Solutions to Health Care Waste: Life-Cycle Thinking and "Green" Purchasing

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Health care waste treatment is linked to bioaccumulative toxic substances, such as mercury and dioxins, which suggests the need for a new approach to product selection. To address environmental issues proactively, all stages of the product life cycle should be considered during material selection. The purchasing mechanism is a promising channel for action that can be used to promote the use of environmentally preferable products in the health care industry; health care facilities can improve environmental performance and still decrease costs. Tools that focus on environmentally preferable purchasing are now emerging for the health care industry. These tools can help hospitals select products that create the least amount of environmental pollution. Environmental performance should be incorporated into the evolving definition of quality for health care. *Key words*: environmentally preferable purchasing, green purchasing, health care, hospital, life cycle, pollution, purchasing, supply chain management, waste. *Environ Health Perspect* 109:205–207 (2001). [Online 14 February 2001]
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It is difficult to categorize health care professionals who work with environmental issues. Some concentrate all of their time on environmental health issues, and some juggle other responsibilities such as housekeeping and safety; some facilities have recycling programs, and some do not. The amount of waste generated and where the waste is being treated are known for some health care facilities but not for others. The American Hospital Association and U.S. Environmental Protection Agency have set goals to reduce both the volume and toxicity of wastes by 2010. Are these goals sufficient to deal with the environmental problems associated with our modern health care industry?

Currently, medical waste incinerators are ranked among the top four sources for dioxin and anthropogenic mercury emissions in the United States (*1*,*2*). These contaminants are capable of traveling long distances and can be easily transferred between air, land, and water (*3*).

According to estimates from the early 1990s, medical waste is generated at a rate of 3.5 million tons per year (*4*). This statistic is amplified by the increasing prevalence of home health care, which currently generates waste at about 50,000 tons per year (*5*). With proper waste segregation practices, roughly 15% (by weight) of hospital waste can be classified as infectious, requiring treatment before disposal (*6*). To reduce its infectious potential, hospitals in some regions treat much of this waste. Although many treatment options exist, over the years hospitals have chosen medical waste incinerators to treat wastes. This infectious segment of the health care waste stream is called by many different names; however, for this discourse it will be referred to as "medical waste." In this paper, the term "health care waste" refers to all of the waste that is produced through health care activities.

The link between health care waste and pollution is not readily apparent. The issue is highly complex and sometimes controversial. It includes a web of relationships and decisions encompassing product suppliers, health care workers, and hospital waste treatment choices. Pollutants with the potential to have harmful effects on human health have been identified with health care waste. Two of these substances, mercury and dioxin, have been detected in significant amounts in air and ash emissions from medical waste incinerators (*7*).

Some health care facilities, recognizing the links between human health and the environment, are implementing precautionary plans of action to improve their environmental performance. In essence, the precautionary principle states, "better safe than sorry." Or, in terms more appropriate for health care facilities, "an ounce of prevention is worth a pound of cure." According to this approach, some risks should be avoided, especially where the level of scientific uncertainty is high and knowledge in the area of concern is limited (*8*).

To acknowledge the problem and publicly address the solution, in June 1998 the American Hospital Association agreed to work with the U.S. Environmental Protection Agency, using a memorandum of understanding to set goals for waste volume and toxicity reduction. Two key points of this memorandum of understanding are a 50% reduction in volume of all wastes by 2010 and the virtual elimination of mercury from health care facilities by 2005 (*9*). This agreement addressed not only volume reduction of health care wastes but also toxicity reduction. Toxicity reduction is the more important of the two because adverse impacts on human health have been demonstrated for several pollutants associated with health care wastes. Volume reduction can lower disposal costs and result in smaller amounts of waste that require special treatment such as incineration or autoclaving, which contribute to various forms of pollution.

Life cycle considerations. The life cycle concept is useful when assessing the environmental impacts of medical products and services. Life cycle assessments of products and services provide a description of the environmental effects of the product or service and its materials during manufacture, distribution, use, and end-of-life or disposal.

Many environmental issues currently associated with health care are directly related to waste generation patterns and disposal methods. Most health care administrators now address only the costs directly related to waste disposal. These costs are associated with collection, transport, treatment, and disposal of waste. Many health care administrators have realized that the waste generated in their facilities can have indirect impacts on human health and the environment after disposal. The immediate hazards associated with disposal of medical products are obvious because the waste presents a practical problem. However, end-of-life is only one of several stages in the life cycle of a product where costs are incurred; indirect costs can also be incurred during the manufacture and use of a product.

The key tasks for health care professionals who wish to improve their facilities' environmental profiles include reviewing by-products of waste disposal methods and developing criteria for environmental screening of products. In the United States, the current purchasing effort lacks environmental criteria in the decision-making process. The prime factors traditionally considered in purchasing decisions include cost, quality, efficacy, and availability.

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Personnel responsible for procuring health care products and services (materials managers or purchasing agents) come from varying backgrounds. Many have worked in auxiliary fields within health care such as nursing or another technical skill area, or they may have business or legal backgrounds to effectively handle finance and contracts. Environmental background or training is not a prerequisite for the individuals responsible for securing health care products and services.

The overall health care supply chain management process should be revised to incorporate other criteria that directly link product selection, product use, product disposal, and environmental and community health impacts. Further, product acquisition should also include the evaluation of upstream life cycle steps in terms of resource use, energy demands, and global impacts. Without this holistic perspective, the industry charged with promoting health and healing contributes to environmental problems, which in turn adversely impact human health.

Environmental education in health professions. The gap in the knowledge of the environmental impacts of health care products and services underscores the need for increased understanding among health professionals of the integral links between human health and environmental health. The average physician receives little if any occupational health training in medical school (*10*). A 1994 survey of medical school deans indicated a "minimal" emphasis on environmental education (*11*). Nurses are in a similar situation, with curricula in nursing programs that normally do not include environmental education. This educational gap is particularly problematic because it concerns not only the potential impacts of health care product choices but also the understanding of contributing factors to disease processes. Some researchers claim that 40% of deaths worldwide "can be attributed to various environmental factors, especially organic and chemical pollutants" (*12*). Environmental information should be integrated into the education of health care professionals to match the changing trends in disease and illness and to increase their consciousness of appropriate use and disposal of resources.

Perspectives on risk. Few hospitals in the United States have made the commitment to employ full-time environmental managers or waste managers, despite the fact that health care has evolved into one of the most intricate organizations and has an extremely complex waste stream. Solid waste, medical waste, hazardous waste, radioactive waste, recyclable waste, compostable waste, controlled-substance waste, confidential paper waste, and construction and demolition waste are all created at health care facilities in the process of supporting patient care services.

Looking into the future, the evolution of the complexity of health care waste streams will proceed at an even more rapid pace. New materials, new technologies, and new power sources will emerge. The disposal options for these new products and technologies will barely keep pace with the latest innovations in health care. The regulatory milieu that has evolved in health care settings is staggering, with more than a dozen regulatory agencies imposing requirements on even the smallest facilities. Life cycle thinking, from a design and purchasing standpoint, holds the promise of decreasing environmental risks and costs.

Upstream Tactics: Environmental Purchasing for Health Care

By focusing its activities upstream, a health care facility can reduce the environmental impacts of the products and services it uses before regulatory problems arise or waste disposal costs increase. Upstream activities usually focus on reducing environmental impacts of products and services and where they come from instead of managing these impacts after they have occurred. For example, reducing mercury emissions by purchasing mercury-free products is an upstream tactic. Solving environmental problems will require a broader view, one that requires professionals from different areas of health care to work together to meet the challenge. Effective action to eliminate persistent bioaccumulative contaminants will require proactive activities such as engaging product manufacturers and waste treatment processors. Purchasing approaches bridge gaps by providing a dialogue within the supply chain on environmental attributes.

One promising channel for action is through purchasing. This approach, which has been used to shift U.S. government agencies toward using environmentally preferable products (*13*), has yet to permeate the health care industry. Health care facilities can use "green" purchasing initiatives to secure environmentally preferable products.

One important caveat of the purchasing approach is that alternative products must clearly be shown to have superior environmental performance. For example, a polyolefin intravenous (IV) bag does not contain chlorine, so it has less potential to produce dioxins through incineration than an IV bag containing polyvinyl chloride (PVC). It is also imperative that the alternative product has equal or superior clinical performance. For instance, a recent comparison of polyolefin and PVC platelet storage containers showed "no consistent differences" in the parameters observed (*14*).

Negotiating with product suppliers. Many health care facilities work with at least one group purchasing organization (GPO) to secure lower prices by buying products along with a group of hospitals. By clearly communicating to GPOs and other product vendors the desire for environmentally preferable products, facilities can alter the composition of the products they buy. For example, if a facility chooses to invoke the precautionary principle by minimizing the use of PVC IV bags, it can seek contracts with suppliers who make non-PVC IV bags.

A health care facility can negotiate with GPOs and suppliers to identify products the facility deems problematic and to find alternative products. Catholic Healthcare West (Phoenix, AZ), for example, incorporated the following points, and others, into its newly created partnership with Premier (San Diego, CA), a large GPO: *a*) Premier will assist Catholic Healthcare West in identifying products that contain mercury and PVC; and *b*) Premier will communicate to manufacturers the desire for environmentally favorable products (*15*).

Changing purchasing policy. Facilities can also stimulate the purchase of environmentally preferable products by mandating certain practices in their purchasing policy. Butterworth Hospital (now Spectrum Health) in Grand Rapids, Michigan, adopted a purchasing policy that required the purchase of mercury-free products whenever possible. The hospital switched to mercury-free blood pressure gauges and stopped sending mercury thermometers home with new mothers (*16*). This formal commitment to environmentally preferable products is a powerful example of "green" purchasing practices.

Evaluating medical products. Changes in purchasing policy are easy to make if the benefits are clear and the costs are minimal (e.g., replacing mercury thermometers with mercury-free thermometers). If a health care facility desires to move toward integrating environmental criteria into purchasing decisions, it may benefit from the use of a decision support tool, such as the assessment of the environmental impact of a medical product through all of its life cycle stages—manufacturing, packaging, distribution, use, and end-of-life.

In the United States, decision support tools such as quantitative supplier assessments are not widely available to health care facilities that wish to evaluate the environmental profiles of the products they purchase. As part of a research team at the University of Wisconsin-Madison, we recently completed testing of newly developed "Health Care Environmental Purchasing Tool" at nine health care facilities. The results

of this study have not yet been released, but indicate that the capacity to incorporate environmental changes needs to be expanded. This expansion can happen through increased environmental awareness and toxic-specific education.

Downstream Tactics: Waste Management

There are many other opportunities for the health care industry to assess and improve its environmental performance while reducing costs. These opportunities downstream of the health care facility involve waste treatment. Some facilities have implemented recycling programs, segregating their waste streams for optimal end use such as recycling and materials recovery (*17*). In addition, other facilities have instituted upstream programs to prevent pollution, such as focusing on reducing mercury use. Reducing mercury emissions by installing pollution control equipment such as mercury traps in drains can be considered a downstream tactic.

Beth Israel Medical Center (New York, NY) has a program to rigorously reduce the amount of solid waste going into the designated "red bags" for biohazardous waste. This effort saves the hospital $900,000/year in disposal costs by reducing the amount of waste that must be treated (*16*). Albany Medical Center (Albany, NY) distills waste chemicals for reuse, saving $250,000/year in chemical disposal and purchasing costs (*16*). Naples Community Hospital (Naples, FL) switched from incineration to autoclaving of medical waste, thus reducing disposal operating costs by more than 80% and improving its relationship with the community (*16*).

The Medical Center Hospital campus of Fletcher Allen Health Care in Burlington, Vermont, implemented a recycling collection and education program to recover over 20 materials, from glass to stretch wrap and kitchen grease. Food waste from the hospital cafeteria is composted at a nearby farm; the end product is used to enrich the soil of organic vegetable gardens belonging to a nonprofit foundation. Blue wraps were donated for reuse in veterinarian clinics and collected for recycling. The hospital saved between $18,000 and $20,000 annually for the first years on avoided landfill fees (*18*).

Conclusions

The health care industry is in a state of rapid change, with a multitude of internal and external factors driving the changes. As new priorities and technologies are created, new guidelines for environmental performance and efficiency must be introduced. Health care is responsible for the generation of two particularly harmful pollutants that adversely affect human and environmental health. These pollutants, mercury and dioxin, largely result from product and waste disposal. The irony in this situation is that the majority of health care providers and professionals are unaware that this problem exists; thus they focus mainly on recycling programs and compliance with waste regulations.

The necessary management transitions will not be easy, but other industries, such as the electronics and chemical sectors, can be used as models for health care. Like these other industries, health care can deal with environmental issues in a systematic way. How much waste is generated? How much water does the facility use, and what is the quality of the wastewater effluent coming out? How much energy does the facility consume, and do opportunities exist to eliminate unnecessary uses of energy? What types of pollutants are a result of care delivery and operations? All of these concerns are really part of a total quality effort in which health care organizations comprehend their role in the community, including the benefits they have to offer and the liabilities they may be creating. Some of the tools available to health care include environmental purchasing tools, environmental management systems, and waste management programs. Hospital administrators should look to good management techniques, with firmly set goals and effective metrics, to monitor progress and ensure success.

Current social and technical forces will continue to offer administrative challenges to delivering quality care. Health care is a unique sector with many commitments, including support of community health. Most communities cherish access to quality health care and list it among the most valuable attributes of their community. Some boards of health care organizations are increasingly being held accountable for the health of the community. Part of that accountability includes the environmental performance of the organization.

Optimizing solutions to environmental issues in the health care industry requires holistic approaches that incorporate not only health care facilities but also the supply chain and end-of-life disposal strategies. This means understanding environmental outputs and inputs and identifying opportunities to provide better service and quality care in a cleaner, greener way. In the creative reconstruction that seems to typify current health care, it is necessary to shift the focus of environmental issues away from disposal costs alone to a focus on broader systems. We do not suggest that the quality of health care should be sacrificed for the environment. Incorporating environmental performance is part of the natural evolution of quality in health care.

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