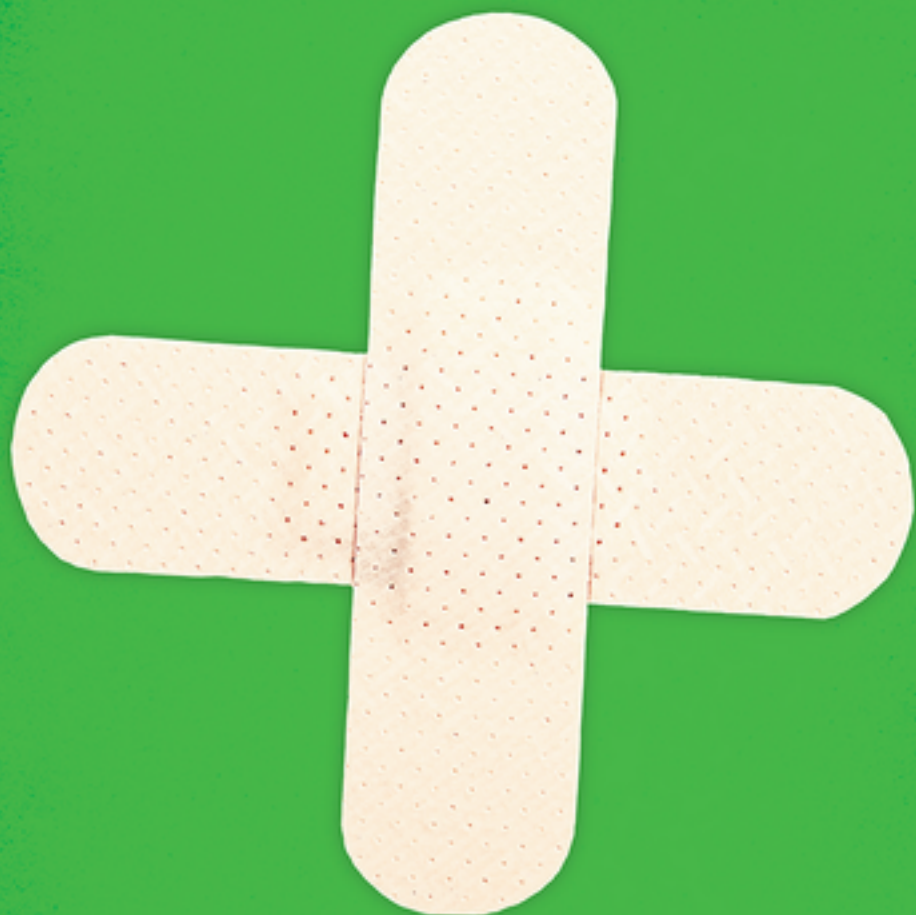


Kathy Gerwig



Greening Health Care

HOW HOSPITALS CAN HEAL THE PLANET

OXFORD

Greening Health Care

Greening Health Care

How Hospitals Can Heal the Planet

KATHY GERWIG

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PREFACE

The very nature of health care is changing. Health care reform, clinical innovations, electronic medical records, social connectivity, technological advances, baby boomers' expectations about quality of life, demands for price to align with value, and ways the environment contributes to disease are some of the factors behind the changes. These changes offer profound, new opportunities to address environmental issues across the health care sector and beyond.

In this changing landscape, what does environmentally sustainable health care look like? Let's take an imaginary visit to a hospital for a routine doctor visit. Approaching the medical facility, the first thing we notice is that the building is smaller than we expected. There is a convenient transit stop at the front entrance. And the parking lot pavement allows rainwater to filter through to be cleaned and returned to the aquifer. We notice that instead of lawns there are native plantings that minimize water and pesticide use.

There is a garden path that takes us by a stream that was brought back to life from where it was hidden in a concrete culvert decades ago. We enjoy the birds that have rediscovered this tranquil place. You notice a labyrinth and take a meditative respite.

Once inside, we are walking on nonvinyl, nonpolluting material on the carpets and floors, and we notice how much natural light floods into the lobby and hallways from specially designed window glass, shades, and blinds that allow sunlight in while minimizing afternoon heat. The walls

are painted in soothing colors and patterns that mimic the adjoining landscape. The energy-efficient lighting fixtures glow with a pleasing hue. You see a plaque on the wall indicating that the building is carbon neutral.

In the bathroom, the toilets and sinks are water conserving, and the soap does not contain harmful antibacterial agents. The paper towels are made from 100 percent recycled, postconsumer waste, and the used towels go into a compost container. In the waiting room, the fabric on the chairs was selected to avoid harmful chemicals that can cause adverse health effects.

In the exam room, your temperature and blood pressure are taken with mercury-free devices. You notice the purple exam gloves used by the clinical staff. These are latex-safe for worker and patient safety, and they are environmentally preferable.

If you are here for a biopsy, your doctor will use a rigid endoscope (for minimally invasive surgery) which is steam sterilized to avoid the use of chemicals that are hazardous to the environment and to staff. Patients' X-rays are processed through a digital system that supports quality care by enhancing image analysis and transmission, and it is environmentally friendly because each machine eliminates the use of thousands of gallons of potable water annually as well as the chemicals and heavy metals needed for film processing.

As the housekeeping staff makes their routine rounds, we notice the absence of any chemical smells. This is because they use cleaning products that are free of harmful chemicals. And you see a cleaning system that supports zero waste through recycling, remanufacturing, and composting.

When we stop for lunch in the cafeteria, we have a selection of healthy options that are delicious, locally sourced, and sustainably produced, just like most of the patient meals. When we pass by the vending machine, we see a selection of healthy, nonsugary snacks and drinks.

This feels to us like a place of emotional and physical healing. We are better able to handle the medical issue that brought us here. We appreciate the sense of total health that surrounds us.

Everything we see on our trip exists somewhere in the US health care system today. In the future, we will see more of these features embedded in all care locations.

In my work as an environmental advocate in health care, I am often asked how people can best contribute to a healthy environment. There is much we can and should do to lessen our impact on the environment, such as reducing reliance on fossil fuel, preferring products that do not contain harmful chemicals, and being mindful about consumption and waste. I believe, however, that the best thing we can do for the environment is to reduce our own health risks, or if we are healthy to stay that way. The main causes of poor health in the United States are preventable: unhealthy eating, insufficient physical activity, tobacco use, and too much alcohol. One third of Americans are obese, and there is a tsunami of diabetics headed our way because millions of Americans are prediabetic today. Sedentary behavior increases the odds of cancer, stroke, depression, loss of bone density, and a host of other illnesses. The resulting response from the health care system to diagnose and treat these illnesses is environmentally intensive.

Health is determined by many social and economic factors, including education, community safety, employment, and culture. It is determined by physical environments that include food, media, and environmental quality. And it depends on access to quality clinical care and prevention.

As individuals, we can work to reduce our own health risks by eating healthy foods, moving more, and finding our joy. As members of our local and global communities, we can promote policies, programs, and innovations that make healthy behaviors the easier behaviors.

The greening of health care is a lesson of hope. And the future of health care holds a promise of planetary healing that extends far beyond the system of health care.

ACKNOWLEDGMENTS

Environmental stewardship is in the DNA of Kaiser Permanente. In the 1950s Henry Kaiser, the organization's founder, approved the installation of \$5 million worth of pioneering air pollution control equipment at the Kaiser Steel Mill in Fontana, California. Founding physician Sidney Garfield promoted sustainable practices well before the first Earth Day. In the early 1970s, employees at the Kaiser Permanente Medical Center in Santa Clara, California, formed an Ecology Committee with an objective of teaching employees "ecological common sense." More recently, George Halvorson, KP's chairman and CEO from 2002 to 2013 regularly celebrated environmental stewardship accomplishments in his weekly letters to staff. Bernard J. Tyson, Kaiser Permanente's chairman and CEO as of 2013, and formerly our president and COO, ensured our operational commitment to sustainable energy and waste minimization by approving national policies in both areas. The organization's long-standing commitment to environmental sustainability is but one example of Kaiser Permanente's vision of what we call total health, a focus on the health of mind, body, and spirit that addresses the whole person, including the communities where they live, work, and play. I am privileged to be part of this organization.

This book would not have been possible without Jon Stewart, communications director at Kaiser Permanente until he retired in 2013. During the last few years of his career he committed his considerable talents as a writer and editor to this book. I am deeply grateful for Jon's approachable

writing style, eloquence, and journalistic acumen. That this book has been completed is a reflection of his dedication and partnership.

Others from Kaiser Permanente who made significant contributions include Susannah Patton, who supported the overall project and helped author the chapters about food and waste, and Susan Saito, who helped write the chapter on green buildings.

Joe Bialowitz, a trusted colleague and respected expert, works with me at the national level to manage our overall environmental stewardship program. He contributed to several chapters, most notably the chapter on measurement.

I sincerely thank several external contributors, including Judith Nemes, Carrie Rich, and Seema Wadhwa. Their contributions are woven throughout the book.

Sustainability work at Kaiser Permanente is governed by the Environmental Stewardship Council. The Working Group of the Council is the home for our initiatives, and the members are an exceptionally gifted group of people who make their extraordinary achievements look easy. The Executive Committee of the Council provides wonderful inspiration and support while ensuring that the work is appropriately paced and focused. The chair of the Council, Raymond J. Baxter, took me and this work under his wing in 2007. I am profoundly grateful for his vision and mentorship.

It is my distinct honor to work with the amazing people of Health Care Without Harm. All proceeds from this book will be donated to that organization as they lead the global movement for environmentally responsible health care.

ABOUT THE AUTHOR

Kathy Gerwig is Kaiser Permanente's Environmental Stewardship Officer, responsible for organizing and managing a nationwide environmental initiative for the organization. Under her leadership, Kaiser Permanente has become widely recognized as an environmental leader in the health care sector. Kathy has testified twice before Congress on the need for federal chemical policy reform, and she has appeared at numerous hearings on environmental issues.

As Kaiser Permanente's vice president for Employee Safety, Health and Wellness, Kathy is also responsible for eliminating workplace injuries, promoting healthy lifestyle choices, and reducing health risks for the organization's 190,000 employees and physicians. She oversees the national departments of workplace safety; workforce wellness; integrated disability management; employee assistance programs; and environmental, health and safety.

Prior to joining Kaiser Permanente in 1993, Kathy was an environmental and economic development consultant to businesses and public agencies in the United States and Europe. Prior to consulting, she worked for nonprofit environmental organizations in California.

Kathy has a master's degree in business administration, with honors, from Pepperdine University and a bachelor's degree in geography and environmental studies from San Francisco State University. She is a certified professional healthcare risk manager, a certified professional environmental auditor, and a certified healthcare environmental manager.

Kathy is on the boards of several leading nongovernmental organizations focused on safety and environmental sustainability in health care.

Greening Health Care

Launching a Green Revolution in Health Care

Modern neonatal intensive care units (NICUs) are amazing environments. Nowhere else is one likely to witness, at a single glance, the utter fragility alongside the heroic miracle of human life. Tiny, preterm and critically ill infants—some so small their perfectly formed feet are no larger than a paper clip—lie enclosed in sterile plastic bubbles, surrounded by and physically connected to a stunning array of high-tech medical equipment that monitors and regulates their most basic biological functions. Highly specialized clinicians—neonatalogists, neonatal nurses, respiratory therapists, and others—move about the bassinets and bubbles with calm and purposeful professionalism, stopping here and there to bend over an infant with a smile and a coo, give a fingertip massage, and quietly confer with colleagues. Parents, exhausted from lack of sleep, keep a 24-hour-a-day vigil, unable to conceal that haunting mixture of fear, hope, and helplessness.

It was a visit to just such a unit, at Kaiser Permanente's San Francisco Medical Center, back in 2001 that left an indelible mark on my memory and has since informed my work as Kaiser Permanente's environmental stewardship leader and the way we deliver care to our 9 million members.

I was there with a small group of technical experts to follow up on suggestions from recently published reports that some of the medical equipment widely and routinely used in NICUs to provide infants with lifesaving blood, drugs, or nutrition might contain a chemical substance known as DEHP, or di(2-ethylhexyl) phthalate (pronounced “THA’late”). DEHP and other phthalates are used in polyvinyl chloride (PVC) plastic products to make them soft and flexible, and at the time PVC accounted for more than a quarter of all plastic used in durable and disposable medical products, including intravenous (IV) tubing, blood bags, gloves, and feeding tubes. As in other products, DEHP can leach out of flexible PVC equipment into the solution or medication it contains and subsequently into the patient.

In the late 1990s, several animal studies, including one by the US Centers for Disease Control and Prevention (CDC), had suggested that exposure to DEHP and other phthalates could be harmful to a developing fetus, especially to the reproductive system in males.¹ However, no studies had been done on human subjects, and because DEHP had been in use in a vast array of plastic products for four decades, the Food and Drug Administration (FDA) found no cause to test it when it began regulating medical devices in the mid-1970s.

Nonetheless, given the emerging data on the toxicity of DEHP in animals and other pollution concerns about PVC, in 1999, Kaiser Permanente joined a coalition known as Health Care Without Harm to petition the FDA to require manufacturers to at least label plastic products that could expose patients to DEHP. Without such identification, we had no way of knowing whether our PVC-based equipment might be harmful to patients, especially to susceptible newborns who often receive multiple and prolonged treatments with PVC-based medical devices. When that petition was rejected, the coalition published its own study, which laid out the known facts and urged health providers to seek out alternative medical devices known to be DEHP-free.²

With this as background, I decided that it was time to find out just how much equipment in our NICUs might be suspect. The group I assembled included experts in neonatal care, biomedical engineering, staff from our National Environmental, Health and Safety department, and Ted Schettler,

MD, the science director of the independent Science and Environmental Health Network, who had published some of the important research on PVC. At our San Francisco Medical Center, we were met by a wonderful neonatal nurse manager with more than a decade of experience in NICU care. We explained to her the facts as we knew them and that we wanted to inventory all PVC-based equipment in the unit to determine, if possible, which devices were likely to contain DEHP. The nurse was familiar with the fact that, during treatment, some plastic tubing lost pliability. But she was alarmed when she learned that it was because the potentially harmful chemical plasticizer was leaching into the solution used to treat the patient.

We catalogued item by item of invasive flexible plastic devices that, on later investigation, proved to contain as much as 80 percent by weight of DEHP: IV bags and tubing, umbilical artery catheters, blood bags and infusion tubing, enteral nutrition feeding bags, nasogastric tubes, peritoneal dialysis bags and tubes, and tubing used in cardiopulmonary bypass procedures, extracorporeal membrane oxygenation, and hemodialysis. Everywhere we turned in that sterile, caring, life-sustaining environment for sick infants, we found PVC-based devices that might contain DEHP, which was linked to reproductive and developmental damage to newborns, fetuses, and prepubertal children. The very equipment we were using to support life for these critically ill and preterm infants was capable of leaching a potentially toxic substance into their bodies that could result in reproductive abnormalities over a lifetime.

The sense of alarm soon turned to action. Following that visit and subsequent NICU equipment inventories, a technical committee of Kaiser Permanente neonatal experts directed staff to conduct a series of clinical trials to determine which products could be replaced with DEHP-free alternatives. Based on those evaluations, the committee moved quickly to switch to non-PVC/DEHP products for three of the most commonly used NICU devices such as catheters and feeding tubes. We also engaged with our main NICU equipment supplier to conduct an analysis of other products and non-DEHP alternatives.

Today, I am proud to say, the IV solution bags purchased by Kaiser Permanente are 100 percent PVC- and DEHP-free and our IV tubing is

DEHP-free. The product selection affects nearly 100 tons of medical supplies. As an added bonus, the safe alternative products are saving us close to \$5 million a year.

In the meantime, the National Toxicology Program's Center for Evaluation of Risks to Human Reproduction has issued three reports on DEHP exposure to pregnant women, infants, and children, confirming that DEHP has been shown to be a reproductive and developmental toxicant in animal studies, and that those studies are relevant to humans. Other studies, from Harvard University School of Medicine and the University of Rochester, have gone further, confirming that infants subjected to intensive NICU care have increased levels of DEHP and other phthalates in their bodies, and that boys born to mothers exposed to high levels of DEHP display distinct differences in their reproductive organs.³ Even the FDA, first in 2002 and again in 2007, has issued public health notifications outlining the risks of extended or frequent exposure to DEHP in high-risk patients and recommended that hospitals switch to a growing array of DEHP-free products whenever possible.⁴

After all these years, I still think often of that lovely and caring NICU nurse in San Francisco and her shock at learning that hidden in the life-sustaining equipment with which she lavished care on those tiny infants were chemicals that might, contrary to her every instinct, have contributed to serious health conditions for them years later. I suspect that the same emotions have played out among thousands of nurses and physicians in many hundreds of other hospitals over the years, as health care providers have begun to come to terms with the sometimes serious health consequences of an environment sickened by human-made poisons and neglect.

ENTER HEALTH CARE WITHOUT HARM

For me and for a handful of other health care professionals concerned for a healthy and sustainable environment as a necessary foundation for human health, that coming to terms began not long before my NICU visit. I tend to date the beginnings of the environmental stewardship movement

in health care back to the mid-1990s, in my case, precisely to the day when I first met Gary Cohen of Health Care Without Harm in the lobby of the Royal Sonesta Hotel in Cambridge, Massachusetts. It was 1996, and I had flown in from Oakland, California, to attend an environmental conference sponsored by Tufts University. Kaiser Permanente's environmental stewardship strategies and goals were taking shape just as some important information was emerging that had direct relevance for health care, specifically involving the harmful health impacts of dioxin, mercury, and other chemicals. The conference promised to be a good opportunity for hearing the latest expert thinking on these and other issues I knew I would be dealing with, and for establishing a network of professionals with a shared commitment to environmental health.

Cohen, who was also attending the conference, had called me before that trip to introduce himself and tell me about plans for a new advocacy group called Health Care Without Harm that he was forming with Charlotte Brody, a registered nurse. I knew almost nothing about Cohen, except that he had a reputation as a committed activist with a focus on toxic chemicals. Health Care Without Harm, he explained, would be dedicated to cleaning up and limiting the use of toxic materials in the health care sector. This agenda seemed ambitious for someone who had no experience in health care. In fact, as I later learned, Cohen's formal training was in Eastern philosophy.

Nonetheless, a series of life-altering experiences, including Cohen's work on behalf of survivors of the 1984 Union Carbide pesticide factory explosion in Bhopal, India—which killed 3,000 people and sickened a half million more—had focused his activist's passions on the growing dangers of toxic chemicals. When the US Environmental Protection Agency (EPA) issued a series of alarming reports in the early to mid-1990s on the carcinogenic, reproductive, and immune system effects of dioxin, one of the most toxic human-made pollutants, Gary set his sights on the health care industry. Health care, after all, had been identified as the biggest emitter of dioxins into the atmosphere in the United States, due to the routine burning of thousands of tons of chlorine-based plastic medical waste and trash at an estimated 5,000 onsite or remote incinerators.

Brody, co-founder with Cohen at Health Care Without Harm, had come to focus on the same issue while serving as executive director of a Planned Parenthood affiliate in North Carolina. Her clinic routinely disposed of all manner of medical wastes, including PVC by incineration as a way of protecting patients and staff against the spread of AIDS. That seemed like the responsible and legal thing to do—at least until the EPA assessments on dioxin revealed that the main source of this toxin was PVC, which, when incinerated, creates dioxin pollution. “Most of us thought that the more we burned, the safer we were making our patients,” she says. “We didn’t know that every red bag (of medical waste) that we burned contributed to poisoning mothers’ breast milk.”⁵

PVC was and continues to be ubiquitous in health care in everything from plastic bags that contain intravenous solutions to exam gloves and even furniture and vinyl floors. It is plentiful, cheap, durable, and performs well. And as we have found over the past 15 years, shifting to less polluting alternatives has been possible for some but not all PVC-based products. Finding acceptable substitutes has been an ongoing struggle for many health care organizations.

PVC is but one of many disturbing examples of the paradox of health care’s role in environmental pollution. In the course of providing health care to individuals, we are inadvertently using chemicals and materials that are hazardous to human health. We generate pollution and wastes that become environmental contributors to disease. Institutions dedicated to human health were among the primary culprits in poisoning the atmosphere with toxic emissions that, at even low levels, were contributing to human cancers and infertility. The fact that laws and regulations required incineration of many pathology and chemical wastes only made the irony more painful.

Health Care Without Harm was born out of that paradox. As Cohen puts it, “Health care is one of the only sectors of the entire economy that has an ethical framework as a centerpiece of its profession. Caregivers take an oath to ‘first, do no harm.’ But if you’re running a hospital on energy that comes from a coal-fired plant, you are contributing to the asthma rate. If you have a McDonald’s restaurant in the lobby of your hospital, you may be contributing to the rampant obesity rate and all the health and environmental

problems associated with that. If I'm a hospital leader, I want to model for others to do the right thing from a disease prevention standpoint.”⁶

With all this as background, I confess that I felt some trepidation prior to that initial 1996 meeting. As a representative of the nation's largest non-profit health care organization—and an industry known for caution and risk aversion in the face of major change—I did not know what to expect from this activist. Would I be viewed as the enemy, an unwitting agent of the chemical industry? Fortunately, any apprehensions I had dissolved when we met face to face.

Cohen and Brody's strategy was not to blame the health care industry for its ways. They were more interested in collaboration than confrontation, in working with partners rather than battling enemies. Cohen understood the issues surrounding harmful chemicals and products in the health care realm and in the interests of environmental and human health wanted to share what he knew. Brody approached the challenge from the same standpoint. Setting up the “good-guy activists against the evil, bad-guy hospitals,” she says, “creates a dynamic where real change is hardly possible, and even if you do get some change, it doesn't create a trajectory of hope. Instead, if we create a dialogue among participants, all of whom have strengths and weaknesses, you can get much farther faster.”⁷

I left that Cambridge meeting thinking I had established valuable contacts for the challenges I was facing, and I was determined to stay in touch.

Fifteen years later, when I reminded Cohen of that first meet and greet, he broke into a big smile. Recalling the days when Health Care Without Harm was more a vision than a reality, he said, “I remember going back to my colleagues and telling them I thought Kaiser Permanente was going to be a partner with us. It was like picking a lottery ticket from the ground and it turns out to be the winning number.”

The payoff of our continuing relationship has been transformative for both of us. In many ways, our two organizations, along with several other mission-driven hospital systems that joined the movement early on, were embarking on a long and ongoing journey. Our journey would take those early concerns about environmental health and its links to human health from the fringes of the nation's health care industry to its mainstream.

Today, Health Care Without Harm includes nearly 500 hospitals, universities, health professional organizations, and environmental groups working in 52 countries. It has also created a separate nonprofit organization, Practice Greenhealth, which has become the nation's premiere membership organization for hundreds of large and small health care systems committed to environmental stewardship and sustainability (see Box 1.1). The movement Health Care Without Harm helped nurture has played a key role in the ongoing transformation of American health care from its long-standing sick-care orientation to a disease-prevention and well-care agenda. And in doing so, it has demonstrated both the potential and necessity of reaching beyond hospital walls to improve people's health and well-being wherever they live, work, or play: in neighborhoods and communities, office buildings and factories, schools and playgrounds. It has helped to turn visionary ideals about health, the economy, society, and environmental stewardship into practical, cost-effective, commonsense strategies for a healthier world.

FACING UP TO ENVIRONMENTAL HEALTH HAZARDS

But that is getting far ahead of the story. For the truth is, despite all that has been accomplished in the past 15 years—and the progress has been impressive by any measure—the health care sector is playing catch-up to an explosive growth in scientific evidence in recent years about the links between human and environmental health. As Susan Dentzer, then editor of the journal *Health Affairs*, noted in a 2011 issue on environmental health, we now know that “the environment plays a role in nearly 85 percent of all disease. Yet... what we know about that subject—as opposed to what we need to know or do to protect health—is at best an inch deep.”⁸

What we know today about the scope of the problems is a mile wider than what we knew 15 years ago. Back then, Health Care Without Harm and its earliest partners, including the US Environmental Protection Agency (EPA), the American Nurses Association, and a number of private health care systems, were focused narrowly on the emerging evidence

Box 1.1 PRACTICE GREENHEALTH

Practice Greenhealth is a nonprofit membership organization founded on the principles of positive environmental stewardship and best practices in sustainability by organizations in the health care community. Practice Greenhealth grew out of the former EPA-funded Hospitals for a Healthy Environment (H2E) and, as a membership organization, carried on H2E's agenda for the virtual elimination of mercury, reduction of the health care sector's total waste volume, chemical waste minimization, and other educational and information-sharing activities. Its overriding goals include the following:

- Preventing, reducing, and generating less waste in the health care sector
- Achieving carbon neutrality in health care
- Reducing energy and water usage
- Encouraging responsible construction, renovation, and product purchasing
- Maintaining safe and respectful work environments
- Engaging communities on environmental sustainability in design, construction, and operations
- Increasing recycling programs
- Phasing out hazardous substances and toxic chemicals

Practice Greenhealth has more than 1,200 members, including hospitals and health systems, health care provider organizations, major health care product and service providers, plus architectural, engineering, and design firms, group purchasing organizations, and affiliated nonprofit organizations. It is the key sponsor of the Greening the Supply Chain Initiative, the Greening the Operating Room Initiative, and the Healthier Hospitals Initiative.

about the hazards of hospital-based PVC and dioxin pollution. They also took on mercury, a potent neurotoxin that can harm the brain, spinal cord, kidneys and liver, and was used widely in hospitals in virtually all thermometers, blood pressure instruments, and other medical devices. Today, thanks largely to Health Care Without Harm's early campaigns to inform health systems of the dangers of these chemicals and its work to find cost-effective alternatives, both hazards have been minimized, if not eliminated. Mercury thermometers and blood pressure devices are now practically obsolete in the United States, and only about 60 medical waste incinerators remain of the thousands that were spewing dioxin into the atmosphere 15 years ago.

Toxic Chemicals

Every year, the evidence linking costly and increasingly widespread chronic diseases like cancer, asthma, and Parkinson's disease to environmental factors grows stronger, including environmental exposure to tens of thousands of human-made chemicals. The chemical world into which most of us were born was a universe apart from the relatively benign chemical environment that greeted our parents' or grandparents' generations. And given the rate of production of new chemical substances, still untested for human health impacts, it is hard to imagine the chemical soup that awaits the next generation. In just the last 50 years, more than 80,000 synthetic chemicals have been invented and put to use in commercial applications. Due to weaknesses in the Toxic Substances Control Act (TSCA), we know practically nothing about the potential impacts on human health of the vast majority of these chemicals. Of the industrial chemicals that have been registered with the EPA since 1976, when the act was passed, approximately 62,000 were "grandfathered" into the inventory without any toxicity testing. Even now, new chemicals added to furniture, electronics, toys, cosmetics, household products—and medical products—can go to market with no proof that they are safe. Most hospital purchasing departments are in no better position to determine the health impacts of the billions of dollars' worth of products they purchase every

year than the average consumer. And even after negative health impacts are documented, the TSCA makes it almost impossible for the EPA to ban products containing harmful chemicals.

Since 1999, the National Biomonitoring Program of the CDC has conducted periodic surveys of human exposure to 219 of the estimated 3,000 chemicals that are considered “high-production” chemicals, meaning they are produced in volumes exceeding a million pounds per year. The results are published in the *National Report on Human Exposure to Environmental Chemicals*. Over the years, measureable amounts of all tested chemicals have been detected in the bloodstreams and urine of virtually all Americans, including pregnant women.

GETTING PERSONAL

In 2005 I agreed, out of pure curiosity, to be tested for the presence of 27 common industrial chemicals in my body. It turned out I had measureable amounts of all of them, including some nasty ones. It also turned out, according to the physician administering the test, that my results were typical.

Was I at risk? Certainly. But how much risk and for what? No one knows. No one really understands, with much precision, the impact of this twenty-first century chemical tidal wave, except for the relatively few substances that have been directly linked to animal or human health effects. Since the early 1990s, much attention has focused on chemicals known or believed to contribute to disease and dysfunction in fetuses, infants, and children, all of whom are particularly sensitive to toxic substances due to their disproportionate exposure per pound of body weight. Scientists cite strong evidence that toxic chemicals are directly linked to the rising rates of chronic diseases in children, including asthma, birth defects, neurodevelopmental disorders (such as dyslexia, attention-deficit/hyperactivity disorder, and autism), leukemia, brain cancer, and testicular cancer.⁹ One recent study, from the Mount Sinai School of Medicine, calculated that the costs of environmentally mediated diseases, including lead poisoning, prenatal methyl mercury exposure, childhood cancers, asthma, autism, and attention-deficit disorders, exceeded \$76 billion in 2008, equal to 3.5 percent of total US health care costs.¹⁰

Contributions to Climate Change

But toxic substances are not the only poorly understood environmental health threat lurking in hospitals and homes. Even now, scientists alarmed by the potential health impacts of climate change are urging public and private health systems to prepare to deal with entirely new kinds of health issues. These include the possible resurgence of vector-borne communicable diseases like cholera, malaria, and typhoid in developed nations, where they have been virtually eradicated, but also rising rates of Western-style chronic diseases like asthma and other respiratory diseases in rapidly developing nations. The World Health Organization estimates that, due in part to climate change, dengue is now endemic in more than 100 countries, up from nine countries in 1970, and is now a threat to at least 40 percent of the world's population.¹¹ Climatologists predict dramatic changes in weather patterns and the frequency of floods and drought, which will result in unprecedented levels of human migration and the spread of once-isolated diseases and even new diseases. Whether or not one ascribes to the well-documented evidence on the human causes of climate change, its potential health impacts are beyond political dispute.

From my perspective, what has been particularly disturbing is the growing evidence over the last 10–15 years of the extent of the health care industry's own contributions to environmental pollution. For instance, we have learned that hospitals constitute the second most energy-intensive commercial buildings in the United States. Operating around the clock, they use more than 2.5 times the energy per square foot of other commercial buildings and make an equally outsized contribution to carbon dioxide emissions. One average-size US hospital produces approximately 18,000 tons of carbon dioxide annually.¹² Overall, US hospitals' energy demands account for about 8 percent of total US energy consumption, at a cost of more than \$8.5 billion a year, and rising.¹³ According to a 2009 study, the health care sector in the United States contributes 8 percent of the nation's total greenhouse gas emissions, which are at least in part responsible for