

Making Health Care Healthier:

A Prescription for Change



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When people are sick, all they want is to feel better, so they go to a doctor, clinic, or hospital for help. But sick people may get more than they bargain for when seeking treatment. “[T]hreats to patients’ health often can be found within the health care setting itself,” writes registered nurse Ann Melamed in the November/December 2000 issue of *Nursing World*. Problems can be triggered by exposure to indoor air pollutants, mercury, latex, polyvinyl chloride (PVC), disinfectants, laboratory chemicals, and hundreds of other substances integral to medical care. Exposure to agents such as these is enough to make both vulnerable patients, who often have weakened immune systems, and health care employees, who are continually exposed, quite literally sick.

A treatment—if not a cure—may be in sight. Pollution linked to health care facilities has drawn both interest and subsequent regulation in the past few years. Medical waste has been in the public eye for more than a decade, spurred in part by sightings of discarded syringes washing up on beaches. Federal and state regulations now apply to medical waste incineration, and numerous programs target reductions in medical waste. Latex allergies, which affect many patients and health care industry employees, are being addressed through a variety of alternatives and changes to medical procedures. Many health care organizations are moving to reduce problems associated with

mercury contamination. And around the United States, a number of projects are being undertaken to improve the environmental quality of health care facilities as well as minimize the risk of adverse exposures inside them.

Faulty Facilities

According to the U.S. Environmental Protection Agency (EPA) Office of Radiation and Indoor Air, indoor air pollution in buildings of all types ranks among the top five environmental health risks to public health. The EPA’s list of potential culprits includes tightly sealed buildings, reduced ventilation rates, mold contamination, synthetic building materials and furnishings, and chemically formulated personal care products, pesticides, and cleaning supplies. Many, if not all, of these problems exist in health care facilities as well. For some people, exposure to contaminated indoor air can lead to short-term health problems such as headaches, dizziness, difficulty thinking, fatigue, and irritation of the eyes, nose, and throat. Longer-term

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problems may include respiratory disease, heart disease, and potentially even cancer.

While the evidence of indoor air quality problems in buildings of all types is accumulating, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) addresses only a few of these issues in its review of thousands of hospitals that voluntarily participate in the accreditation process. JCAHO accredits about 5,000 hospitals and another 14,000 facilities including laboratories, ambulatory care centers, and long-term care facilities. ratings by JCAHO can be important in issues such as Medicare certification, state licensure, liability insurance premiums, managed care contracts, and bond ratings. Of about 500 criteria for a hospital, just a handful at most deal directly with indoor air quality. For instance, JCAHO generally checks the design and management of utilities so that they function in accordance with standard industry guidelines for such factors as air exchange rates, filtration efficiency, and other standards.

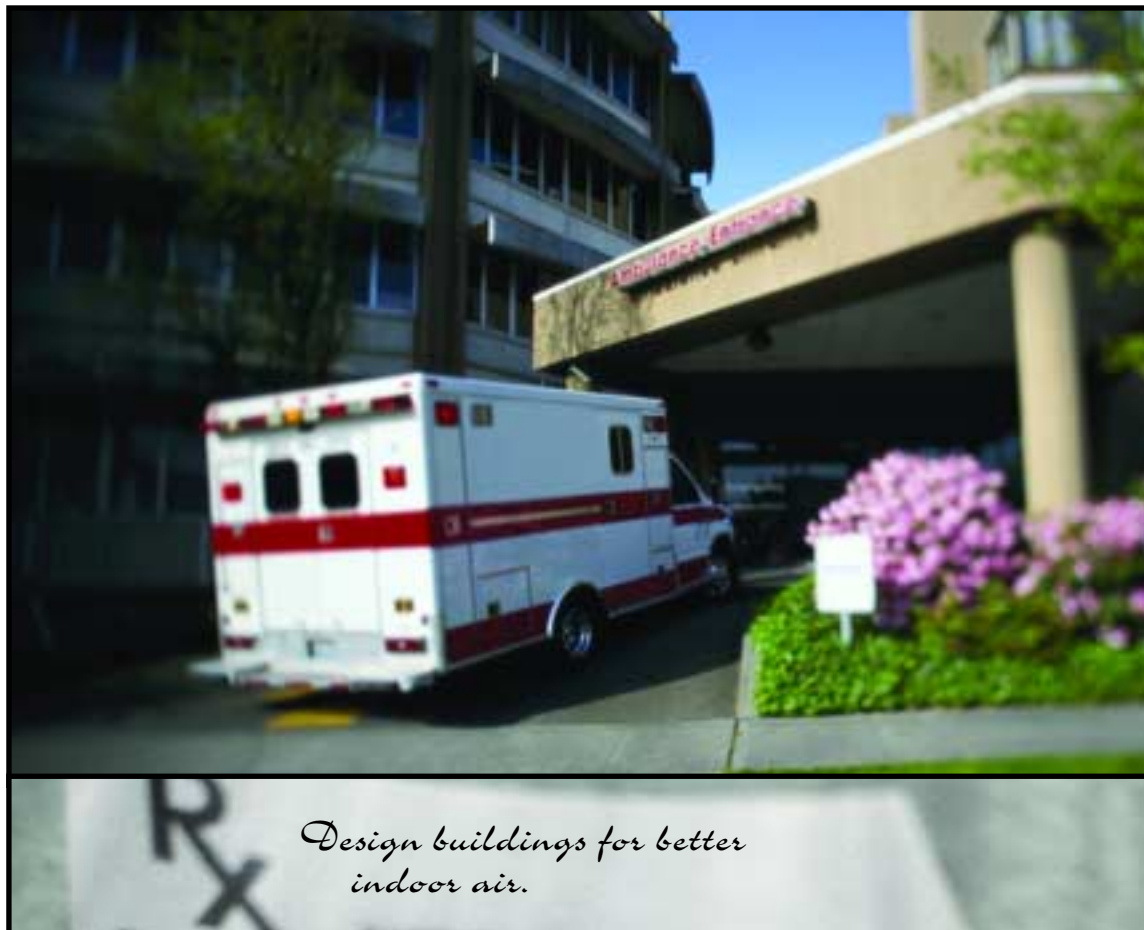
A few organizations involved in the construction of new medical facilities are voluntarily attempting to build hospitals, clinics, and other facilities incorporating safeguards against indoor air pollution and other environmental hazards. Nationally, the health care industry builds about 70–75 million ft² of space each year, according to Gail Vittori, a project consultant and codirector of the Austin, Texas-based Center for Maximum Potential Building Systems, a nonprofit design firm that focuses on sustainable design and building practices.

Plans are on the drawing board for such a new building at the University of Texas Health Science Center at Houston. The goal is to design a nursing school and student community center that will be healthy inside and out. The new \$40 million

194,000 ft² building, though dominated by educational and office facilities, will also have a few medical spaces tucked into its eight stories.

Having experienced environmental problems such as poor indoor air quality with some of their other buildings, officials at the University of Texas Health Science Center are trying to be proactive this time. “Among other things, we are a

period, which is scheduled to begin in March 2002. To improve indoor air quality specifically, the design team will consider factors such as material selection, maintenance requirements, ventilation design and operations, and construction processes, Vittori says. Looking at the whole picture is a key part of reducing health and environmental impacts, says Howard Yarme, codirector of the Health



health science center,” says campus architect Rives Taylor. “We wanted to walk the walk.” Center officials are also watching their wallets, because the new building is expected to be in use for decades, if not centuries. “It’s much more [cost-]effective to be smart up front,” Taylor says, and build with materials that won’t later cause harm. Campus officials are planning to take the lessons from construction of this new center and apply them to two other buildings in the next few years.

The design team is looking at a wide range of issues, including energy use, water resources and stormwater management, life cycle costs of materials, global warming impacts, indoor air quality, recycling, and waste during the construction

Care Facility Research Consortium, a Barrington, Rhode Island-based organization representing dozens of suppliers, designers, and providers in the health care industry.

With material selection, which is just beginning, the team is looking for those materials that pose the fewest threats from volatile organic compounds (VOCs), carcinogens, mutagens, and endocrine disruptors, those that don’t trap or contain allergens, and those that generate the least amount of pollution during the entire production–use–disposal cycle. These constraints greatly narrow the list from the usual indoor air contamination suspects, including vinyl flooring (which can emit toxicants), high-VOC paints, and

carpets (which can trap allergens and pollutants). But acceptable alternative products are becoming more available, and contractors are less likely to charge extra to compensate for the learning curve associated with using a new material, says Jason McLennan, director of Elements, a consulting division of one of the lead firms on the Texas project, BNIM Architects of Kansas City, Missouri.

Healthier alternatives are not always available, though, and trade-offs inevitably must be made between cost and design. For instance, in their efforts to reduce energy consumption in the construction process, design team members are leaning toward using concrete that has a high fly ash content. Fly ash is a powdery substance created as a by-product of many industrial processes, primarily the generation of coal-fired electricity. Increasing concrete's fly ash content reduces the amount of Portland cement that is needed, thereby saving much of the considerable energy necessary to run the high-temperature furnaces used to produce Portland cement. Because fly ash is an industrial by-product, it is available with little additional energy expenditure. However, fly ash can contain a number of toxic substances, including heavy metals. It will take diligent research to identify specific facilities that can supply fly ash with low contaminant levels, McLennan says.

Speaking on the cost-effectiveness of environmentally friendly building design, Kathy Gerwig, director of national resource conservation for health care provider Kaiser Permanente, says, "In many cases, the environmental change is either cost-neutral or less expensive." Minimizing costs is important to Kaiser because the company must replace or refurbish about half of its 27 California medical centers in the next decade to meet earthquake standards. "It's just a terrific opportunity to get the [environmental] standards in place," Gerwig says.

This same thinking went into building the new Richmond-based headquarters of the American Lung Association of Virginia, whose designers and contractors used about 40 techniques to minimize health impacts on occupants. Their strategies included avoiding allergen-trapping carpets, using well-sealed recessed lighting fixtures to prevent the migration of ceiling space toxicants into rooms, reusing older furniture that had already outgassed chemicals such as formaldehyde (the most oft-cited outgassing contaminant), using electric appliances instead of natural gas, and installing meeting room writing boards that use less toxic markers. The

dominance of hard surfaces in the building—for example, on floors in place of carpets—makes it easier to clean dust but can also cause some acoustic problems. Occupants are gradually installing washable wall hangings made of natural fabrics to minimize noise. People who use the building are cautioned not to use oil-based perfumes and colognes.

Outdoors, designers specified less allergenic plant materials. For example, certain cultivars of plants such as red maple and heavenly bamboo were selected for their low pollen production. Also, landscaping techniques such as the use of gravel instead of wood mulch help keep mold and mildew levels down.

Since the building opened in April 2000, people with asthma and other respiratory problems come to the 12,000 ft² building just to hang out, says association spokeswoman Donna Reynolds. American Lung Association branches in Florida, Minnesota, Oklahoma, and Arizona are contemplating similar approaches for their buildings.

The Nova Scotia Environmental Health Centre near Halifax has taken an even more aggressive approach to improving indoor air quality, because its 950 patients have various degrees of chemical sensitivity that can lead to health problems following exposure to relatively low levels of toxic substances. To reduce exposures during their outpatient treatment at the center, which is administered by the Dalhousie University Faculty of Medicine and the Nova Scotia Department of Health, the building was remodeled to reduce levels of toxic emissions.

The new portion of the 8,500 ft² building, completed in 1997, has an exterior shell of glazed clay block. The floors are ceramic tile, grouted with plain Portland cement. Ceramic tile is quite inert in comparison to wood floor finishes (which can emit VOCs) and carpets (which can trap and release pollutants). Portland cement does not contain the VOCs, color compounds, and other additives that are found in traditional grouts. The old-fashioned plaster walls emit fewer potentially harmful substances than drywall, which can contain ink residue from recycled newsprint used to make the outer layers (in addition, joint compounds used to finish drywall surfaces can release formaldehyde). The walls are finished with a paint that emits very low levels of VOCs. The furniture is made of materials such as metal, glass, and woods such as poplar and birch, which emit fewer chemicals such as terpenes, hydrocarbons found in plants.

While diagnosis and treatment of people with chemical sensitivities remains controversial, about half the physicians in Nova Scotia now refer patients to the center, says Roy Fox, the center's director. That number could increase, because an outside review board has recommended that the center be included in the province's health care system, he adds.

Lurking in the Hallways

While a few health care industry organizations, officials, and building designers are beginning to address some of the pollutants inside health care facilities, most are not. To remedy this problem, the Sustainable Hospitals Project (SHP), operated through the University of Massachusetts Lowell, disseminates doses of information to health care facilities on how to use healthier, safer, and more environmentally sound medical products and materials. Begun about five years ago, the project aims to help reduce pollution at its source. As part of these efforts, SHP organizers have assembled a lengthy list of hazardous health care industry substances, as well as less toxic alternatives. The problematic substances include PVC, disinfection chemicals such as glutaraldehyde, latex gloves, and mercury thermometers, among others.

PVC. PVC is used in a wide range of health care products, including bedding covers, intravenous tubing, blood bags, catheters, gloves, and respiratory therapy products. A plasticizer commonly used in PVC—di(2-ethylhexyl) phthalate, or DEHP—can leach out of the plastic and into patients. DEHP is listed by the National Toxicology Program as reasonably anticipated to be a human carcinogen and is a possible endocrine disruptor. PVC also poses a health risk when it is incinerated, creating dioxins, many of which are known or suspected human carcinogens and possible endocrine disruptors.

Disinfectants and other chemicals. Disinfectants, naturally, are widely used in health care settings. One of the primary disinfectants, glutaraldehyde, can cause a variety of health problems, including asthma, skin sensitization, and possibly chemical sensitization. Glutaraldehyde alternatives are now being used in a number of health care facilities.

Natural rubber latex. This substance, common in many health care products, including the gloves worn to protect health workers from infection, can cause problems ranging from skin disease to asthma to death from anaphylactic shock. About 8–12% of health care workers have an allergic response to latex, according to

the American Nurses Association. Because there is no treatment, avoidance is the best policy. That's now possible, given an array of products made from alternative materials or with more rigorous manufacturing standards. Some of the alternative materials include nitrile rubber, polyurethane, neoprene, polyisoprene, and chloroprene. Each alternative is targeted toward specific uses (for example, surgery or examination). Their effectiveness under a full range of conditions sometimes is unknown. Some of the alternatives are much more expensive than latex gloves. Not all health care facilities have yet adopted comprehensive policies regarding latex for patients and employees.

Mercury. Mercury is found in hundreds of products used in health care facilities, including thermometers, laboratory chemicals, and dental fillings. Mercury is a neurotoxicant and can damage many organs and systems in the body. Some forms of mercury are possible human carcinogens. Alternatives to many mercury-containing products are being developed, and a number of health care facilities are evaluating their medical and waste management practices to reduce health threats and environmental contamination from mercury.

Pesticides. Another potentially hazardous substance patients may encounter is the residue from pesticides, commonly spread in and around many public buildings, health care facilities included. The authors of a 1995 report from the office of the New York attorney general titled *Pest Management in New York State Hospitals: Risk Reduction and Health Promotion* found that 33 active pesticide ingredients were applied in virtually all areas of most hospitals throughout the state. In the vast majority of cases, pesticides were used routinely, not in response to a specific problem, and less than half of the hospitals provided written notice to patients and employees that they were using a pesticide.

The report acknowledges the benefits pesticides offer hospitals in helping to control the spread of disease, but also emphasizes the potential harm they can cause, including neurologic damage, delayed development, cancer, reproductive dysfunction, and possible impairment of the immune and endocrine systems. The report recommends the use of less toxic pest control methods, such as integrated pest management, which a few state hospitals had adopted at the time of the study. However, little action on the issue, in New York hospitals or elsewhere around the country, has since occurred.

Alternative Medicine

At least a few hospitals have deemed each of the alternative products listed by the SHP as acceptable, and project organizers continue to evaluate the use of products at four New England hospitals and one West Coast hospital (which the SHP declined to name, per their agreement with the hospitals). But Margaret Quinn, the project's director and an assistant professor in the Department of Work Environment at the University of Massachusetts Lowell, acknowledges that the transition from



products currently in use to those that are less toxic has just begun, and some of the alternatives may present problems as well. For example, a limonene-based solvent is one of the alternatives for a xylene-based product, but limonene is a known sensitizing agent. Quinn says, "Some of these alternative chemicals are not the best, in an ideal world. We view the whole process as one of continual improvement."

The project is gaining national recognition, and is receiving considerable attention through its Web site from medical professionals and associations, as well as government agencies. But not many hospitals have come aboard yet. Says Quinn, "They're doing it slowly. Because they're under pressure in so many other arenas, pollution prevention is just coming onto their radar screen." However, pollutants tend to become a more prominent blip on the radar screen when

employees notice health effects and take action, as occurred with latex products, or when regulators step in, for example to regulate medical waste, she says.

Progress in easing the environmental health impacts on patients and health care employees is also slowed by a lack of valid information from reliable sources, as well as a reluctance on the part of some facility operators to acknowledge the extent of the problem. "There's a lot of 'greenwashing,'" says Yarme, who believes that many health care facilities make the problem of environmental pollution sound less serious than it is or, on the other hand, indicate that they are doing more to address it than they really are.

Along with specific product research and recommendations, SHP organizers are beginning to research the links between environmental health issues and occupational safety and health measures, with much of the funding coming from the National Institute for Occupational Safety and Health. Quinn and her colleagues also are researching cost implications and purchasing procedures related to alternative products and practices.

Kaiser Permanente is trying a variety of less toxic options at its clinics and investigating other ideas for pollution control. For the past four years, the organization has had a policy of purchasing products including paint, carpet adhesive, shelving, and furniture that emit fewer emissions. Kaiser also changed its glove purchasing policy in mid-1999, eliminating the use of 43 million vinyl gloves containing PVC in favor of nitrile rubber gloves. And early in 2001, it stopped using a mercury-based laboratory fixative, which eliminated the equivalent of 10 pounds of mercury. Kaiser officials also are in the formative stages of reviewing their pesticide use, and are discussing setting up a pilot program to test alternative pest control methods with Health Care Without Harm (HCWH), a coalition of about 300 organizations in 28 countries that is working to eliminate pollution in the health care industry without impinging on safety or care.

Alternative products are a major part of the treatment protocols for patients with chemical sensitivities. The Nova Scotia Environmental Health Centre uses less toxic products such as baking soda, vinegar, and a few select fragrance-free formulations for cleaning, and hydrogen peroxide for disinfecting. Patients and visitors are strongly encouraged to eschew fragrances; when necessary, they are given either the opportunity to shower or a change of clothes free of fragrance,



Select less toxic cleaners.



Eliminate contact with natural latex gloves.



Reduce exposure to pesticides and biological agents.



Use alternatives to PVC-containing equipment.

PhotoDisc

cigarette smoke, paints, and other sensitizing agents. Sometimes, the center's time-tested palette of products does some good even before a patient gets to the building. Patients who are given educational materials and who choose to use less toxic products before they arrive for their first appointment often clear some symptoms in just a few days, Fox says.

Officials at Southwest General Health Center, a 336-bed facility near Cleveland, Ohio, also have adopted patient management policies that use alternative products for patients with chemical sensitivities. Spurred initially by the needs of a single patient, hospitalwide policies have gradually been developed, says Rosemary Reiner, a vice president and chief nursing officer at the center. For instance, center officials have determined that sensitive patients may launder their sheets at home with a tolerated cleaner, rather than use the center's detergent. But those rare instances must be coordinated with staff at the hospital, some of whom are still learning about the various practices.

Once the bugs are worked out of these procedures—in the next year or so—center officials are planning to expand their program to the other facilities in the University Hospitals Health System, which comprises 14 hospitals in Cleveland and vicinity, along with 33 ambulatory care centers, 10 urgent care centers, and other facilities. "There are more and more patients with different types of sensitivities," Reiner says.

Watching Their Waste

Many of the thousands of products and substances used in a typical health care facility find their way into the waste stream in one of three ways, as either airborne residue from incinerators, contaminants in sewer effluent, or a component of solid waste shipped to landfills. Environmental contaminants going into the waste stream include dioxins, furans, lead, cadmium, mercury, hydrogen chloride, sulfur dioxide, nitrogen oxides, and many others.

Medical waste has drawn the attention of the EPA on several fronts. On 15 August 2000, the EPA issued a rule finalizing requirements for hospital, medical, and infectious waste incinerators built on or before 20 June 1996. The rule applies to states and tribal areas that have not yet adopted a comprehensive plan sanctioned by the EPA. At the time the final rule was approved, that included about half the states. Others, such as Alabama, Iowa, and Wyoming, have developed plans that fit guidelines initially issued by the EPA

in 1997. When the rules are fully enacted, EPA officials anticipate that hospital emissions of mercury will drop by 95%, hydrogen chloride emissions will drop by 98%, and dioxin and furan emissions will drop by about 96%.

Mercury reduction is one of the primary goals of the Hospitals for a Healthy Environment (H₂E) program, begun in 1998 by the EPA and the American Hospital Association with input from HCWH. The immediate goals of the voluntary H₂E program are to slash mercury waste generated by hospitals by 2005, and to cut hospital waste volume by 33% by 2005 and 50% by 2010. In the future, the partnership may go on to tackle dozens of other industry hazards it has identified, such as chloroform, di-*n*-butyl phthalate, ethylene oxide, phenol, and potassium hydroxide.

Taking the H₂E program one step further, 36 hospitals in Maine agreed in March 2001 to voluntarily participate in the Maine Hospitals for a Healthy Environment program. The program is the first statewide adoption of an advanced H₂E program, and includes detailed information on measures that facilities can take to reduce impacts of mercury, persistent bioaccumulative toxicants, chlorinated compounds, and other problem substances. Three other Maine hospitals may also join the free program, which crystallized when the participants determined that they needed help to cope with their waste problems.

Nationally, the effort to reduce the use of mercury is gaining ground. HCWH is participating in an effort to reduce the widespread use of mercury thermometers, and its officials say that a number of large retailers, such as Wal-Mart, Kmart, Walgreens, and Rite Aid, have agreed to stop selling mercury thermometers. In addition, cities such as San Francisco, Boston, and Duluth, Minnesota, have banned the retail sale of mercury thermometers. Digital or glass alcohol thermometers are available alternatives that are comparable in cost and performance, and infrared ear thermometers are a more expensive option.

On a broader scale, nearly 600 hospitals and medical clinics had agreed by mid-2000 to participate in HCWH's Making Medicine Mercury Free campaign. This initiative targets hundreds of mercury sources in health care facilities. Participants range from the 20 facilities included in the Catholic Healthcare West system (which comprises 18 facilities throughout California, plus 1 facility each in Phoenix, Arizona, and Henderson,

Nevada) to the sole participant from Guam, the island's Memorial Hospital Authority.

Concerns about mercury and other heavy metals contaminating the city's sewer system helped push officials in Albuquerque, New Mexico, to publish their *Biomedical Laboratory Code of Practice* in 1997. The lengthy manual offers guidance to laboratories, which are urged to voluntarily reduce contamination in their effluent. City officials continue to hold workshops with local health care facilities, with the help of EPA grants and other funding sources, and they are monitoring the effluent of three area hospitals in 2001 to establish better baseline information, says Andrew Padilla, a pollution prevention specialist for the City of Albuquerque. Other cities are taking similar steps.

In New Hampshire, the state is tackling dioxins from all different sources, including the 29% that come from its hospital/medical/infectious waste incinerators. Officials announced on 13 March 2001 that the state would be the first in the nation to adopt a comprehensive strategy on dioxins, with the goal of halving all dioxin emissions within the next two years. The state standard is 10 times more stringent than the federal standard. There has already been a significant shrinkage in incinerators in the state, from 13 in 1998 to 3 by May 2001.

The shutdowns haven't hit the industry too hard, says Richard Rumba, the air toxics program manager at the state's Department of Environmental Services. "We didn't have a big outcry," he says. "I think it was an area they were probably looking at already. I think they were just putting off doing something about it. [The state's action] was a factor that made them jump off the fence."

To help cope with the reduced incineration capacity, the health care industry is beginning to cut the volume of waste that has to be incinerated by focusing on recycling. One such initiative involves reusing containers that store sharps (syringes and other similar devices) to whittle down waste. A study of one 250-bed hospital revealed that it used 18,000 sharps containers annually, says Jack McGurk, chief of the Environmental Management Branch in the California Department of Health Services. Recycling the containers can save about 13 tons of plastic each year.

In addition to recycling, separation of hazardous medical and infectious waste can also help, says Vicki Jas, who is manager of biosafety at Dartmouth-Hitchcock

Medical Center in Lebanon, New Hampshire. Hazardous waste contains pollutants such as mercury, while infectious waste contains biologically infectious material (the two categories can overlap). Pulling materials in either category out of the waste stream reduces volume and prevents them from being spread into the environment. There are separate

nonincineration methods available for extracting reusable substances and disposing of the remainder more safely.

But changing medical practices also has a big impact, Jas adds. For instance, by carefully analyzing its techniques, Dartmouth-Hitchcock officials have reduced the number of items and procedures for which it needs to use ethylene

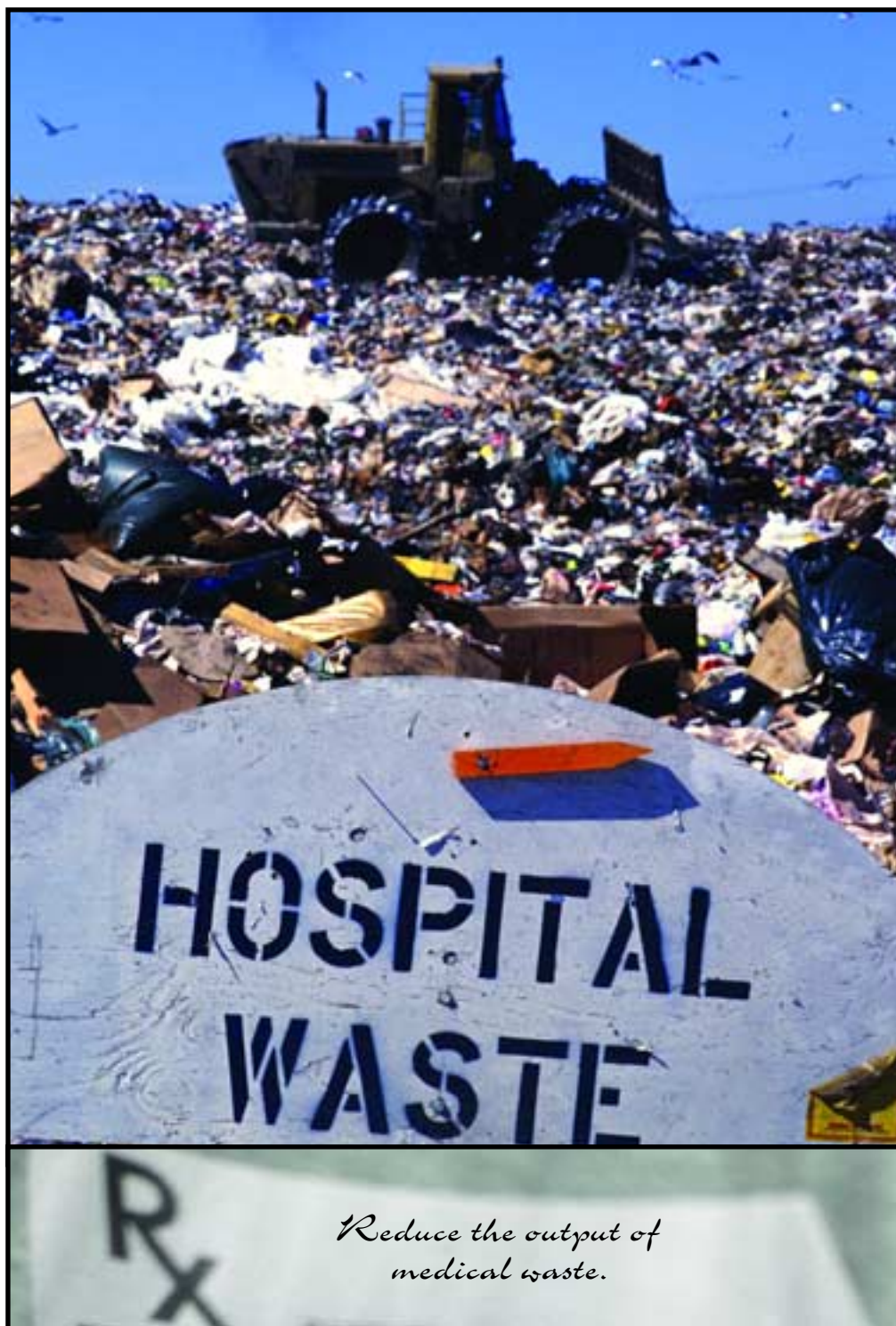
oxide, a sterilant that is a known carcinogen and reproductive toxicant, from 527 to 14. In some cases, alternative sterilants that are less toxic, such as hydrogen peroxide or plain old steam, have proven effective. Staff have looked at similar strategies for a number of other substances, and will look at more in the coming year, Jas says.

One of the specialized niches that Dartmouth-Hitchcock is helping the state look into is the disposal of bodies. Cremation typically is the method used, but the standard practice of enclosing bodies in material made with PVC means that dioxins, a combustion by-product of PVC and other substances, are released. State and hospital officials are investigating the use of bags with no PVC, which are already available. The state may also decide to change its cremation regulations to minimize the possibility that other toxic substances could be either accidentally or intentionally burned during cremation.

Symptoms of Change

Many individuals and organizations are now crafting books, protocols, videos, Web sites, and other educational devices to get the word out about environmental health issues in health care settings, and some of the issues are covered in a number of university curricula. One of the first major conferences on the subject, titled "Setting Healthcare's Environmental Agenda," jointly sponsored by Kaiser Permanente and HCWH, was held in October 2000 in San Francisco. A follow-up conference, "CleanMed 2001," was held in May in Boston. But the overall effort to ensure environmental health in health care facilities is in its infancy, says Vittori, who was surprised by this finding while doing research for her presentation at the San Francisco conference. "It was astonishing," she says. "A profession that you thought would be in the lead is not."

Bob Weinhold



*Reduce the output of
medical waste.*