STATE OF THE ART AND SCIENCE
Greener Clinics, Better Care
Phil Perry, MSJ

Sustainability and environmental stewardship have moved onto the agendas of many hospitals and health systems for both philosophical and practical reasons. Daniel Callahan, co-founder of the Hastings Center, strongly advocated a shift to sustainable medicine [1] and away from the upward curve of health care's cost and technology spiral. The language of environmentalism has permeated our thinking in many areas, and with good reason. It's clear that health care needed some "greening," starting with environmentally sound health care facilities that save on energy, water, and material costs. Some recent history shows why this trend toward sustainable health care is growing.

Health facilities are heavy users of energy and water resources; they also have to use hazardous chemicals every day for sterile procedures, universal precautions, and patient care. A 2012 Commonwealth Fund report that aggregated data to determine the environmental impact of US health care facilities pointed out that hospitals alone produce 6,600 tons of waste per day and use large amounts of toxic chemicals, including radioactive isotopes. In many communities, the hospital and its associated satellite clinics were among the largest users of electric power and water [2].

In the 1990s, hospital incinerators were implicated in air pollution, and waste haulers illegally dumped medical waste, leading to damaging media reports. Notoriously, high mercury levels in Boston Harbor and other locales were attributed largely to medical sources that released it in waste water, through incineration, or by improperly disposing of it in landfills [3]. Even blood bags were criticized since, when the lifegiving blood products they contained carried phthalate residue from the bags' plastics into the patient's bloodstream, the patient was exposed to these potentially carcinogenic compounds [4]. The healers, used to being the good guys, were now on the defensive. But, inside the health community, there was also resolve to "clean up our act" [5]. In 1998 the EPA and the American Hospital Association signed a memorandum about environmentally safer methods of waste disposal, and that led to the formation of a nonprofit called Practice GreenHealth, whose task was to help clean up health facilities nationwide [6]. Immediate targets were mercury waste reduction or elimination, toxin reduction, and medical waste management.

Such clean-up efforts gained support. An Institute of Medicine report recommended that,

on the local scale, within the walls of a hospital, research facility, or clinic, green construction and operation can protect patients, workers, and visitors. For example, choosing safe cleaning agents or limiting the use of pesticides can reduce the potential for toxicity among those exposed. On the community scale, reducing the ecological footprint of a hospital reduces environmental hazards and protects natural resources [7].

Health care systems have found more sustainable ways of doing business. The large health system Kaiser Permanente, in Oakland, California, convened an environmental stewardship council, which leads its long-term effort in going green [8]. Green construction planning is done through an alliance of contractors who have agreed to Kaiser's sustainability principles. A "sustainability scorecard" is applied to its purchase of medical products, which accounts for about a billion dollars of spending per year [9]. Water conservation efforts at its hospitals yielded significant savings in drought-prone southern California. Likewise, New York Presbyterian has set up a sustainability council and shown that a larger urban hospital can achieve significant environmental gains, including Energy Star recognition from the Environmental Protection Agency [10].

In case after case, 10-30 percent savings in water and energy use proved to be achievable [11-13]. In addition, they have been shown to save money for those who undertake them: for hospitals, on a national scale, the Commonwealth Fund report says "our conclusion is that these savings could exceed $5.4 billion over five years, and $15 billion over 10 years" [14].With these kinds of successes, and its contribution to health care cost containment as well as a better environment, the appeal of green health care to businesses was strengthened.

What about Clinics?
Interestingly, some experts predict that "even larger cost savings may be realized through implementation of these sustainability interventions in nonacute settings, such as outpatient clinics and doctors' offices, because of the lower fixed-cost demands of these settings" [15]. Clinics more closely resemble office buildings than hospitals, and thus can more easily be made greener or built to save energy and water.

Greening projects are under way at clinics around the country. The impetus for a greening of health care at an individual facility often comes from staff who propose recycling or green purchasing initiatives [16], but the best and most effective "green teams" also have buy-in and support from the top levels of management and the medical staff, as at Kaiser [17, 18]. Almost any clinic can be "light green" once the staff starts thinking about energy conservation. A longtime sustainable health care advocate, Ted Shieh, MD, is an immediate care specialist at DuPage Medical Group in Downers Grove, Illinois. He became his system's in-house green health care expert. Shieh, a physician member of Practice GreenHealth, maintains that if more physicians would get involved, change would happen faster. He has led several

initiatives at DuPage's Lisle and Glen Ellyn locations and is planning more (Interview and correspondence with Ted Shieh, MD, June-July 2014.)

For example, IV bags and tubing that were made of potentially endocrine-disrupting DEHP (di(2-ethylhexyl)phthalate) materials were replaced with new ones that were safer for patients, recyclable, and cheaper. Other easily accomplished projects include switching from disposable to reusable instruments, evaluating usage patterns to reduce medication and supplies waste, using multi-dose vials when available, and prescribing as little medication as needed. "Turn it Off" is a basic power-saving initiative that anyone can do to reduce energy used by lights, copiers, and computers (Interview and correspondence with Ted Shieh, MD, June-July 2014.)

Other clinics are taking on these projects, too:
- Vidant Health reduced its waste volume by 63 percent at a rural clinic in Bertie, North Carolina, a 6-bed facility built to critical-access standards. Since the program began, that's a 13-ton waste reduction. Part of the reduction is from recycling, and more savings are expected from analysis of purchasing practices [19].

- A solar thermal hot water system provides 50 percent of all hot water at Gunderson Lutheran's dialysis clinic in Minnesota [20].

- Affinity Health, in Menasha, Wisconsin, has committed to purchasing 70 percent of its power from renewable energy sources to run its new clinic for heart, lung, and vascular care, a unit of Saint Elizabeth Hospital. This step is in keeping with "lean principles" of energy and resource use [21]. Seven of Affinity's buildings are LEED (Leadership in Energy and Environmental Design) certified.

Two voluntary national programs can help facilities improve conservation efforts. To be truly "deep green" a clinic can seek LEEDs for Healthcare certification. Fairview Health Services' Savage Clinic in Minnesota is one example [22]. LEED involves meeting strict energy conservation requirements and design specifications, right down to the kind of paint (low in volatile organic compounds) that can be used. Very few clinics have sought the highest (platinum) LEED rating, but about 250 health care clinic buildings nationwide have some level of certification [23].The EPA's Energy Star program is another voluntary way to analyze and reduce usage. Facilities complete an energy audit and implement changes based on the resulting data [24]. This national benchmark enables a facility to see how far it needs and wants to go to green up its operations and rank among the national leaders.

New construction and retrofitting can help to reduce a carbon footprint. A partner of the national Healthier Hospitals Initiative, the San Francisco-based Center for Health Design started the Pebble Project [25] so that members could access data and reports about actual projects and results. The Pebble Project mission is to "create better health care facilities that improve patient and worker safety and clinical outcomes,

while maximizing environmental performance and operating efficiency" [26]. Among the clinics that architects associated with the Center for Health Design have built are Grace Hill Clinic in Missouri (12 physicians) [27] and Clinica de la Raza (8 physicians) in California [28].

One clinic that has tried to actualize Callahan's vision of sustainable medicine is the Kimberton Clinic. Richard Fried, MD, explains the effort on his web site. "Just as we all have an individual moral duty to reduce environmental pollution and global warming, so must we all be committed to cost containment, regardless of what kind of medical insurance we do or do not have" [29]. At Kimberton, preventive medicine and sound prescribing are emphasized to eliminate overuse of antibiotics and psychopharmaceuticals. Patient testing or screening is done sparingly, all in an effort to make health care economically sustainable for both patients and the clinic.

Conclusion
By adopting an environmental ethic locally or by joining in one of the major environmental initiatives, whether EnergyStar, Healthier Hospitals Initiative, or Practice GreenHealth, clinics can improve their sustainability rankings in many ways and potentially reach high efficiency—in green buildings technology, at least. But there's a long way to go toward truly sustainable medicine. Even PracticeGreenHealth counts just over 1,300 partners [6]. There are about 5,000 hospitals [30] and more than 500,000 clinics in the US [31], many in older buildings.

The health care industry, like all industries, has been pushed from outside and in to make these concerns a high priority, given what's at stake. Fortunately, experience to date indicates that energy reduction, water conservation, hazmat reduction, and other such goals are not only doable, but can result in some significant cost savings that can drop to the bottom line and add back into patient care resources.

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Phil Perry, MSJ, is assistant editor of *Virtual Mentor*.

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