the sharps, the disinfectant agent or the cost of solid waste disposal for the disinfected material.

Red Bag Waste - All of the alternatives that will handle portions of the infectious waste stream will also handle sharps. Some limit the volume of fluids or certain types of wastes. One device is the Dispoz-All 2000. The manufacturer recommends this unit for all infectious wastes except Chemotherapy and pathology wastes. In addition, the unit is not suited for disposal of hazardous chemicals. A unit that processes about 5 cubic feet in about 25 minutes costs about $59,500. If such a unit could process all of the infectious waste presently generated, the savings would pay for the unit in less than two years based on the cost of infectious waste disposal for fiscal years 1995 and 1996.

> **Recommendation** - Evaluate the alternative technologies for disinfecting infectious wastes and talk with the suppliers of this equipment. Adopting a plan to disinfect the waste at the hospital will help stabilize if not reduce disposal cost.

Contract Alternatives for Disposal - Any change in the handling of infectious waste will result in changes in the contract with the present disposal company. Significant reductions in the amount to be picked up can result in a dramatic increase in the cost per unit. The cost of backup medical waste disposal and the increase in solid waste disposal fees should be considered in any decision to make a change.

Solid Waste Cost Containment Options

Solid Waste Pickup Options - Based on the disposal cost as reported under "Cost of Waste", the cost of solid waste disposal is not as large as that for infectious waste. But because the waste is not infectious, options are available that do not apply to infectious waste. Based on the billing information provided, 3 - 4.5 tons per load are removed once per week in the 30 cubic yard compactor. A commonly used bulk density for uncompacted municipal waste (similar to hospital solid waste) is 150 pounds per cubic yard. A compactor should decrease volume by a factor of 3 to 5 on this type of waste. Therefore, the 30 cubic

yard container should hold up to 2.25 tons uncompacted or a maximum of 11.25 tons with a 5 to 1 compaction ratio. Based on these calculations, the 30 yard compacting roll-off is being used at less than half capacity. Contracting for a smaller container at a lower cost and/or converting to a dumpable container to reduce the $140 per trip haul fee could save a significant amount on a yearly basis.

Contracting with the present waste hauler for a smaller or dumpable container may not be possible because the local city offers that service exclusively within the city limits. Waste pickup service may be available at a lower cost from the city.

> **Recommendation** - Re-evaluate the solid waste disposal contract. The present 30 cubic yard roll-off is underutilized. Depending on the rates going to a smaller container that can be loaded to a truck at the hospital will reduce the cost even if a more frequent pickup schedule is needed. Consider contracting with the city for waste pickup.

Recycling - The hospital does not have an official recycling program in place. Typically, the revenue generated by recycling programs does not cover the cost. However, when reduced, disposal cost and public relations benefits are included, a net cost reduction may be possible.

The University of Tennessee estimates that a 100 bed hospital will generate about 4 tons of cardboard, 1.5 tons of paper, and 2 tons of plastic per month. During March and April 1997, eight solid waste pickups yielded a total of 29.7 tons. If 13 tons were paper and cardboard, they represent 44 percent of the total solid waste. EPA estimates that paper and cardboard is about 40 percent of municipal waste. For each ton removed from the waste stream by recycling, the disposal cost of $22.25 will be saved. Further, with each reduction in total waste, the need for a device as large as the presently underutilized 30 cubic yard roll-off is reduced.

The community has a relatively new recycling program called the Community Recycling Services. The program is based on a site near the hospital. The project is still developing but recyclables are being collected and containers to collect recyclable materials may soon be available.

Certainly, recycling should not take the place of source reduction. However, recycling things like cardboard and paper can be easily implemented and the result can be a savings in tonnage, in the number of pulls per month, and in the type equipment needed.

> **Recommendation** - Contact Community Recycling Services with the idea of collecting cardboard initially. Some training and a few weeks experience should demonstrate the viability of recycling. If successful, recycling can be expanded to include white and/or mixed paper and other recyclables.

Hazardous Waste

According to the Safety Committees record, the only hazardous waste generated is the pharmacy. This amounted to 288 pounds in Fiscal Year 1996. This material was disposed of with the infectious waste. The character of the waste from the pharmacy should be investigated. Unused pharmaceuticals should be returned to the suppliers. Alternative disposal methods for the chemo containers should be investigated. The laboratory may also be an unrecognized source of hazardous waste. The disposition of hazardous chemicals from the laboratory should be investigated.