Clare Cooper Marcus Naomi A. Sachs Foreword by Roger S. Ulrich

Therapeutic Landscapes

An Evidence-Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces

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Cover design: Wiley

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Published by John Wiley & Sons, Inc., Hoboken, New Jersey.
Published simultaneously in Canada.

Library of Congress Cataloging-in-Publication Data:

Marcus, Clare Cooper.
Therapeutic landscapes : an evidence-based approach to designing healing gardens and restorative outdoor spaces/Clare Cooper Marcus, Naomi Sachs.
pages cm
Includes index.
ISBN 978-1-118-23191-3 (cloth); ISBN 978-1-118-41940-3 (ebk); ISBN 978-1-118-42110-9 (ebk)
1. Medical geography. 2. Landscapes—Therapeutic use. 3. Landscape architecture—Therapeutic use. 4. Evidence-based design. I. Sachs, Naomi, 1968- II. Title.
RA792.M335 2014
614.4'2—dc23

2013007059

Printed in the United States of America
10 9 87 6 5 4 3 2 1

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Foreword

The publication of this important book could not be more timely, given the great wave of healthcare facility construction and renovation overtaking the United States and other countries. Healthcare environments are changing and responding to trends and challenges as varied as new payment policies that reward quality and satisfaction, the growing importance of ambulatory care and rehabilitation, rising acuity levels of hospital inpatients, and rapid growth in the number of frail elderly and those with Alzheimer's disease or other forms of dementia. The fast-evolving character of healthcare underscores the need to rethink the design of care environments and to create better facilities that prominently include gardens designed in evidence-informed ways to reduce stress, improve satisfaction and clinical outcomes, and enhance sustainability.

The interdisciplinary field of evidence-based design (EBD) has developed over the past twenty-five years in response to the need for sound knowledge to help guide healthcare design that improves care quality, outcomes, and cost-effectiveness. It makes solid sense to use the best available evidence when creating a new, long-lived healthcare environment on which so many will depend. Although the quality and amount of EBD research has rapidly increased, most studies address issues linked to the architecture and interior design of hospitals—the effects of single versus multibed patient rooms on infection transmission, for example. A smaller but growing body of EBD research has examined the influences of gardens and nature views on quality of care and outcomes in healthcare facilities. This book provides an up-to-date account of the research and theory on the effects of nature and excels in extracting and clearly explaining the design implications. Readers will gain a great deal of evidence-informed knowledge and insight concerning what garden design approaches work and which are not effective in improving healthcare quality.

It has been fifteen years since publication of the landmark volume edited by Clare Cooper Marcus and Marni Barnes, *Healing Gardens: Therapeutic Benefits and Design Recommendations*. Compared to that 1999 work, this new book by Marcus and Naomi A. Sachs contains much fresh material, based on recent research, plus a wealth of new knowledge derived from evaluations of several innovative and successful therapeutic gardens created in recent years by landscape architects and healthcare providers. The book begins by surveying the history of hospital outdoor space, provides a chapter covering research and theory, and follows with chapters on types and locations of therapeutic spaces in healthcare, and general design guidelines relevant across different categories of medical facilities.

Each of the following chapters focuses on a garden category designed for specific patients or user groups: gardens for children's hospitals, for example; for patients with cancer; for persons with Alzheimer's; and for mental and behavioral health facilities. These chapters present case studies of exemplary real-world gardens, accompanied by instructive and interesting insights obtained from postoccupancy assessments giving balanced views concerning strengths and weaknesses of the settings. Each chapter reviews research relevant to the specific user group and discusses design guidelines adjusted to meet their particular therapeutic needs. These chapters are superbly illustrated. A few examples of the many outstanding gardens featured: the Olson Family Garden at St. Louis Children's Hospital, Alnarp Rehabilitation Garden in Sweden, and the internationally renowned Oregon Burn Center Garden at Legacy Emanuel Medical Center in Portland. Additionally, this is the first book on healing gardens with chapters on planting design and maintenance, horticultural therapy, sustainability, gardens for veterans, restorative spaces in public spaces, and the business case for healing gardens, including funding strategies.

A theme running through the book is that a participatory design process is vital to creating a successful therapeutic garden. This critical topic is the focus of a noteworthy chapter by Teresia Hazen, which describes the participatory process developed at Legacy Health in Portland, Oregon, and used to create several successful gardens at Legacy medical centers. The Legacy process begins with the premise that there is no one-size-fits-all garden design adequate to meeting the needs of varied types of patients, their families, and associated clinicians. The Legacy process instead tailors the design of each garden to ensure it directly and effectively serves the therapeutic needs of a particular category of patients (for example, stroke patients, burns cases) and their families and healthcare team.

More than any other previous book, *Therapeutic Landscapes* provides research-grounded yet user-friendly information that will enable readers to successfully design, fund, and build healthcare facilities that provide beneficial

access to nature for patients, visitors, and staff. This book will be an indispensable resource for healthcare designers and horticultural therapists. It will also be of great value for healthcare administrators, facility managers, facility developers, and many therapists and other clinicians. The knowledge and lessons it offers will be critically important for increasing the quality and success of any healthcare project that provides gardens or other forms of access to nature.

Roger S. Ulrich, PhD, EDAC

Acknowledgments

We are deeply grateful to the many people who helped make this book a reality. We thank two colleagues who generously contributed their time and expertise by writing chapters: Teresia Hazen of Legacy Health in Portland, Oregon, who wrote chapters 5, "The Participatory Design Process," and 16, "Horticultural Therapy and Healthcare Garden Design"; and Marni Barnes of Deva Designs in Palo Alto, California, who wrote chapter 17, "Planting and Maintaining Therapeutic Gardens."

We greatly appreciate those colleagues who wrote or contributed to individual case studies of exemplary restorative landscapes that they designed, studied, or helped facilitate. These include Chris Garcia and Shelagh Smith (chapter 9); Chris Garcia (chapter 11); Jessy Bergeman, Victoria L. Lygum, and Ulrika K. Stigsdotter (chapter 12); Brian Bainnson (chapter 13); and Jeffrey Smith, Patty Cassidy, Kevin Aust, and David Kamp (chapter 15).

As we wrote about the business case for healing gardens and funding considerations, we asked a variety of colleagues for their experiences and drew upon their responses. For useful insights we want to thank: Brian Bainnson, Carter van Dyke, Becky Feasby, Bob Golde, Teresia Hazen, Rob Hoover, Kirk Hines, David Kamp, Deborah LeFrank, Connie Roy-Fisher, Alberto Salvatore, Jeffrey Smith, Jerry Smith, Lisa Waisath, and Daniel Winterbottom.

We greatly appreciate those colleagues who took the time to read and give valuable feedback on drafts of various chapters and case studies. These include Janet Brown, Barbara Kreski, Deborah LeFrank, Steve Mitrione, Connie Roy-Fisher, Zofia Rybkowski, Alberto Salvatore, Amy Wagenfeld, James Westwater, and Russell Wilson.

We asked colleagues for images or site plans of projects they had designed, studied, or photographed that we might include in the book, and we had an overwhelming response. We offer our thanks to the many individuals and firms who replied: Lena Welen Andersson, Kevin Aust/AECOM, Angela Milewski/BHA Design, Brian Bainnson/Quatrefoil, Marni Barnes/Deva Designs, Tom Benjamin/Wellnesscapes, Jessy Bergeman, Melissa Bierman/Legacy Health, Beverly Brown/Nazareth College, Renata Brown/Cleveland Botanical Garden, Laura Blackwell/The Plaza at Twin Rivers, Sabrina Buttitta/Plant Connection, Patrick Carey/Greenroofs.com, Jack Carman/Design for Generations, Sharon Coates/Zaretsky Associates, Tara Graham Cochrane/Design Well, Nilda Cosco/Natural Learning Initiative, Brenna Costello/SmithGroup JJR, Bob Cunningham/Arcadia Studio, Sharon Danks/Bay Tree Design, Leah Diehl/University of Florida, Henry Domke/Henry Domke Fine Art, Mark Epstein/Hafs-Epstein, Julie Evans/The Fockele Garden Company, Terri Evans/Shepley Bulfinch, Lesley Fleming, Gwenn Fried/NYU Langone Medical Center, Chris Garcia/San Diego Botanic Garden, Charlotte Grant, Teresia Hazen/Legacy Health, Ella Hilker/Haverefugiet, Kirk Hines/Wesley Woods-Emory Healthcare, Sonja Johansson/Johansson Design Collaborative, Bryan Johns/Clarke-Lindsey Village, Jennifer Jones/Carol R. Johnson Associates, Kenneth Helphand/University of Oregon, David Kamp/Dirtworks, Lydia Kimball/Mahan Rykiel Associates, Barbara Kreski/Chicago Botanic Garden, Kurisu International, Deborah LeFrank/LeFrank and Associates, Kun Hyang Lee/Asia Pacific Association of Therapeutic Horticulture, Victoria Linn Lygum, Laurel Macdonald/Macdonald Environmental Planning, Beth Matlock/Living Art Designs, Randall Metz/Grissim Metz Andriese Associates, Maja Steen Moller, Jim Mumford/Good Earth Plants, Dorinda Wolfe Murray/Independent Gardening Ltd., Upali Nanda, Danna Olsen/University of Wisconsin–Madison, Samira Pasha/Perkins+Will, Annie Pollock/Arterre Landscape Design, Mary Poole/Christian Care Community, Robert Rensel/Cleveland Botanical Garden, Annette Ridenour/Aesthetics Inc., Susan Rodiek/Texas A&M University, Geoff Roehll/Hitchcock Design Group, Connie Roy-Fisher/Studio Sprout, Alberto Salvatore/Salvatore Associates, Jan Satterthwaite/VireO Design Studio, Herb Schaal, FASLA, Becky Hoerr and Peter Schaudt/Hoerr Schaudt Landscape Architects, Giulo Senes/University of Milan, Mike Shriver/National AIDS Memorial Grove, Erin Smith/Just in Time Therapy, Jeffrey Smith/Professional Engineering Associates, Shelagh Smith/Vancouver General Hospital, Rick Spalenka/RGS Designs, Diana Spellman/Spellman Brady, Ulrika Karlsson Stigsdotter/University of Copenhagen, Tim Sturdy/Mainzeal, Christine Ten Eyck/Ten Eyck Landscape Architects, Nissa Tupper/HGA Architects and Engineers, Martha Tyson/Upland Design, Roger Ulrich/Chalmers University, Carter van Dyke/Carter van Dyke Associates, Lori Vierow/Planning Resources Inc., Amy Wagenfeld/Western Michigan University, Gary Wangler/St. Louis Children's Hospital, Keith Watson/Gardening Leave, Steven Wells/Austin Health Royal Talbot Rehabilitation

Center, Daniel Winterbottom/University of Washington, Mary Wyatt/TKF Foundation/Open Spaces Sacred Places. We extend a special thank you to Henry Domke of www.henrydomke.com for his generosity in letting us use his nature photographs.

We are grateful to all of the members of the Therapeutic Landscapes Network who submitted images, stories, and ideas as we were developing the themes encompassed in this book.

We want to thank two people who were invaluable in helping us get the manuscript into shape: Janine Baer, for computer assistance; and Laura Leone, who tirelessly checked and organized references.

Thank you to Ian Muise, Rowena Philbeck, and Sheetal Goyal Rakesh at Texas A&M University's Technical Reference Center for technical support.

We are deeply grateful to the following people at John Wiley and Sons: Margaret Cummins, Senior Editor, encouraged us from the very beginning to undertake this book and guided us through the process with a firm but gentle and competent hand; Mike New, Editorial Assistant, for his invaluable help with organizing images and permissions; David Sassian, Senior Production Editor, for his excellent production skills.

Finally, some personal thanks. Clare wishes to thank her family—her children Lucy Marcus and Jason Cooper Marcus, daughter-in-law Angela Laffan, and grandsons Myles and Remington Marcus—who understood her passion for this work and gave her unfailing support and love. Her thanks go also to many friends, as well as her family, who rallied around when she broke her right (dominant) arm during the process of completing the book. Naomi wishes to thank her best friend, James Westwater, for his tremendous support—including insistence on healthy eating, sleeping, and spending time in nature ("Remember, this is what you're writing about!"); Agnes and Boo for making her take them on daily walks and providing healthy doses of positive distraction; and her parents, Benjamin and Jacqueline Sachs and mum-in-law, Nedra Westwater, for their love and encouragement.

CHAPTER 1

Introduction

> Having spent many weeks in the hospital left an indelible imprint on the way I experience pain, suffering, and loss within the recognized healthcare environment. Surely this fear and anxiety that one feels in this controlled and somewhat clinical building can leave one feeling more vulnerable, fragile, and scared. Just by being outside and with nature, to smell and touch the plants, reduced the depression and dread. I think more positive thoughts, am hopeful, and if I cry I feel the plants understand and do not judge or cringe.
>
> Mariane Wheatley-Miller, personal communication, 2013

HOSPITALS AND OTHER HEALTHCARE FACILITIES are some of the most difficult places for people to be. Regardless of the physical setting, they are almost invariably environments where people face a high degree of stress. Patients may be experiencing physical or emotional pain; visitors, in an alien and, for many, a threatening environment, are worried about a loved one or close friend. Healthcare providers, in many cases dealing with life and death on a daily basis, are under an enormous amount of pressure. Their hours are long and their workload is taxing.

Since the mid-1990s there has been an increasing emphasis on a patient-centered approach in healthcare and a growing understanding of the importance of evidence-based design (Cama 2009; Frampton, Gilpin, and Charmel 2003). Hospital interiors have largely changed from the white, clinical settings of decades ago to more colorful—sometimes even hotel-like—environments. Nursing homes, renamed assisted-living facilities, have largely left behind their depressing reputation and are being reborn as warm, homelike settings. The environmental needs of specific patients, such as those with Alzheimer's disease, are increasingly understood. In short, there has been a revolution in the provision of healthcare and the recognition that the physical environment matters to people's health and well-being and that the health and well-being of the whole person needs to be addressed rather than just the disease.

Along with these beneficial changes to healthcare buildings, there has been a growing recognition that the whole environment—including outdoor space—matters (fig. 1.1). A significant body of research confirms and sheds new light on what many people have known intuitively: that connection with nature is beneficial—even vital—for health. Walking in the woods, sitting on a park bench, tending the soil in one's garden, and even watching the colors and movements of nature from indoors are all passive and active ways to connect with the natural world. They awaken our senses, encourage physical movement and exercise, facilitate social connection, reduce stress and depression, and elicit positive physiological and psychological response. Healthcare facilities—from hospitals to specialized medical settings to assisted-living and retirement communities—are striving to incorporate specially designed outdoor spaces that can support the health and well-being of patients, residents, visitors, and staff (fig. 1.2).

Professional magazines are increasingly mentioning praiseworthy hospitals with healing gardens or views to nature. Excellent books have been published recently that focus specifically on healthcare outdoor space (Rodiek and Schwarz 2006, 2007; Pollock and Marshall 2012). However, it is rare that journals and magazines read by designers review such books or feature articles on healthcare outdoor space. Sadly, excellent books and monographs on healthcare building design often pay scant attention to outdoor spaces. Building plans are depicted with white expanses around them as if they are floating in space.

While the evidence for the importance of access to nature is there—and growing—the actual provision of appropriate outdoor space in healthcare facilities is often less than adequate, with limited "green nature," unmet needs for privacy and "getting away," even poor provision of the most basic needs, such as ease of access, comfortable seating, safe walking surfaces, protection from the sun, and so on.

1.1 The trend toward patient-centered care continues to grow. Healthcare facilities such as the Northeast Georgia Medical Center, in Gainesville, incorporate restorative gardens into the master plans from the beginning of the design process. The Wilheit-Keys Peace Garden offers physical access to nature outside of the building and visual access from inside. Designer: The Fockele Garden Company.

The goal of this book is to focus critical attention on healthcare outdoor space, to emphasize the importance of evidence-based design, to highlight exemplary case studies, and to present research-based guidelines to inform clients and designers of restorative outdoor spaces. The aim is to address two key groups of readers: the clients and funders of healing spaces and the designers (principally landscape architects) who will translate client needs into an actual environment. If clients and funders understand more about the requirements and goals of a healing garden, they can more easily communicate with the designer. If designers understand more about the research on which to base their decisions, they are more likely to meet the goals of their clients—those who provide the funding and the users who will eventually benefit from the garden (fig. 1.3).

With an audience of two quite different sets of "actors," it is inevitable that some parts of this book will speak more to one than the other. For example, some sections of the chapter on planting and maintenance may be basic knowledge for an experienced landscape architect but new and useful information for a client. The detailed design guidelines are principally aimed at the practicing designer and may be of less importance to the client or philanthropic donor. Chapters on horticultural therapy and participatory design may provide new information for many readers. The case studies of exemplary gardens throughout document existing best practices and will, the authors hope, inspire anyone using this book.

The core of the book consists of the general design guidelines presented in chapter 6. These are research-informed recommendations that need to be followed in any kind of healthcare outdoor space, whether it is a courtyard or a roof garden, whether it is at an acute-care hospital or a residential

1.2 Walking paths and benches for rest—even for stretching out to take a nap—provide a restorative environment for patients, visitors, and staff. The gardens of McKay Dee Hospital, in Ogden, Utah, are also open to the public and are thus an example of "preventive care" through community-centered design.
Photo by Chris Garcia

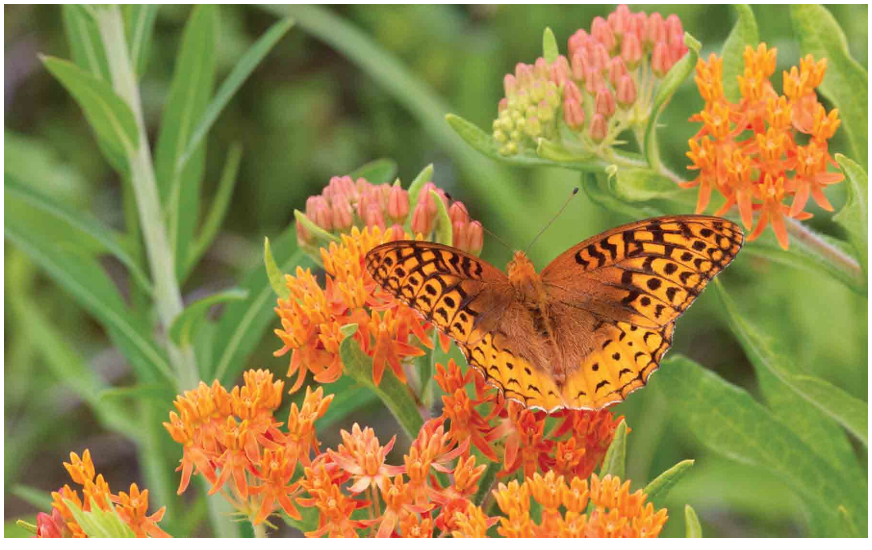
1.3 Native plantings at Kent Hospital in Warwick, Rhode Island, create a beautiful entrance. Designer: Wellnesscapes.
Photo courtesy of Thomas Benjamin, Wellnesscapes.com, on behalf of Kent Hospital

facility for the frail elderly. Beyond these basic guidelines, specific guidelines must also be followed for certain patient groups. These are explained in chapters 7 through 14—gardens for ill children, those with cancer, the mentally ill, Alzheimer's patients, the frail elderly, returning veterans, rehabilitation patients, and those in hospice.

Different terms have emerged to refer to outdoor spaces in healthcare, and two different types can be recognized. A healing, therapeutic, or restorative garden (these terms are used interchangeably in this book) is one that users, whether residents or visitors, experience any way they want: to sit, walk, look, listen, talk, meditate, take a nap, explore. Therapeutic benefits are derived from just being *in* the garden. No staff is necessary, except for maintenance. Such a garden might be found at an inpatient acute-care hospital, a residential facility for the frail elderly, a hospice, or an outpatient clinic.

In an enabling garden, by contrast, activities are led by a professional horticultural therapist (HT), occupational therapist (OT), physical therapist (PT), and other allied professionals in collaboration with other clinical staff. The HT might engage recovering stroke victims in weeding, watering, and repotting plants; the PT or OT might help someone with a broken limb by encouraging reaching, grasping, and exercising. Therapeutic benefits are derived from hands-on activities and exercise in the garden (fig. 1.4). Such a garden

1.4 A veteran transplants seedlings into a larger pot at Gardening Leave in Auchincruive, Scotland.
Courtesy of Gardening Leave Limited



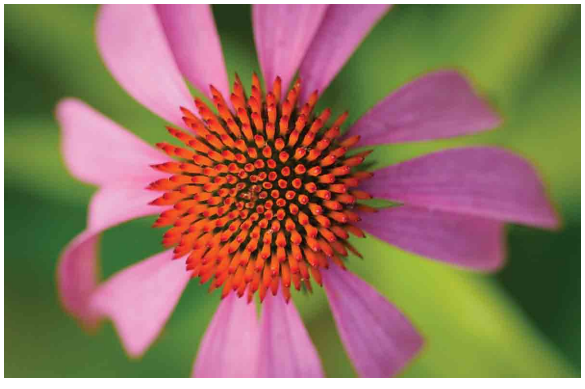
1.5 Great spangled fritillary on butterfly weed.
Photo from www.henrydomke.com.

is likely to be found at a rehabilitation hospital, some mental and behavioral health facilities, and some children's hospitals.

For the purposes of this book, "nature" is defined quite broadly, and while largely referring to vegetation, it also refers to wildlife, water, stone, the weather, sky, clouds, wind, and sun. "Access to nature" includes actual passive and active, indoor and outdoor engagement with nature through any or all of the senses (fig. 1.5).

Indoor contact with nature can include looking out at nature through a window; viewing nature imagery (still and moving pictures); seeing, touching, and smelling indoor vegetation; and hearing nature's sounds through an open window or through sound recordings (birds, water, and the like).

1.6 The Elizabeth and Nona Evans Restorative Garden at the Cleveland Botanical Garden in Cleveland, Ohio, provides opportunities for passive and active connection with nature. Designer: Dirtworks, PC
Courtesy of Dirtworks, PC; photo by Bruce Buck



1.7 Echinacea flower detail.
Photo from www.henrydomke.com

Outdoor contact with nature is likely to engage more than one of the senses and can range from passive to active: sitting just outside the entry of a building, taking a stroll, stopping to look at, touch, or smell plant material, engaging in physical or occupational therapy, gardening, watering plants, taking a brisk walk for exercise, jogging, or engaging in team sports (fig. 1.6).

The word "garden" will be used throughout the book to refer to any designed outdoor space with predominant greenery, even though the term has slightly different meanings in different English-speaking countries. For example, in the United Kingdom it refers to the whole of a defined and designed cultivated space that is predominantly green, whereas in the United States it tends to refer to a planting bed, such as a flower garden (fig. 1.7).

"Healthcare facilities" are defined as places where people receive medical care. These include—but are not limited to—inpatient and outpatient facilities, acute-care general hospitals, rehabilitation hospitals, psychiatric hospitals, children's hospitals, veteran's hospitals, specialty hospitals and clinics (cancer, kidney dialysis, mental health, etc.), hospice, residential and outpatient facilities for those with special needs (the frail elderly, Alzheimer's patients, the mentally ill, battered women).

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CHAPTER 2

History of Hospital Outdoor Space

THE HISTORY OF HOSPITALS AND HEALING PLACES goes back many centuries. At one time nature was seen as intrinsic to healing, but this important connection was largely lost by the twentieth century. Now, however, it is being rediscovered, in the form of healing gardens and therapeutic landscapes in healthcare settings.

One of the first healing places for which we have evidence was the Aesclipion at Epidaurus in ancient Greece—one of a network of healing places functioning from the fourth century BCE to the sixth century CE. Natural spring water was used in cleansing rituals; a library, museum, theater, marketplace, and groves of trees provided for people's entertainment as they waited until the auguries were favorable and they could enter the most important building, the *abaton* (Gesler 2003). Here, dream-healing took place, for it was believed that when people were asleep, the soul left the body and could communicate with the gods. Sleeping patients received prescribed cures from the god Asclepius, and when they awoke, his injunctions were administered by physician-priests (ibid.).

Among the first hospitals as we know them were Roman military hospitals with naturally lit and cross-ventilated wards separated from each other to avoid cross-infection, although this was long before any understanding of germ theory (Heathcote 2010). Throughout the Middle Ages in Western Europe, monastic hospices and infirmaries cared for pilgrims and others who were sick as part of the Christian obligation to offer charity and show mercy to the poor. A major figure in this era was Hildegard von Bingen, a remarkable twelfth-century German mystic, theologian, and medical practitioner who—along with Hippocrates—did not imagine the body as a machine or disease as a mechanical breakdown. She embraced the concept of greenness, or *viriditas*, gleaned from the practical concerns of gardening. Just as plants put forth leaves, flowers, and fruit, so the human body has the power to grow, give birth, and heal (Sweet 2012).

Monastic settings were the first instances where a garden, usually enclosed by an arcaded cloister, was specifically incorporated as part of a healing environment (fig. 2.1). Bernard of Clairvaux (1090–1153) wrote of the intentions of this space at the hospice at Clairvaux, France: "Within this enclosure many and various trees . . . make a veritable grove which lying next to the cells of those who are ill, lightens with no little solace the infirmities of the brethren, while it offers to those who are strolling about, a spacious walk. . . . The sick man sits upon the green lawn. . . . He is secure, hidden, shaded from the heat of the day . . . for the comfort of his pain, all kinds of grasses are fragrant in his nostrils. The lovely green of herb and tree nourishes his eyes. . . . The choir of painted birds caresses his ears. . . ." (Gerlach-Spriggs, Kaufman, and Warner 1998, 9). This passage indicates the remarkable intuitive insights of early Christian leaders regarding the significance of sensory awakening in nature as a component of healing, an understanding that was for a long time lost, and only now, almost a thousand years later, is being rediscovered.

As monasticism declined in the fourteenth and fifteenth centuries, care of the sick fell to civic and ecclesiastical authorities. Within the Roman Catholic tradition, one of the primary design requirements of a hospital was the provision of long wards, where the priest celebrating Mass could be seen from every bed. The influential Ospedale Maggiore of Milan (1458), for example, was built in a cruciform plan with windows so high that no one could see the formal gardens outside (Thompson and Golden 1975, 31).

Some hospitals continued the courtyard-garden tradition exemplified in the monastic cloister gardens. The English hospital and prison reformer John Howard (1726–90) reported hospitals in Marseilles, Pisa, Constantinople, Trieste, Vienna, and Florence that had gardens where patients could see through windows and doorways, and where convalescing patients could stroll (Warner 1995, 18) (fig. 2.2).

In England, by the seventeenth century, wealthy merchants and philanthropic nobility were willing their grand homes and grounds to act as hospitals. Soon architects were building hospitals in the style of grand houses, such as Christopher Wren's Royal Chelsea Hospital in London with its spacious lawns and courtyards (Darton 1996, 91). But for most, the hospital was still a refuge of last resort. Birth, sickness, convalescence, and death were mostly experienced at home (ibid., 70).

Among the first set of recommendations for hospital garden design were those written by the German horticultural theorist Christian Cay Lorenz at the end of the eighteenth

2.1 Medieval hospital garden (now part of a hotel), Santiago de Compostela, Spain.
Photo by Clare Cooper Marcus

2.2 Eighteenth-century hospital courtyard (now part of the Danish Museum of Design), Copenhagen, Denmark.
Photo by Clare Cooper Marcus

century: "The garden should be directly connected to the hospital. . . . A view from the window into blooming and happy scenes will invigorate the patient . . . [and] encourages patients to take a walk. . . . The plantings should wind along dry paths, which offer benches. . . . The spaces between could have beautiful lawns and colorful flower beds. . . . Noisy brooks could run through flowery fields. . . . A hospital garden should have everything to enjoy nature and to promote a healthy life" (Warner 1995). These suggestions uncannily foreshadow the findings of researchers in the late-twentieth century who offered credible empirical evidence that viewing or being in nature reduces stress (see chapter 3).

The next major shift in hospital design and the provision of outdoor space was the development of the pavilion hospital. In Western Europe, the seventeenth century saw an emphasis on the systematic collection of data on births and deaths and

the careful observation of patients in hospitals. New hospital designs paid special attention to hygiene and ventilation, since it was then believed that infections were spread by noxious vapors or miasmas in the air emanating from swamps, stagnant water, and rotting waste. For example, a new hospital in Edinburgh constructed in 1729 was built in a U-shape on a hill to catch the air and sun, and two acres were set aside for a garden (Gerlach-Spriggs, Kaufman, and Warner 1998, 15).

Pavilion-style hospitals comprised two- and three-story buildings linked by a continuous colonnade, and narrow wards with large windows that enhanced ventilation. Between the wards were courtyards and gardens, which began to be reconsidered as important components of the healing environment. Several influential hospitals designed in this style included St. Thomas' Hospital in London, the rebuilt Hôtel Dieu in Paris, and several naval and military hospitals built at the height of Britain's imperial power.

Florence Nightingale, British nurse and public health reformer, enthusiastically endorsed these new hygienic hospital plans, which became the predominant form in the nineteenth and early-twentieth centuries. Having cared for the wounded during the Crimean War (1854–56), Nightingale observed unexpected differences in mortality experienced by soldiers treated in tents and temporary buildings and those treated in conventional hospitals. She proposed that high mortality rates in hospitals could be solved through a combination of design, sanitation, and quality care. At the Scutari military hospital near Constantinople, she succeeded in reducing the death rate from cholera and dysentery from 42 percent to 2 percent through hygiene and careful nursing practice (Darton 1996, 93).

In one of her influential publications she wrote: "Second only to fresh air . . . I should be inclined to rank light in importance for the sick. Direct sunlight, not only daylight, is necessary for speedy recovery, . . . being able to see out of the window instead of looking at a dead wall; the bright colors of flowers, . . . being able to read in bed by the light of the window. . . . It is generally said the effect is upon the mind. Perhaps so, but it is not less so upon the body on that account" (Warner 1995, 24) (fig. 2.3). Her insights marked a significant important return to an understanding that mind and body are intertwined and must be treated as one. With the study of anatomy in the Renaissance, when the dissection of cadavers revealed "no spirit inside the body," that understanding had been discredited.

The rise of Romanticism prompted a reconsideration of the role of nature in bodily and spiritual restoration. Writers such as Rousseau and Goethe extolled the powers of nature to foster contemplation and an emotional connection with spirit. The landed gentry created landscapes that mimicked nature. Cities built parks for the physical and mental health of their residents. It was during this period that there was a dramatic reemergence of nature as part of the restorative environment, particularly in the treatment of the mentally ill.

2.3 A typical narrow, well-lit ward of a nineteenth-century pavilion-style hospital.
Photo by Clare Cooper Marcus

Rethinking the treatment of the mentally ill began at the hospital at Zaragosa, Spain, founded in 1409. Instead of patients being confined and punished, as was the custom at the time, they followed a simple daily routine of communal meals, household chores, and work in vegetable gardens, vineyards, orchards, and on a farm (Warner 1995, 17). This method of socializing patients became known in the nineteenth century as the "moral treatment," and was enthusiastically endorsed by the reformers Dr. Phillippe Pinel in France and William Tuke in England.

In 1792 William Tuke and the Society of Friends established The Retreat on the outskirts of the English city of York. Here, in a radical new approach to treatment, the mentally ill were treated with gentleness and kindness instead of being chained down and beaten like prisoners. Access to landscaped grounds became part of the treatment; it was believed that the mentally ill could not cope with city environments and could only recover in peaceful natural surroundings. The grounds also protected patients from being perused by the curious and served as a space for gardening and farming.

The philosophy behind these new kinds of hospitals spread to North America. The first such hospital in the United States was the Friends Asylum in Philadelphia founded in 1813. By the 1820s, asylums with natural landscaped grounds had

opened in Boston and New York. The American landscape architect Andrew Jackson Downing wrote in 1848: "Many a fine intellect, overtasked and wrecked in the too ardent pursuit of power and wealth, is fondly courted back to reason and more quiet joys by the dusky, cool walks on the asylum" (Schuyler 1999, 79).

By the 1850s, it was accepted professional orthodoxy that a naturalistic landscape had a direct role in the treatment of the mentally ill and that the mind and body must be treated together. Views onto greenery were believed to "soothe shattered nerves," while exercise and gardening were employed to restore bodily health.

The principal proponent of this restorative landscape approach in the United States was Dr. Thomas Kirkbride, who in 1851 was invited by his peers to compose a set of "propositions on the structure and arrangement of asylums" (what we would now term design guidelines). In these he proposed that asylums should be located in the countryside not less than two miles from a large city; that they have at least one hundred acres of land, or half an acre per patient; of this, at least fifty acres should be dedicated to gardens and pleasure grounds; and that wards for "the most excited class" of patients should have large windows and pleasant views. The "Kirkbride Plan" was unanimously endorsed by his peers, and by 1900, asylums built on these propositions had been created in twenty-eight states.

But paralleling this development, immigration and urban poverty in US cities mushroomed. Asylum wards soon became overcrowded, the humane treatment of patients declined, and asylums became the last resort for hopeless cases. While some of the early influential models are still in operation—for example, the Retreat at York, England, and the Friends Hospital, Philadelphia—and their beautiful landscaped grounds remain, twentieth-century labor unions opposed the policy of engaging patients in farm and garden work. Apart from occasional horticultural therapy programs, the grounds are now primarily used for passive enjoyment.

By the 1850s, the centuries-old belief that disease was spread by noxious-smelling miasmas began to be questioned. A turning point was Dr. John Snow's investigation of a cholera epidemic in London, where he traced deaths from the disease to drinking polluted water from the Broad Street pump (Johnson 2006). Although this was the beginning of an understanding of germ theory, it was not until Scottish surgeon Joseph Lister's discovery of sepsis and French chemist Louis Pasteur's discovery of bacteria in the 1860s that it was fully accepted. This radically changed the rules of hospital design (Heathcote 2010). Since the spread of germs could now be contained by antiseptics and basic hygiene, physical separation as in the pavilion hospital was no longer necessary, though many have remained in operation up to the present time (fig. 2.4).

Land-consuming low-rise pavilion hospitals began to be replaced by highly functional compact "monoblock" and high-rise hospitals, where design was concerned with efficiency and infection control; illness was treated with the help of antibiotics, pain killers, anesthesia, and improved surgical techniques; emotions were now studied in psychology, the physical body in anatomy and medicine, thus severing any lingering belief in the mind-body connection; outdoor space was relegated to parking lots and delivery ramps; gardens disappeared, and glimpses of nature were restricted to token areas of landscaping at the main entrance. Traditional styles were thrown out in favor of the International Style, and many new urban hospitals came to resemble office blocks and corporate headquarters. Even the sanitarium, where tuberculosis had been treated with ample exposure to sunlight, fresh air, and spacious grounds, now fell into disuse as drugs were found to treat the disease. Two kinds of healthcare facility did not succumb to this loss of a connection with nature: the hospice and the nursing home. For residents and patients in these facilities, the emphasis was, and is, on care rather than cure. The buildings are often designed at a domestic scale, echoing images of home—one element of which is the garden.

Alongside the proliferation of large medical centers, several professions arose that heralded a resurgence of interest in the garden. Occupational and physical therapy (OT and PT) came into prominence in the treatment of veterans returning from World War I. By the end of the twentieth century, rehabilitation hospitals (and the rehab wards of acute-care hospitals) often included a garden or outdoor area where patients could work with physical therapists in a more normalized setting than the hospital interior.

After World War II, horticultural therapy came into prominence as a subset of occupational therapy, using gardening as a means of restoring both physical and mental health. Degree programs in this profession were established, and indoor and outdoor gardening programs were instituted in veterans hospitals, psychiatric facilities, chronic-care facilities, and rehabilitation hospitals. Trained professionals work with the clinical staff to facilitate the recovery of patients who have experienced posttraumatic stress disorder, traumas, strokes, brain injuries, and other forms of mobility impairment (see chapters 14 and 16). These professionals work as well in prisons and geriatric facilities.

2.4 Nineteenth-century pavilion-style hospital, Edinburgh Royal Infirmary (now converted to apartments), Edinburgh, Scotland.
Photo by Clare Cooper Marcus

By the latter decades of the twentieth century, a number of changes in society signaled the emergence of what has become known as patient-centered care. The general public began to take an interest in health and wellness, recognizing the importance of diet and exercise rather than focusing on illness and disease. There was a growing interest in alternative or complementary medicine. Tools became available to research the mind-body connection. Healthcare designers and administrators began to recognize the physical environment of the hospital as an important component in a competitive market place and strived to create more patient-friendly settings.

One of the signature events in the development of patient-centered care was the emergence of the Planetree model in the early 1980s. In the mid-1970s, San Francisco resident Angelica Thieriot was hospitalized with a life-threatening condition. Although the best of Western medicine was available, little attention was paid to her emotional, social, and spiritual needs (Frampton, Gilpin, and Charmel 2003, xxvii). Motivated by this negative experience, Thieriot founded the nonprofit organization Planetree in 1978, its name taken from the plane tree under which Hippocrates taught his students.

The entire hospital experience was evaluated from the perspective of the patient. A consumer health resource center was opened in San Francisco in 1981. In 1985 a patient-oriented thirteen-bed model hospital unit at Pacific Presbyterian Medical Center in San Francisco was designed by University of California professor Roslyn Lindheim (ibid., xxix). The emphasis was on organizational and physical changes meant to create more

healing environments. Organizational changes included unrestricted visiting hours, permitting children and pets to visit, and encouraging family members to stay overnight and to cook food for the patient. Physical changes included a homelike decor; naturalizing the interior environment with plants, fish tanks, and so on; connecting the interior environment to the outdoors by providing views to attractive outdoor spaces; and stressing the importance of healing gardens for patients, family members, and staff (ibid., 237). For example, the waiting area for ambulatory surgery and endoscopy at Lakeland Hospital in Niles, Michigan was "designed to focus the attention of patients and families toward the calming and peaceful view provided by the natural setting of the St. Joseph River . . . as they mentally prepare for their procedure" (ibid., 171). For the first time since the clearly articulated value of nature in the treatment of the mentally ill in the nineteenth century, the Planetree model brought nature and gardens back into focus as important elements of a healing environment and a healthy workplace.

In the 1990s, the Eden Alternative was another innovation emphasizing nature as a component of healing. Shocked by the institutional environment of a nursing home they had been hired to administer, Dr. William Thomas and his wife, Judy Myers-Thomas, instituted a philosophy of creating more homelike settings by bringing in plants and animals (dogs, cats, birds, fish) and encouraging children to visit. After these cultural and environmental changes were made, remarkable changes were noted in the residents in terms of alertness, happiness, and reduced rates of mortality. The staff and administrators of many nursing homes have now been trained in this approach, and more than three hundred facilities have been "Edenized" in the United States, Canada, Europe, and Australia.

Less well known in North America than in Western Europe is anthroposophy—the healing philosophy of Rudolf Steiner (1861–1925), who argued that all healthcare buildings should have the physical and spiritual health of their users at their core (Heathcote 2010). This is best exemplified at the Vidar Clinic, designed by Erik Asmussen in Järna, Sweden, near Stockholm, where a simple organic plan built around a green courtyard eschews the straight corridors and square windows of contemporary hospitals.

Paralleling the incorporation of Planetree elements in hospitals and the Eden Alternative philosophy in nursing homes, academic research began to provide sound scientific evidence for the importance of nature and gardens in the healing process. The initial work in this area appeared in Roger Ulrich's

2.5 The presence of a healing garden is becoming more common in American healthcare facilities.
Photo by Clare Cooper Marcus

(1984) much-cited article "View through a Window May Influence Recovery from Surgery." With access to the medical records of patients who were recovering from surgery, Ulrich found that those who had views onto trees asked for less high-dose pain medication, called the nurse less often, and went home sooner than those who looked out onto a brick wall. This study was followed by many others (reviewed in chapter 3) that have provided strong scientific evidence for something most people would intuitively expect to be true—that moving from a difficult or frightening situation into a garden or a natural landscape results in a reduction in stress. The medical world began to take note and realize that trees and gardens in healthcare were not just cosmetic niceties. They could actually affect the bottom line.

Psychologists began to experiment with nature imagery and found that having subjects *imagine* themselves in a restorative, natural environment also had a stress-reducing effect. Blue Shield of California gave surgery patients audio compact discs that helped them imagine being in a natural setting, and this along with breathing exercises and music resulted in shorter hospital stays and lower drug costs. For the price of a $17 CD, Blue Shield saved on average $2,000 per surgery patient. Kaiser Permanente, the large HMO, now gives free imagery CDs to all surgery patients.

From the mid-1990s, healing gardens began to appear in hospitals, chronic-care facilities, hospices, and senior communities (fig. 2.5). The annual conference of the American Society of Landscape Architects began to add a preconference workshop or tour on healing garden design. In 1999

the award-winning organization and website Therapeutic Landscapes Network (www.healinglandscapes.org) was founded to provide information and connect those interested in this new emerging field. In 2003 the School of the Chicago Botanic Garden inaugurated an annual postgraduate certificate program in healthcare garden design, which now draws students from all over North America as well as from overseas.

The early healing gardens tended to be in acute-care general hospitals serving a variety of patients as well as staff and visitors. Designers, who often look to precedents to guide their work, drew upon metaphors; regional attributes; and historical, cultural, and domestic precedents, as well as envelope-pushing "artistic statements." Some of these resulted in successful restorative landscapes; others did not. A promising new direction beginning in the early years of the twenty-first century saw medical diagnosis treated seriously as a design precedent. The garden began to be seen as a means of treatment, and spaces were created for specific patient populations with contributions to the design process from clinical staff, current and former patients, and family members. Such gardens include those for patients with cancer, HIV/AIDS, psychiatric problems, burns, and Alzheimer's disease and other forms of dementia, as well as gardens for distinct age groups such as children and the frail elderly.

Despite the growing interest in providing healing gardens, many designers (and their fee-paying clients) knew little about the published research or how to translate this into design programs. This gap began to be filled by the almost simultaneous publication of three important books: *The Healing Landscape: Therapeutic Outdoor Environments* by Martha Tyson (1998), *Restorative Gardens: The Healing Landscape* by Nancy Gerlach-Spriggs, Richard E. Kaufman, and Sam Bass Warner Jr. (1998), and *Healing Gardens: Therapeutic Benefits and Design Recommendations*, edited by Clare Cooper Marcus and Marni Barnes (1999). A further significant step in the communication of research on the importance of nature was the production of a set of three award-wining DVDs entitled *Access to Nature for Older Adults* (Rodiek 2009).

As the impetus to recognize nature as a component of healing has gained ground, a number of official bodies began to draft mandatory and/or voluntary guidelines for the incorporation of access to nature as an element in hospital design. The 2014 *Guidelines for Design and Construction of Health Care Facilities* will include "Access to Nature" as one of eight key elements in the physical environment component of the Environment of Care. LEED for Healthcare and the Sustainable Sites Initiative (SITES) now award credits and provide guidelines for visual and physical access to nature and natural light. In the UK, the National Health Service is working to incorporate access to nature into the design of its health facilities.

The growing interest in the importance of gardens in the medical world has been paralleled by many other segments of society's reawakening to the beneficial aspects of connecting with nature. Writers within the deep ecology and eco-feminist movements have passionately argued the need for our working in partnership with nature for our very survival (Roszak, Gomes, and Kanner 1995; Roszak 1992; Macy and Johnstone 2012; Macy 1991; McKibben 1986, 2010). In his book *The Spell of the Sensuous*, eco-philosopher David Abram (1996) maintains that nature speaks to us through all our senses in a different way from how we communicate with each other. Publication of Richard Louv's (2008) book—*Last Child in the Woods: Saving Our Children from Nature Deficit Disorder*—and the inauguration of the website www.childandnature.org have resulted in a large wave of interest from parents, teachers, and others as to how they can bring nature back into children's lives. Louv's (2012) follow-up book *The Nature Principle* argued for the importance of nature in the lives of everyone. In the field of psychotherapy, in books such as Linda Buzzell and Craig Chalquist's (2009) *Ecotherapy: Healing with Nature in Mind* and Craig Chalquist's (2007) *Terrapsychology: Reengaging the Soul of Place*, a small but vocal group of eco-psychologists have called for the recognition that our separation from nature has led to significant mental health consequences and that great benefits can come from wilderness trips, conducting therapy in nature, and encouraging clients to explore the sense of place where they live. While gardening has long been the number one American pastime in terms of dollars spent, a burgeoning interest in home-grown food has resulted in long waiting lists for plots in urban community gardens.

Thus, in the millennia since the healing center at Epidaurus in ancient Greece, we have come full circle—back to an understanding of the mind-body connection and the significance of nature in the healing process. What is needed now are the tools to assist the sponsors and designers of contemporary healing gardens so that these spaces meet their full potential of being truly restorative landscapes.

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CHAPTER 3

Theory, Research, and Design Implications

The View through a Window

In the late 1970s, environmental psychologist Roger Ulrich began to research the emotional and physiological effects of environmental aesthetics on a population that experiences a great deal of emotional duress: hospital patients. He was one of the first researchers to study and publish quantitative evidence on the effects of access to nature in the healthcare setting. His "View through a Window May Influence Recovery from Surgery," published in *Science* in 1984, became the seminal argument for access to nature in healthcare facilities. Ulrich compared the recovery records of gall bladder surgery patients who had a bedside window view of trees with those of patients who had a view of a brick wall. The outcomes data revealed that patients with the nature view had shorter hospital stays (7.96 days, compared with 8.70 days), suffered fewer postsurgical complications, needed fewer doses of potent narcotic pain medication, and received more positive written comments in their medical records from staff (e.g., "patient is in good spirits"). Patients in the wall view group, on the other hand, had more negative evaluative comments ("patient is upset," "needs much encouragement"). Medical and social science researchers have replicated Ulrich's study many times, and it has continued to hold up (Marberry 2010) (fig. 3.1).

Ulrich's study, cited in thousands of publications—from books to scholarly journals to newspaper and magazine articles—was, and continues to be, significant for two reasons. First, it demonstrated to the medical community—using the same empirical, quantitative methods that they used and respected—that the physical environment, and specifically views of nature, had a measurable positive effect on patient health. Second, it established a business case for providing access to nature. All of the improved health outcomes for patients—duration of hospital stay, amount of pain medication, degree of strain on nursing staff, and level of patient satisfaction—translated directly to potential cost savings. (For further discussion, see chapter 19.)

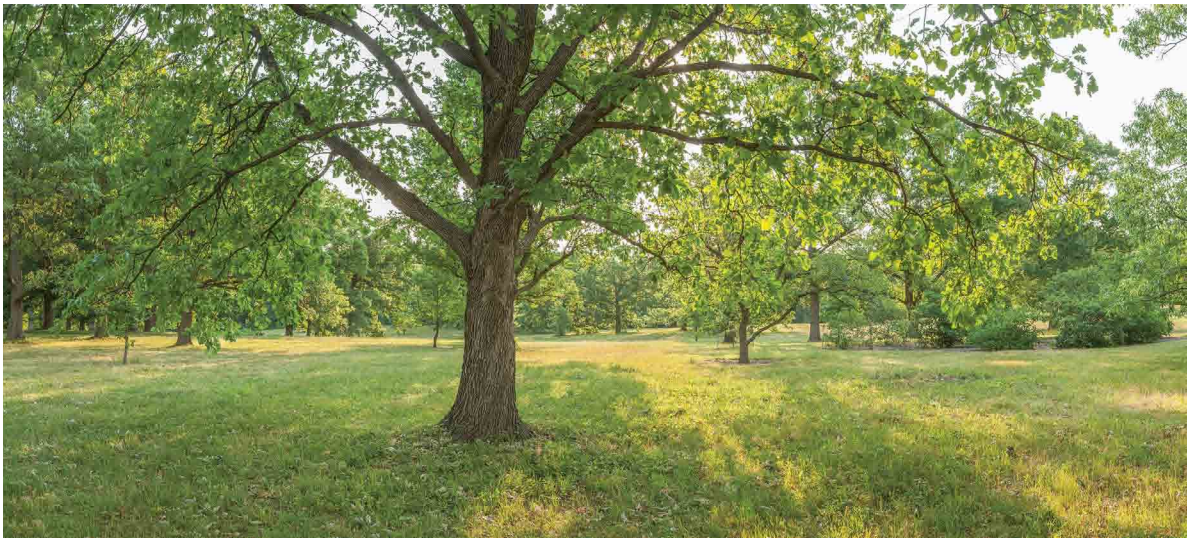
This chapter focuses on theory and research that underpin the provision and evidence-informed design of gardens and other natural settings in healthcare facilities. A significant body of research, using a broad array methodologies and populations, and looking at a variety of health outcomes, confirms and sheds new light on what many people have known intuitively: that connection with nature is beneficial—even vital—for human health and well-being. The research discussed in this chapter is only a small percentage of the literature on the positive benefits of contact with nature. The chapter is not intended as a literature review, but rather as an introduction and overview of the theory and research on the physical design of nature settings in healthcare facilities.

The Importance of Research

Why do we need research to tell us what we think we already we know?

Research informs design

If the goal of good healthcare design is to promote optimal health and well-being for patients, visitors, and staff, then it must be based on the best information available. Research aids in good decision making about what to do and, just as importantly, what *not* to do. While research can be a useful tool for any design work, it is essential in environments where people are emotionally and physically vulnerable. The most frequently cited part of the Hippocratic Oath reads, "I will prescribe regimens for the good of my patients according to my ability and my judgment and *never do harm* to anyone" (Edelstein 1943). Ideally, everyone working in the healthcare realm—staff, administrators, designers, etc.—would abide by this oath in their practice. Intuition and personal preferences are not enough. Ulrich (1999, 65) states, "Some designers may unwittingly create gardens containing negative distractions if they focus exclusively on design qualities that please their personal aesthetic tastes. . . . Further, the types and styles of environmental design



3.1 Even a simple view of grass and trees can promote health and healing.
Photo from www.henrydomke.com

and art that many designers and artists personally prefer can be those that elicit distinctly negative reactions from the public."

Winston and Cupchik (1992) found that artists and experienced art viewers preferred work that was more intellectually challenging or emotionally provocative than that preferred by the general public. In a study of the preferences of three hundred randomly selected hospital inpatients, Carpman and Grant (1993) found a consistent preference for nature images and a dislike of abstract art. Nanda, Eisen, and Baladandayuthapani (2008) found that people's art preferences varied significantly between hospital patients and people with art or design backgrounds. While patients preferred images with nature and realistic content, the designers tended to prefer abstract or stylized content.

These and many other studies support the appropriateness of nature and representative nature content (art and design) in hospitals, and they also underscore the need to focus on the specific needs of the end user.

> Regardless of whether a garden might garner praise in professional design journals as "good" design, the environment will qualify as bad or failed design in healthcare terms if it is found to produce negative reactions. These points imply that the use of the term 'healing' in the context of healthcare gardens ethically obligates the garden designer to subordinate or align his or her personal tastes to the paramount objective of creating a user-centered, supportive environment. (Ulrich 1999, 30)

Research makes the case for good design

Great strides have been made in the acceptance of the built environment's powerful effect on people's health, but throughout most of the twentieth century, gardens were thought to be—by most architects as well as healthcare providers—unnecessary amenities. In a budget-conscious era when every dollar counts, and in healthcare facilities where funding and space are at a premium, the benefits of contact with nature through gardens and other landscapes has to be proven. Any design decisions made for an existing or a new facility will need to be well supported. Research—especially if it clearly demonstrates potential improvements in health for patients and staff and/or a healthy bottom line for the facility—can be an effective tool in convincing even the most skeptical decision makers.

Research informs policy

Laws and regulations governing facility design and construction rarely change without a good reason—in other words, without strong evidence. For example, the American Society for Healthcare Engineering (ASHE) of the American Hospital Association publishes the *Guidelines for Design and Construction of Health Care Facilities*, a document used by Authorities Having Jurisdiction (AHJs) as a basis to review and approve the designs for any proposed renovations to existing or new healthcare facility construction. Any changes to the document, published every four years, must be proposed

and then accepted by the Federal Guidelines Regulations Commission. Changes with the strongest evidence are the most likely to be adopted (FGI 2013).

Evidence-Based Design

Using the best possible research to inform design is referred to as evidence-based design (EBD). The need for this approach in healthcare became clear when a report in 2000 from the Institute of Medicine revealed that medical errors were involved in 98,000 hospital deaths a year. In the same year, the Centers for Disease Control reported that the annual cost of hospital-acquired infections for the United States was estimated to be $5 billion (Ulrich et al. 2008). In a review of the literature on evidence-based healthcare design, Ulrich et al. (ibid., 62) stated, "hospital-acquired infections and medical errors are among the leading causes of death in the United States, each killing more people than automobile accidents, breast cancer, or acquired immune deficiency syndrome (AIDS)." Industry professionals realized that to the extent that the physical environment may contribute to—or ameliorate, or even prevent—such problems, design decisions had to be based on sound empirical evidence.

EBD evolved from other disciplines that use research to guide decisions, most notably evidence-based medicine, which integrates clinical expertise with the best available evidence from systematic research. Healthcare architect and researcher/scholar Kirk Hamilton sought to formalize the concept of EBD. His definition states, "Evidence-based design is a process for the conscientious, explicit, and judicious use of current best evidence from research and practice in making critical decisions, together with an informed client, about the design of each individual and unique project" (Stichler and Hamilton 2008, 3). Hamilton's definition is important because it stresses that research, or evidence, is not just to be found in published work. Evidence-based healthcare design is still a relatively new field with many gaps in the literature. For any design, "on-the-ground" site-specific and user-specific research is essential. There is no one-size-fits-all.

The Center for Health Design (2008, 4) has simplified Hamilton's definition to "the process for basing decisions about the built environment on credible research to achieve the best possible outcomes." "Outcomes" are defined as measures of a person's condition (health, well-being, satisfaction) or indicators of healthcare quality. Measures include observable clinical signs or medical measures (e.g., blood pressure, heart rate, length of stay), subjective measures (reported pain and mood levels, satisfaction with environment or service, etc.), and economic measures (cost of patient care, recruitment or hiring costs of staff, etc.) (Ulrich 1999) (fig. 3.2).

3.2 Examining the minutiae of the natural world may reduce stress by distracting a person from worrisome thoughts.
Photo from www.henrydomke.com

A current limitation of EBD practice is its emphasis on quantitative methods, particularly randomized control trials (RCTs). This type of research is still considered the gold standard in the medical field, and thus healthcare designers strive to fit that paradigm. Yet the evidence-based medicine framework of strictly controlled laboratory experiments with as few variables as possible is not always the best fit (and is often impossible) in settings that involve human beings and natural environments. There are signs that a broader approach of "mixed methods" research, with evidence gathered from many different sources and using many different methodologies (including qualitative and quantitative), is beginning to be embraced as more realistic and productive. This approach can help to support, refute, or call other evidence into question, thereby creating a picture that has greater dimension and, thus, potential for successful design.

In Australia, Singapore, the United Kingdom, and several provinces of Canada, an architect cannot apply to design a hospital unless he or she is qualified in EBD. In the United States this is true for the design of military hospitals, and is increasingly encouraged in all healthcare design with the establishment of the Evidence-based Design Accreditation and Certification (EDAC) through the Center for Health Design (Ulrich 2011).

Research on Benefits of Nature Exposure

In a literature review of more than four hundred peer-reviewed articles on evidence-based healthcare design, Ulrich et al. (2008, 108) reported relationships between design

strategies or environmental interventions and healthcare outcomes. In two categories—reduced pain and reduced patient stress—"especially strong evidence" indicated a link between access to nature and health outcomes. Research reviewed also indicated a link between access to nature and reduced depression, reduced length of stay, increased patient satisfaction, decreased staff stress, and increased satisfaction.

Virtual nature, real nature

Identifying empirical evidence from any sort of physical environmental factors, such as wall color, spatial configuration, or quantity of beds to a room, is challenging because of the number of variables. With nature, the variables are myriad and difficult to control as they shift, sometimes from moment to moment. To date, most research on preferences and outcomes has been conducted using simulations of nature, such as pictures or videos, to reduce the number of variables. Some studies indicate that research using simulated nature produces results that can be considered reliable because they are similar enough to research involving actual nature (Hull and Stewart 1992; Nanda, Eisen, and Baladandayuthapani 2008; Taylor, Zube, and Sell 1987). While this research is valuable for showing that nature is beneficial (and sometimes for showing *how* it is beneficial), the question then arises: If simulated views of nature are effective in promoting health, then why do we even need real nature?

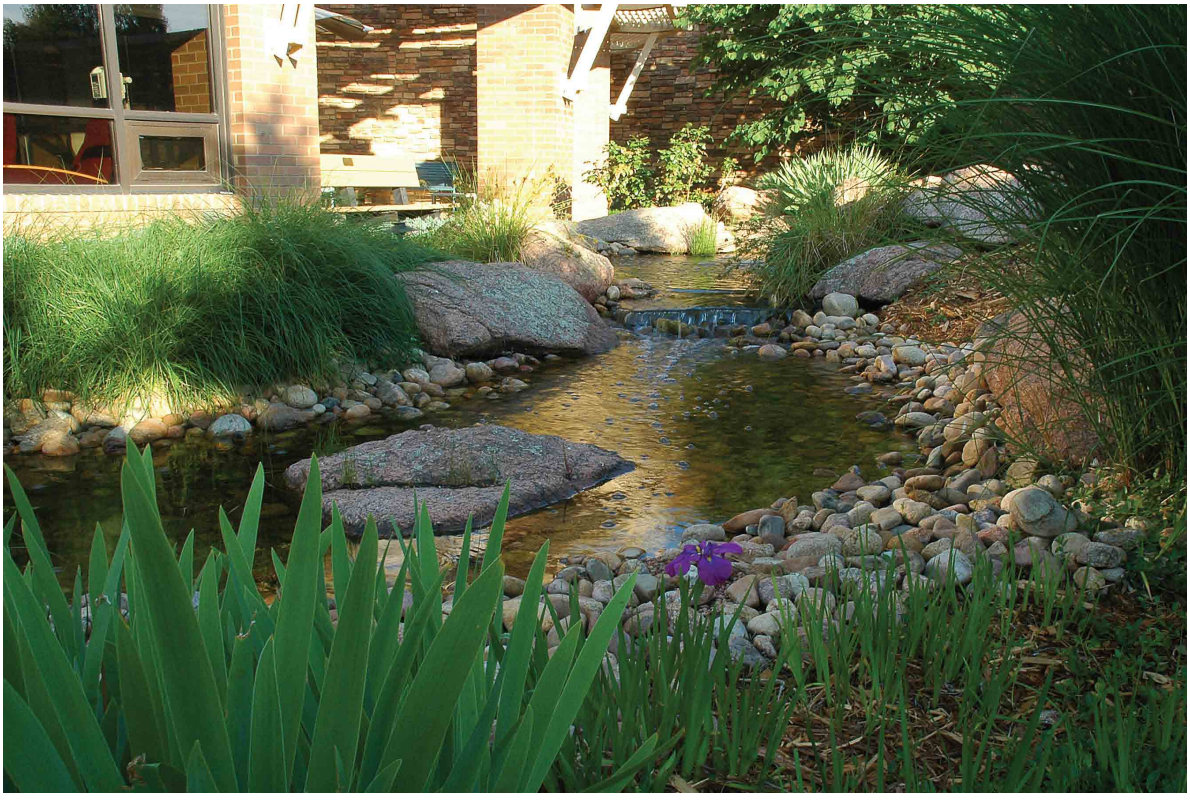
Art on the walls is certainly less expensive to install and maintain than a living garden. However, some research indicates a progressive improvement in outcomes, beginning with still pictures of nature (as opposed to pictures of urban scenes, abstract views, or no pictures), then moving images, then views of real nature, and, finally, passively or actively engaging with real nature. A study by Friedman, Freier, and Kahn (2004) found that a real-time streaming image of nature on a plasma screen television improved psychological well-being, cognitive functioning, social connectedness, and connections with nature, implying that a moving image may be more beneficial than a still image. A study by Kahn et al. (2008) compared the effects on recovery of three views from an office space—an outdoor scene through a window, the same scene on a plasma television screen, and a blank wall. After experiencing mild stress, the subjects' heart rate recovery was more rapid when they looked out of a window rather than at the plasma screen or a blank wall.

Studies that look at other sensory exposure, such as scent, or combined sensory experiences, suggest that while pictures of nature are an important component of the environment of care, they cannot be a substitute for real nature views and therapeutic gardens (fig. 3.3). The neuroscientist Esther Sternberg suggests that part of nature's benefit is derived from the multitude of simultaneous positive sensory experiences (Sachs 2009; Sternberg 2010). A study by Kline (2009) on the ability of nature-related stimuli to promote relief from acute pain found that the combination of nature views and sounds was more effective in reducing pain than either type of stimulus used alone. A study by Diette et al. (2003) found that the patients undergoing a painful bronchoscopy who were shown views of simulated nature and heard sounds of a bubbling brook before and during the procedure had a 50 percent increase in self-reported "very good" or "excellent" pain control as compared to the control patients. Perhaps the reason that contact with nature is so difficult to measure is precisely the reason why, or even how, it is beneficial (fig. 3.4).

3.3 Fragrant plants in a healthcare garden elicit the attention of two senior residents. Scent is the strongest memory trigger.
Courtesy of Studio Sprout; photo by Michiko Kurisu

Scent, "forest bathing," and "green exercise"

The preference for and benefits from nature extend beyond the visual realm. Hyun-Ju, Fujii, and Cho (2010) studied cerebral and autonomic nervous system activity and self-reported mental function in male subjects as they inhaled the natural scent of pine needles. Cerebral activity was activated in the feeling, judgment, and motor areas of the frontal lobe, as well as in the memory area in the temporal lobe. Self-reports also indicated increased vigor and decreased confusion. Fujita, Miyoshi, and Watanabe (2010) found that "green odor" (a 50:50 mixture of trans-2-hexenal and cis-3-hexenol) reduced maternal stress as well as prenatal stress in these mothers' offspring. Watanabe et al. (2011) found that green odor not only had a therapeutic but also a potentially preventive effect on depressive-like states in rats. Oka et al. (2008)



3.4 A naturalistic stream at McKee Medical Center, a cancer treatment center in Loveland, Colorado, provides a multisensory experience for garden visitors. Designer: BHA Design.
Courtesy of BHA Design; photo by Jerod Huwa

found that green odor attenuated stress responses of systolic and diastolic blood pressure in humans.

Shinrin-yoku, which translates roughly as "forest bathing," was originally introduced by the Forest Agency of Japan to promote walking and health. It has since become a popular practice. A study by Li et al. (2007) found that "green exercise"—physical movement in a natural setting—increased the activity of natural killer (NK) cells, a part of the immune system that fights cancer. This, in turn, helps to boost stress resistance. Li attributes some of the stress reduction to the presence of phytoncides (wood essential oils), antimicrobial volatile organic compounds emitted from trees to protect them from rotting and insects. Li et al. (2008) compared the effects of walking in a forest with walking in a city. A high concentration of phytoncides was detected in forest air; in contrast, almost none were present in the city air. The study found that only the forest walking increased NK activity and number and decreased the concentration of adrenaline (a stress indicator) in urine. The effects of the forest walks were found to last at least seven days. A larger-scale study by Park et al. (2010) of 260 people at twenty-four sites across Japan found that the average concentration of salivary cortisol, an indicator of stress, was 13.4 percent lower in people who walked in and viewed a forest area than in people performing a similar activity in urban settings.

Research on green exercise is not limited to Japan. In a UK study of more than 1,850 participants, researchers found that people who took part in walks in a country park with woodlands, grasslands, and lakes had significantly better mood and self-esteem outcomes than those who walked for the same amount of time in an indoor shopping mall. For example, 92 percent of the park walkers reported a decrease in depression, whereas 22 percent of mall walkers actually reported an increase in depression (Mind 2007). A study in the United States by Berman, Jonides, and Kaplan (2008) focused on outcomes of memory performance and attention