



Connecting Health Care With Public & Environmental Health

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Catholic health care is committed to protecting the environment, to minimizing environmental hazards and to reducing our contribution to the problem of climate change. We care for those who are harmed by the environment, we strive for internal practices to ensure environmental safety and we advocate public policies and private actions that bring solutions.

With our members, CHA is working to raise the issue of environmental stewardship as a mission-based clinical and public policy imperative. We act as responsible stewards of God's creation as we respond as a ministry to building healthier communities.

What follows is an article by Ted Schettler, MD, MPH, science director of the Science and Environmental Health Network (SEHN). Dr. Schettler has worked extensively with community groups and non-governmental organizations throughout the U.S. and internationally, addressing many aspects of human health and the environment. He has served on advisory committees of the U.S. EPA and National Academy of Sciences.

He is co-author of *Generations at Risk: Reproductive Health and the Environment*, which examines reproductive and developmental health effects of exposure to a variety of environmental toxicants. He is also co-author of *In Harm's Way: Toxic Threats to Child Development*, which discusses the impact of environmental exposures on neurological development in children, and *Environmental Threats to Healthy Aging: With a Closer Look at Alzheimer' and Parkinson's Diseases*.

He serves as science director for the Collaborative on Health and Environment and is an active participant in the Health Care Without Harm coalition, contributing to its international campaign to improve the environmental performance of hospitals and other health care institutions.

Dr. Schettler earned a medical degree from Case-Western Reserve University and a master's degree in public health from the Harvard School of Public Health. He practiced medicine for many years in New England.

I hope you find this resource insightful and that you share it widely in your organization.

Thank you,



Sister Carol Keehan, DC
President and Chief Executive Officer
Catholic Health Association of the United States



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Ted Schettler, MD, MPH

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About 25 years ago, health care organizations began hesitantly looking at the public and environmental health consequences of what they were doing. Driven by news reports of syringes and other medical waste washing up on New Jersey and New York beaches, they focused initially on waste management.

Then came U.S. EPA findings that medical waste incinerators were the leading source of environmental dioxin releases and a major source of mercury. These toxic contaminants build up in the food chain to levels that are unsafe for humans and wildlife. Their origins have sparked intense interest. It looked as if health care institutions, dedicated to providing high quality care to their patients, were unwittingly adding to disease and disability burdens in the communities that they served and beyond.

Improvements in waste management soon followed, but many organizations went further. They began to look more deeply and broadly at themselves, ultimately confronting their organizational systems and values. They began to explore preferential purchasing of products made of safer chemicals and materials, green building design and operations, energy conservation and procurement of nutritious food produced in more just, sustainable ways.

These initiatives are central to a broad-based effort to re-connect medicine with public and environmental health. They come at a time when the inseparability of human and environmental health is documented daily in scientific journals and stories from around the world. Leading organizations realize that providing safe and effective medical care to their patients connects fundamentally to the well-being of the public, the earth and the ecological systems on which life depends.

THE ENVIRONMENT & HEALTH

The term *environment* refers not only to air, water, soil, plants and animals but also to biotic communities and systems of food and agriculture, social organization, buildings and transportation that people have created.

An integrated, ecological framework recognizes that individuals are nested within families, communities, ecosystems, societies and cultures.

This perspective features complex, rich interactions within and across levels of organization. Health, however defined, is deeply dependent on these relationships.

The environment influences human well-being even before conception. Various qualities of eggs and sperm of prospective parents are altered by nutrition and exposure to environmental chemicals. Maternal diet, environmental contaminants and social stressors help to shape the environment of the womb.

Typical U.S. babies are born with measurable levels of dozens of industrial and agricultural chemicals in their mothers' and umbilical cord blood.^{1 2 3} These chemicals are encountered in food and water, the ambient environment—home, community, workplace—and many consumer products. Some of them are known to cause cancer, birth defects, learning and behavioral problems, and various other diseases and disorders. But most have not undergone adequate safety testing, and we don't know what their impact may be.⁴

In 1986, Barker and Osmond reported in the journal *Lancet* that the offspring of undernourished pregnant women during the Dutch famine of WWII were at much higher risk of heart disease and stroke in adulthood.⁵ Studies showed that poor nutrition in early development increases susceptibility to the effects of an abundant diet after birth. Recent science now shows how profoundly other environmental agents can also influence fetal development and disease risk throughout life, including many decades later.^{6 7}

We have long known that early life exposure to lead, alcohol, tobacco smoke and some pharmaceuticals can have lasting health consequences. But the list of chemicals and contaminants of concern is now much more extensive. It includes mercury and other metals, various pesticides, and a long list of chemicals commonly encountered in consumer products but inadequately regulated by government.



During infancy, childhood, adolescence and adulthood, human interactions with the chemical, physical, nutritional, built and social environments fundamentally influence the health of individuals and communities.

Neurodevelopmental problems with lasting impact on learning and behavior can result from exposure to lead, mercury, flame retardants, pesticides and many others.^{8 9 10} Asthma can be caused or triggered by air pollution and exposures to chemicals in consumer products or the workplace.¹¹ Some pesticides and other industrial chemicals increase the risk of various kinds of cancer.¹² The National Toxicology Program's Report on Carcinogens lists about 240 chemicals as known or reasonably anticipated to be human carcinogens.¹³ The importance of optimal nutrition for health throughout life is well-known, but the impact of environmental chemicals on health status in older adults has received less attention. For example, higher lifetime lead exposures result in greater

cognitive decline in later years.¹⁴ Exposures to certain pesticides used in agriculture increase the risk of Parkinson's disease^{15 16} and some kinds of cancer.^{17 18} Air pollution increases the risk of myocardial infarction, bronchitis and asthma.^{19 20 21} Emerging evidence also links air pollution to cognitive decline and dementia.^{22 23}

Recognizing that many of these diseases are treated in their own facilities, leading health care organizations have begun to investigate the extent to which they inadvertently contribute to them and seek ways to reduce that impact by modifying their practices. Moving beyond the institutional level, some are weighing in on development of local, state and federal policies addressing public and environmental health. Their rationales differ and tend to evolve.

ETHICAL RATIONALE

Some health care leaders are motivated to reduce their institutional impacts on public environmental health primarily for ethical reasons. They see it as the right thing to do. Faith-based organizations often express this ethical rationale as care for God's creation. Moral considerations have always had a major influence on medical practice and health care. The imperative to "First, do no harm," has deep historical roots in medical practice. This is easily extended more generally to the community and earth. Commitments to beneficence, respect promotion and defense of the dignity of people, and concern for the most vulnerable and future generations demand a more clear-eyed view of the positive and negative impacts of what health care organizations are doing.

ECONOMIC RATIONALE

Economic considerations initially motivated some health care organizations. Facing large and growing disposal costs, they realized substantial savings when their facilities took steps to reduce waste and minimize the volume of more-costly regulated "red bag" waste, even when that meant hiring a waste manager. They saw the potential benefits of reduced packaging and material recycling, but inevitably this meant that manufacturers and suppliers would need to become involved, and efforts moved upstream in the supply chain.

Economies of scale now give health care institutions, through their group purchasing organizations (GPOs), an opportunity to transform the supply chain by creating incentives for development of cost-competitive, safe and effective products and processes.

Similarly, many organizations employ measures to reduce energy use, driven primarily by cost considerations. Yet these steps can also yield environmental and public health benefits if chosen wisely.

PUBLIC & ENVIRONMENTAL HEALTH-BASED RATIONALES

Health care institutions that want to improve the public and environmental health consequences of their practices can choose among a range of activities. They include:

- + Purchasing
- + Materials: toxicity, volume reduction, recycling
- + Waste management
- + Building design, construction, and renovation
- + Energy use
- + Housekeeping and maintenance
- + Water management
- + Transportation
- + Food systems (*integrates diet, nutrition, food production, food justice, ecological impacts of agriculture*)
- + Grounds and landscaping

WASTE MANAGEMENT

The volume of the hospital waste stream and its financial and public environmental health consequences are not trivial. In 1998, the AMA estimated the total annual volume of regulated medical waste generated in the United States to be approximately 465,000 tons, with an expected 7 to 10 percent annual rate of growth.²⁴ Their report estimated total solid waste generated per person per day in hospital facilities to range from 10 to 25 pounds, of which approximately 10 to 15 percent was classified as potentially infectious regulated medical waste.

Today, Practice Greenhealth reports that award winning hospitals generate 33 pounds of waste per bed daily.²⁵ Extrapolating that figure to the number of staffed hospital beds nationwide yields an estimate of more than 5.9 million tons of waste annually.

In many ways the contents of hospital waste are similar to the general municipal waste stream coming from households and other businesses. But there is an important difference. Hospital waste contains about twice as much plastic as the general municipal waste stream, 20 to 25 percent versus 10 percent.²⁶

Regulated medical waste is unique. It is potentially infectious, must be handled carefully, and is considerably more costly to dispose of properly. Many hospitals have undertaken strict measures to make certain that the two waste streams are appropriately segregated to minimize costs. The most common methods of treating regulated medical waste include incineration, autoclaving, microwave deactivation, chemical disinfection and electro-thermal deactivation. Treatment costs vary by method.

Unregulated hospital waste management has changed considerably in the past 15 years.

Previously, many hospitals used on-site incinerators for at least some of their waste disposal. Emissions from these were largely unregulated and in 1996, the EPA estimated that approximately 2,300 hospital waste incinerators were in operation. Studies showed that medical waste incinerators were leading sources of emission of dioxin, heavy metals and other hazardous pollutants. These contaminants fouled the air, water and soil, and some, like dioxins, furans and mercury, entered the food chain, threatening the health of people and wildlife. In 1997, under the authority of the Clean Air Act, the U.S. EPA issued regulations to control emissions from medical waste incinerators. Since then, many medical waste incinerators have closed. Today, hospitals choose between sending their unregulated waste to commercial incinerators or to landfills.

Despite more stringent regulatory oversight of incinerator emissions, their use is still highly controversial. Emissions from incinerators depend on their design, operation, and composition of the waste stream. The relatively large amount of polyvinylchloride plastic (PVC) in hospital waste is a significant source of chlorine for the *de novo* synthesis of dioxins, furans and related hazardous compounds in incinerator exhaust gases, depending on temperature and other operating conditions.²⁷ Released into the atmosphere, these persistent, bioaccumulative compounds contaminate air, water, soil and sediments, entering the food chain. If they are captured from the incinerator exhaust stream, they are deposited in the bottom ash, which is typically put into landfills.

Dioxins and furans are potent toxic chemicals. At low levels of exposure, they cause an array of adverse health effects, including impaired reproduction and development, interference with hormones, changes in metabolic enzymes, immunotoxicity and cancer. In 2012, after nearly 20 years of effort, the U.S. EPA finalized an assessment of the non-cancer health risks related to exposure to dioxins.²⁸ The assessment of cancer risks is forthcoming. Although dioxin levels in people and the environment have been falling in recent years as sources of emissions have been better controlled, the EPA finds that the level of exposure that begins to cause adverse health effects is close to typical dietary exposure levels in the U.S. today. Thus, efforts to reduce dioxin emissions further are justified.

Reducing the volume and toxicity of the waste stream requires a multi-faceted approach. In hospitals, switching to multi-use products and initiating comprehensive recycling programs can dramatically reduce the volume of waste requiring disposal.

Persuading suppliers to reduce unnecessary packaging reduces waste. And careful choices among waste disposal options can reduce harmful exposures in people and wildlife.

PURCHASING

Leading hospitals and GPOs soon realized that staff, patient, public, worker and environmental health concerns led directly to product manufacture. Some began to preferentially purchase products made of inherently safer materials, creating incentives for manufacturers to re-design and re-formulate, phasing out hazardous materials in the life cycle of their products. An early broad-based purchasing initiative, led by Health Care Without Harm (HCWH) with the support of the U.S. EPA, focused on eliminating the use of products containing mercury and replacing them with safer alternatives. Mercury is a heavy metal used for many years in sphygmomanometers, thermometers and some electronic equipment. It can also be a low-level contaminant in laboratory chemicals. Metallic mercury is volatile and when exposed to the air, mercury vapors rapidly contaminate indoor air at levels that can pose health risks. In the hospital, mercury spilled from a broken sphygmomanometer must be treated as hazardous waste and can cost thousands of dollars to clean up properly.

When mercury-containing waste is incinerated, mercury not captured in the ash is emitted into the atmosphere and can travel long distances. Metallic and other forms of inorganic mercury are converted by bacteria—normally residing in soils and sediments of oceans, rivers, lakes, streams, and wetlands—into methylmercury, a highly toxic, organic form of the metal. Methylmercury is environmentally persistent and bioaccumulative—in aquatic systems it builds up to high levels in predatory fish, exposing people and wildlife eating those fish to unsafe levels.

Methylmercury is rapidly absorbed from the intestine and in pregnancy, easily crosses the placenta, exposing the developing fetus. It disrupts normal brain development in children exposed during critical windows of vulnerability. Whereas high-level exposures can cause mental retardation, seizure disorders and birth defects, lower levels cause more subtle effects on various measures of cognition and psychomotor development.²⁹ In 2001, the U.S. EPA established a reference dose, later affirmed by the National Academy of Sciences, below which adverse impacts on brain development are unlikely. According to the CDC, approximately 7 percent of women of reproductive age in the U.S. are currently exposed to mercury at levels exceeding the reference dose.³⁰ This means that more than 300,000 newborns each year in the U.S. may have increased risk of learning disabilities associated with prenatal exposure to methylmercury. Higher level mercury exposures from eating contaminated fish also contribute to the risk of heart disease and myocardial infarction in older people.³¹

Efforts to eliminate mercury-containing products from hospitals have gained wide support and many hospitals are now virtually mercury-free.

These hospitals have substituted safe and effective equipment and supplies that do not compromise patient care. This effort also led to the elimination of mercury thermometer sales in major pharmacy chains throughout the country and similar efforts internationally.

BEYOND MERCURY: PVC/DEHP

While efforts aimed at mercury-free health care were underway, other products also came under close scrutiny. Among them were items made with polyvinylchloride (PVC), a high volume plastic polymer with many applications in health care, construction and consumer products.

Interest in identifying alternatives to medical devices and supplies containing PVC has grown for several reasons. In addition to the hazardous compounds formed by its incineration, PVC manufacture requires ethylene dichloride, a likely human carcinogen, and vinyl chloride monomer, a known human carcinogen. Workers in PVC manufacturing and fence line communities next to these facilities are at risk for exposure to these chemicals. In addition, wastes associated with PVC manufacture contain dioxins and other hazardous organic compounds that must be disposed of properly.

Many uses of PVC require the addition of plasticizers to the polymer to impart flexibility. Diethylhexyl phthalate (DEHP), a member of another family of chemicals of concern, is the most common plasticizer used. Many laboratory animal studies show that DEHP and related phthalates interrupt normal development of the male reproductive system, resulting in lower sperm counts and various genital defects, at low levels of exposure.³²

Studies also show that, in some circumstances, DEHP leaches out of PVC medical devices resulting in significant patient exposures.³³ Bags, tubing and catheters made of PVC plasticized with DEHP can result in some of the highest exposures, particularly when fat-containing liquids flow through them. Quantitative assessments show that developing males can be exposed to DEHP at levels that pose a significant risk to their reproductive tract development, particularly when undergoing multiple interventions with DEHP-containing devices.



Sr. Mary Ellen Leciejewski, OP, director of ecology for San Francisco-based Dignity Health, shows several of Medline's pigment-free plastics now being used as part of Dignity Health's decision to use only pigment-free plastics in all of its hospitals and other care centers. It was the first health system in the nation to adopt the practice systemwide.

Based on these findings, in 2002, the FDA issued a public health notification, advising health care professionals to try to avoid using DEHP-containing devices when procedures with the highest risk of exposures were to be performed on male neonates, pregnant women who are carrying male fetuses and peri-pubertal males.³⁴

As a result of one or more of these concerns, some health care facilities have chosen to purchase medical devices made of alternative materials, without limiting care or sacrificing patient safety. Some hospitals have moved away from PVC in construction and furnishings, as well.

BEYOND MERCURY & PVC: COMPREHENSIVE CHEMICALS POLICIES

Other chemicals that can cause cancer, asthma, a variety of neurological, reproductive and developmental problems among others, are commonly embedded in products regularly used in health care delivery, hospital laboratories, offices, furnishings, maintenance and building materials. Some are indispensable while others are completely replaceable.

Chemotherapeutic agents for treating cancer and other disorders can increase cancer risk in hospital staff handling the drugs.³⁵ Since they are currently essential for recommended medical care, personal protection and other staff exposure-reduction measures are critically important.

Ethylene oxide, a known carcinogen, has long been used as a sterilant for heat-sensitive medical devices. Studies have shown an increased risk of breast and other kinds of cancer in health care workers exposed to ethylene oxide. Its replacement, when possible and with strict control measures, have lowered although not eliminated the risk.^{36 37}

Formalin, a dilute solution of formaldehyde, is a tissue fixative in hospital laboratories. Unfortunately, it is a carcinogen, skin allergen, and can cause asthma.^{38 39} Lab personnel must be cautious when using it in lieu of good alternatives. However, some building materials, for example particle board, can also contain formaldehyde that off-gases into indoor air, directly exposing occupants. Alternatives for those uses are available, and some hospitals have begun to specify carcinogen-free products for remodeling, new construction, and maintenance.

The occupational asthma risk for nurses ranks among the highest of all professions.^{40 41} The risk for custodial staff is 70 percent higher than the general population. Exposure to asthma-causing irritants and sensitizers is common in health care, including from cleaning products and sterilants. Preferential purchasing of green cleaning products enables facilities to maintain cleanliness and appropriate disinfection, while avoiding worker and patient exposure to chemicals that can cause or trigger asthma and allergies.⁴² Integrated pest management programs successfully address the problem while reducing the use of potentially harmful pesticides in buildings and surrounding landscaping.⁴³

Many purchasers now insist that electronics suppliers have take-back programs, with verified safe recycling, so that used equipment is not sent overseas where it is often dismantled by unprotected workers, some of whom are children, exposing them to high levels of hazardous chemicals.^{44 45}

In recent years, motivated by wanting to move beyond addressing one chemical at a time, more hospitals and their GPOs have begun a systematic review of their general purchasing policies recognizing:

- + Widespread human exposure to a complex mixture of industrial chemicals used in consumer products.
- + Lack of adequate federal regulatory authority to assure pre-market safety testing of chemicals and minimization of risk.
- + The ethical responsibility of health care institutions to use products containing chemicals that reduce risks to workers, patients, the general public, and environment.
- + The opportunity for health care institutions to collectively move entire markets toward safer alternatives and serve as a model for other sectors of the economy.

Hospitals and GPOs are beginning to ask suppliers to identify all ingredients in products so that they can make more informed purchasing decisions, avoiding chemicals that can cause cancer, reproductive and developmental disorders, neurological damage and interfere with hormones.

Adoption of a comprehensive policy encourages close scrutiny of virtually the entire material flow into and out of a facility, including products for building, operations, maintenance, furnishings, medical products, electronics and office supplies.

BUILDING DESIGN, OPERATIONS, AND MAINTENANCE

Historically, hospitals have used materials and practices in their design, construction and maintenance that, ironically, actually contribute to the diseases treated within them. This is no longer being accepted by many health care leaders. Green building design and operations have taken hold in the health care sector, led by the Green Guide for Health Care (GGHC), a multi-year project of HCWH and the Center for Maximum Potential Building Systems.⁴⁶



In collaboration with Dignity Health Corporate Real Estate, Mercy Elk Grove, Elk Grove, Calif., a new medical office building, ambulatory surgery center and imaging center opened in June of 2012 with a fully functional photovoltaic system. The building was designed and constructed using energy efficient technologies and includes a 197 kW solar array to offset approximately 35 percent of the building's base building common area electric consumption. The solar arrays are integrated in parking canopies which also provides covered parking for approximately 80 automobiles. Through January of 2013, the system produced 310K kWh, reduced CO2 emissions by 222 tons and saved over 25,000 gallons of gasoline.

In the introduction to their book *Sustainable Healthcare Architecture*,⁴⁷ Robin Guenther and Gail Vittori say, “Considering buildings within a life cycle context and viewing them as part of an ecosystem or ecological metabolism, at least metaphorically, signals that buildings have much in common with the human body. Knowing that buildings are a principal determinant of human and global health means that a building that is healthy through the life cycle is key to creating a healthy planet.”

As Rick Fedrizzi, founding chairman of the U.S. Green Building Council notes, “Buildings are human habitat. The way we design, construct, and operate these buildings has a profound impact on our health and the health of our environment. For too many years, the impact has been negative, from carbon dioxide emissions and construction waste to the wanton use of energy, water, and natural resources. Often, indoor air is more polluted than the air outside and has been linked to illnesses ranging from asthma to cancer.”

Recognizing these connections leads first to incremental and then transformational change. In existing buildings, the GGHC outlines operations initiatives in site management, transportation, energy efficiency, water use reduction, building management, reduction in use of toxic chemicals, environmentally preferable cleaning and sustainable food purchasing. These initiatives offer real benefits within the facility and help to reduce impacts on community and public health.

Renovation and new construction are opportunities for transformational change— for designing and building an aesthetically pleasing hospital that is truly a healing environment.

It could be built without materials containing chemicals that can cause cancer, birth defects or asthma anywhere within their life cycle. It may capture, use and recycle rain water and take full advantage of natural light and ventilation, incorporating views of the natural world. Properly designed and constructed, energy consumption can be dramatically reduced in this kind of building. This ecological design perspective also improves patient outcomes, reduces stress, and enhances staff functioning.⁴⁸

ENERGY

Second only to the food industry, health care is a highly intensive consumer of energy.⁴⁹ According to the Commercial Building Energy Consumption Survey (CBECS), hospitals of more than 200,000 square feet accounted for less than 1 percent of all commercial buildings and 2 percent of commercial floor space, but consumed 4.3 percent of the total energy used by the commercial sector in 2003 and 5.5 percent in 2007.⁵⁰ Health care also accounts for about 8 percent of all greenhouse gas emissions in the U.S.⁵¹

Energy-related resource extraction, transportation, processing and refining, combustion of fossil fuels, and waste management have profound impact on public health and the environment.

Coal-fired power plants generate about 45 percent of the electricity used in the U.S. According to the EPA, coal combustion produces 84 of 187 hazardous air pollutants that threaten human health and the environment. These plants produce 40 percent of all hazardous air pollutants released from point sources.⁵² They are major sources of nitrogen oxides, sulfur oxides, particulate air pollutant, and mercury releases. These emissions have adverse impacts on lungs, kidneys, brains, and cardiovascular systems—substantially contributing to asthma, bronchitis, myocardial infarctions, stroke, cancer and learning disorders in our communities.

Carbon dioxide released from fossil fuel combustion is a greenhouse gas contributing to climate change. Emissions from natural gas extraction and combustion also add to ground level air pollution. Nuclear energy is faced with intractable waste management problems, threats of catastrophic accidents, and is tightly interwoven with nuclear weapon threats around the world.

Some health care institutions have undertaken substantial efforts not only to reduce energy consumption but also to purchase green, renewable energy for at least a portion of their energy requirements. Properly configured, these efforts can not only reduce costs but also benefit public and environmental health.

FOOD: DIET, NUTRITION, HUMAN HEALTH

What we eat is undeniably among the most important determinants of our health.

Epidemiologic and laboratory data show that diet and the agricultural system that produces it can increase the risk of cancer, cardiovascular disease, diabetes, obesity, hypertension, cognitive decline, dementia, Parkinson's disease, birth defects and various neurodevelopmental disorders.

Most nutritional scientists and epidemiologists arrive at the same general conclusions: people are healthier when they eat mostly fruits and vegetables, unrefined carbohydrates, limited fats—with a preference for polyunsaturated fatty acids, particularly Omega-3s in cold water fish, walnuts and some vegetables—as well as monounsaturated fats, low fat dairy, little processed food and limited animal protein. Opinions about optimal proportions and patterns differ, but there is little disagreement about the basic structure. Unfortunately, this doesn't resemble what most people in the U.S. actually eat.^{53 54}

Dietary changes, combined with moderate levels of exercise, i.e. 20 minutes daily, can prevent the onset of diabetes, even in people already at risk.⁵⁵ Atherosclerotic cardiovascular disease can be prevented and even reversed with combinations of diet and exercise.^{56 57} Observational studies show slowing of cognitive decline in elderly people who follow a Mediterranean-like diet containing abundant fruits and vegetables, fish, unrefined grains, legumes, nuts, olive oil and low-fat dairy.^{58 59}



St. Joseph Hospital (Bangor, Maine) is one of many farmer's markets within Covenant Health Systems that offers the community access to locally-grown products as part of the health system's commitment to signing Health Care Without Harm's, "Healthy Food Initiatives" pledge. Covenant Health Systems is a seven-time Practice Greenhealth Environmental Excellence Award winner, a distinction earned by institutions within the health care sector for outstanding programs to reduce the facility's environmental footprint.

The food system in the U.S. is an outgrowth of incentives and subsidies put in place throughout the 20th century. Concerns about malnutrition meant an early emphasis on producing more calories. Subsidies for commodity crops—corn, soybeans, wheat and rice—generated large and growing monocultures, heavily dependent on chemical and fossil fuel inputs. This approach led to air and water pollution on farms and downstream in rivers, lakes and estuaries. Farm workers, their families and surrounding communities are now exposed to hazardous levels of pesticides with increased risk of cancer, neurodevelopmental problems in children, and Parkinson's disease.^{60 61 62 63 64 65 66}

About 80 percent of all antibiotics used in America are given to pigs, beef cattle, chickens, turkeys and other farm animals, mostly to promote growth and not because the animals are ill, although infectious diseases are more likely in concentrated animal feeding operations. This overuse of antibiotics has contributed to the evolution of antibiotic-resistant bacteria and threats to human health.^{67 68} For years, industrial agricultural interests have resisted FDA attempts to monitor or control the use of certain antibiotics in animal food production. In 2012 the FDA arrived at a voluntary, non-binding agreement with the agricultural industry to promote the judicious use of antibiotics.⁶⁹ The effectiveness of this voluntary approach remains to be seen.

Historically, much of the food served in hospitals has not been particularly healthy. Excessive fat, refined sugars, highly processed food and too few fruits and vegetables have been all too common. Some hospitals even house fast food outlets featuring menus guaranteed to contribute to the illnesses treated in wards and operating rooms on the floors above. This has all begun to change with the dramatic growth of a healthy-food-in-hospitals movement.

During the past 10 years, a number of health care systems have adopted food procurement policies that are aligned with healthy dietary guidelines and reflect an understanding of the strong connections between food production and public and environmental health.

Some systems support farmers' markets at their facilities. They provide dependable markets for local growers, helping to support the local economy. Others are growing some of the food served in their facilities. Many now regularly compost food waste for local soil renewal. These efforts have led to more nutritious, tasty food for patients, staff, visitors and the general public. They contribute to the growing shift toward food systems that are ecologically sound, economically viable and socially responsible.

CONCLUSION

A growing number of health care organizations are undertaking systematic analysis of materials and product purchasing, building design, construction operations, energy sources and consumption and profiles of the food they purchase and serve in their own facilities. They recognize that each of these has consequences within and beyond their facilities. They have joined a growing movement to reconnect medicine with public and environmental health.

Adoption of this integrated framework now coincides with health care reform efforts that are taking shape in the U.S. today. New delivery models are emerging with the goals of improving patient outcomes, improving community health and reducing health care costs—sometimes called the triple aim.⁷⁰ Patient outcomes and satisfaction are improved when people receive high quality care in a truly healing environment, appropriate to their needs. Community health is improved when people have access to clean air and water, nutritious food produced in environmentally sustainable ways and safe places for social engagement and exercise. Health care costs can be reduced by primary prevention of many prevalent chronic diseases and disorders, such as diabetes, obesity, cardiovascular disease and various kinds of cancer, among others. Health care institutions can make important contributions to achieving the triple aim by reducing the environmental and public health impacts of their activities, serving as models for other sectors and by promoting community health through expanded community benefit initiatives.



St. Francis Health System in Greenville, S.C., part of Bon Secours Health System Inc., is an active leader in environmental stewardship practices. Here, employees and community members participate in "Sprouting Saturdays" and many other initiatives. In addition, the associates starred in a video the organization produced, "Every Day is Earth Day," which can be viewed at www.youtube.com/watch?v=-vbEvVPFCfc&list=UUPC1jhI-jEB8vTjkdHCLHHg&index=7

In addition to opportunities discussed here, many have yet to be even tentatively explored. Support for creative talent within existing institutions and establishment of new relationships with other organizations committed to re-connecting medicine with public and environmental health will help achieve the triple aim and make lasting contributions to improved individual, community and planetary health.

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