THE HEALTHCARE GARDEN EVALUATION TOOLKIT: A STANDARDIZED METHOD FOR EVALUATION, RESEARCH, AND DESIGN OF GARDENS IN HEALTHCARE FACILITIES

A Dissertation

by

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ABSTRACT

As healthcare organizations and designers accept, and even embrace, healing gardens and other natural spaces as modalities for promoting the health and well-being of patients, visitors, and staff, the spaces provided must be designed and programmed to best optimize user health outcomes. Valid, reliable research instruments can aid in the evaluation of existing spaces. They can also be used as guides and tools for future design and research. The Healthcare Garden Evaluation Toolkit (H-GET) is a set of four standardized instruments developed for use, individually or in combination, by researchers, designers, and healthcare providers to evaluate, design, and research gardens in general acute care hospitals.

Evaluation is an important component of research on the designed environment, and is a critical part of evidence-based design. The more valid and reliable the instrument, the greater the likelihood that results will be credible and generalizable. To date, despite a clear need, there are no rigorously tested, validated instruments available for the evaluation of outdoor spaces in general acute care hospitals. The H-GET fills this need.

This mixed methods study involved development and testing of the four H-GET instruments: (a) the Garden Assessment Tool for Evaluators; (b) Staff and Patient/Visitor Surveys; (c) Behavior Mapping protocol ; and (d) Stakeholder Interviews. All four instruments were tested at eight Pilot Test sites across the United States. Emphasis with data collection and analysis was on establishing instrument reliability and validity. Data from each instrument were analyzed, and data from the four instruments were triangulated to examine support for validity and to explore specific hypotheses about physical and programmatic factors that promote garden use and user satisfaction. Through H-GET pilot testing, a *Healthcare Garden Evaluation Method* (H-GEM) emerged—a *methodological process* that the individual instruments facilitate in a rigorous, standardized, research-based format for future studies' design, protocol, data collection, data analysis, and dissemination of findings.

DEDICATION

For James

And for the healthcare providers and healthcare designers

who work so valiantly to provide the best possible care in the best possible spaces.

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NOMENCLATURE

BMap	H-GET Behavior Mapping protocol
EBD	Evidence-based design
GATE	Garden Assessment Tool for Evaluators
HC	Healthcare
HCF	Healthcare facility
H-GET	Healthcare Garden Evaluation Toolkit
IRB	Institutional Review Board
POE	Post-Occupancy Evaluation
Pre-OE	Pre-Occupancy Evaluation
RA	Research Assistant
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SI	Stakeholder Interviews

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CHAPTER I

INTRODUCTION

1.1 Purpose and Significance of this Study

Healing gardens and other restorative nature spaces in healthcare environments have increased in demand. No longer thought of only as "icing on the cake," passive and active nature contact in the form of gardens, walking paths, and other natural features are being incorporated into healthcare facilities as an essential component of the environment of care (Cooper Marcus & Sachs, 2014; Taylor, 2010, 2011). As designers and their clients accept, and even embrace, nature as a modality in promoting the health and well-being of patients, visitors, and staff, they have an opportunity to utilize existing evidence to create outdoor spaces that optimize health outcomes.

Unfortunately, current design, programming, and maintenance of spaces in healthcare facilities (HCFs) that provide access to nature do not always meet the needs of the users. In some cases, so-called "healing gardens" may even be counter-productive:

> Outdoor spaces designated as 'healing' often lack such basic necessities as shade, comfortable seating, places for privacy or enough greenery to even be perceived as a garden. Components that have become popular…are incorporated without consideration for their appropriateness to the site, understanding of their meaning, or potential users' ability and energy levels (Cooper Marcus & Sachs, 2014, p. 77).

The disconnect between what *could* be provided and what *is* provided is due in part to lack of research and, until recently, specific guidelines about what types of green spaces, and elements within those spaces, offer the greatest health outcomes for patients, visitors, and staff. The disconnect is also due to a lack of translation from research to practice; even when enough evidence exists for a design that would most benefit users, many designers and/or healthcare providers fail to implement the best possible design solutions.

1.1.1 Research and Evaluation for Evidence-based Design

Research is a critical component of design for healthcare facilities (Ulrich et al., 2008). The term "evidence-based design" (EBD) addresses the imperative for designers to base their decisions not just on intuition or prior experience: "Evidence-based design is 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 & Hamilton, 2008, p. 3). Evaluations of healthcare facilities, or aspects of HCFs, are a valuable component of EBD (Cama, 2009; Hamilton, 2013; Shepley, 2011; Zimring, 1987). Conscientious, rigorous evaluation can help designers and clients assess how well a completed design has met the goals set forth during planning, design, and construction stages. Evaluation can also be a valuable *design* tool—a guide for best practices with specific recommendations of what to do in the future. Finally, evaluation can be an excellent *research* tool: Lessons learned, and questions answered, can contribute knowledge to inform future design (Shepley, 2011; Zeisel, 2006; Zimring, 1987). As Joseph and colleagues state, "…there is a significant need for evaluations that contribute to the healthcare facility design knowledge base and help to strengthen and clarify the links between healthcare facility design and key outcomes that drive healthcare organizations—a primary goal in the EBD process" (2014, p. 158).

1.1.2 Existing Healthcare Garden Evaluations

Very few rigorous HCF garden evaluations have been conducted, and only nine have been identified in publications (Cooper Marcus & Barnes, 1995; Davis, 2011; Heath & Gifford, 2001; Naderi & Shin, 2008; Pasha, 2013; Rodiek & Lee, 2009; Shepley & Wilson, 1999; Sherman, Varni, Ulrich, & Malcarne, 2005; Whitehouse et al., 2001). Five of the nine studies were based on Masters Theses or Doctoral Dissertations (Davis, 2002; Pasha, 2011; Rodiek, 2004; Sherman, 2008; Whitehouse, 1999). The methodology and findings from these studies vary significantly depending on the evaluator, instruments used, site, budget, and stakeholders involved. When no single study is strong enough to stand on its own, researchers and designers must rely on what Ulrich and colleagues refer to as "reliable patterns of findings," where findings from multiple studies converge to demonstrate the strength of the evidence (2008, p. 63). This approach is not optimal for evidence-based design. Nevertheless, information from HCF garden evaluations has been extremely useful in filling knowledge gaps about why and how people use a particular outdoor space, how these spaces influence users' physical and emotional health, and how the spaces affect users' satisfaction with the facility and the care they receive. Evaluations have also provided answers to specific design questions, which have in turn informed design guidelines (Cooper Marcus & Francis, 1998; Cooper Marcus & Barnes, 1999; Cooper Marcus & Sachs, 2014).

1.1.3 The Future of Healthcare Garden Evaluation

More evaluations of healthcare gardens are needed. However, rigorous evaluations are time-consuming and expensive, and many practitioners feel that they lack the necessary skills or resources. At present, each time someone wishes to conduct an evaluation, she or he must adapt tools that have been used by previous researchers, or design the methodology and measurement instrument(s) from scratch. Many of the existing instruments that researchers make do with have not been rigorously tested, and neither reliability nor validity have been established. Research that requires "reinventing the wheel" and the use of less-than-optimal instruments wastes valuable time and funds; inhibits generalizability of results; and threatens the credibility of findings. A standardized instrument, or set of instruments, for evaluating gardens in healthcare facilities is sorely needed.

1.1.4 The Healthcare Garden Evaluation Toolkit (H-GET)

This research project fills that need by providing a set of instruments and a process for healthcare garden evaluation. The primary goal of this study was to develop the Healthcare Garden Evaluation Toolkit (H-GET), a set (kit) of four instruments (tools) that can be used individually or in combination by researchers, designers, and healthcare administrators and practitioners to evaluate gardens in general acute care hospitals. The study was conducted in two phases: Phase I involved development of and pre-testing the four H-GET instruments. Phase II involved testing the H-GET at 33 healthcare gardens across the United States. The H-GET uses a mixed methods approach, a combination of qualitative and quantitative techniques for data collection and analysis. The four instruments are ideally used together for the most comprehensive garden evaluation, but they can also be "unpacked" and used individually or in smaller groups as project scope (project goals, funding, time allocation, institutional review board approval, and so on) allows. The H-GET instruments, particularly the Garden Assessment Tool for Evaluators (GATE), can also be used as design tools, or a design process, in which evaluation questions from the instrument become guidelines for design and programming of successful hospital outdoor spaces. Finally, the H-GET instruments and methodology can be used for future research in addressing specific design and programming questions.

1.1.5 The Healthcare Garden Evaluation *Method* (H-GEM)

Although the H-GET is, at face value, a kit of evaluation tools, it is in fact a *methodological process* that the instruments facilitate in a rigorous, standardized format. The *H-GEM* includes each evaluation study's design, protocol, data collection, data analysis, and dissemination of findings. In developing and testing the H-GET instruments, this dissertation research process has yielded information and insights that will inform future research about and provision of access to nature in healthcare environments.

1.2 Literature Review

The literature review covers four areas: first, theoretical underpinnings; second, research on the health benefits of access to nature in non-healthcare settings; third, research on access to nature in healthcare facilities; and fourth, barriers to healthcare garden usage.

1.2.1 Theoretical Underpinnings

Several theories since the 1970s have sought to explain why and how people benefit from nature connection. They also inform the design of spaces to best facilitate human health and well-being. These theories include Fromm and Wilson's Biophilia, Appleton's prospect-refuge theory, Ulrich's Theory of Supportive Design and Theory of Supportive Gardens, the Kaplan's Attention Restoration Theory, several theories on the impact of aesthetics, and the theory of Salutogenic design. The following section addresses these, beginning with Biophilia, which has unifying content that can be associated with most theories that followed.

Biophilia. The social psychologist Erich Fromm coined the term "biophilia," which he defined as "the passionate love of life and all that is alive" (1973, p. 365) and "love for humanity and nature" (1997, p. 101). The word derives from the Latin *bio* (life) and *philia* (attraction). Most people, however, attribute the term to the biologist Edward O. Wilson (1984). In *The Biophilia Hypothesis*, Wilson stated, "Biophilia, if it exists, and I believe it exists, is the innately emotional affiliation of human beings to other living organisms. Innate means hereditary and hence part of ultimate human nature" (Kellert & Wilson, 1993, p. 31). The idea of an inherent attraction to life and living things has become the basis for many of the subsequent theories relating to the restorative benefits of nature to humans.

Prospect-refuge theory. Geographer Jay Appleton's theory of environmental aesthetics—most often referred to as "prospect-refuge theory"—is based on an adaptive-evolutionary perspective. In *The Experience of Landscape*, Appleton (1975) proposed that people's aesthetic preferences in art and the landscape derive from perceptions of what is needed for survival. Despite the fact that humans are, by and large, no longer hunter-gatherers, they still respond positively to settings and elements (shelter, safety, food, water, light, air) that would have enabled their early ancestors' survival. Likewise, humans avoid environments, objects, and situations (hazards) that appear to threaten survival. Thus, the ability to *see* with a clear view (prospect) from a safe vantage point *without being seen* (refuge) and *without potential danger* (hazard) is most comfortable and most preferred. Research across many different countries and cultures has validated Appleton's theory. Looking out from a safe vantage point over a savannah landscape appears to be almost universally preferred (Balling & Falk, 1982; Heerwagen & Gregory, 2008; Orians, 1980; Ulrich, 1993).

Heerwagen and Orians (1993) expanded on Appleton's prospect-refuge theory with identification of "environmental habitability cues" and four key components of environments that provide what enables people to survive and thrive: Resource availability, shelter, hazard cues, and wayfinding. The authors further propose that human response is not just response to the things themselves, but also to their symbolic meaning. For example, we are attracted to water elements, plants, and "fresh air" because of an innate dependence on all three for survival; on elements of shelter and refuge because we once needed these as protection from predators; and on ease of wayfinding in order to move easily from place to place.

Ulrich's Theory of Supportive Design. The premise of Roger Ulrich's Theory of Supportive Design (1991) is that people in healthcare settings—particularly patients, but also their loved ones (visitors) and staff—are under an enormous amount of physical, emotional, and mental stress. The indoor and outdoor design of HCFs should foster users' ability to cope with stress. In addition, HC environments should eliminate or minimize stressors and obstacles to stress coping. Ulrich's focus on stress as an outcome was practical: research on satisfaction, preferences, and attitudes is usually not sufficient to inform design decisions. On the other hand,

> …stress is a well-established concept in health related fields, and well over 100 studies have shown that stress is linked with psychological, physiological, and behavioral dimensions of wellness. By focusing on the concept of stress, a theory of supportive design can be developed that conceptualizes human impacts of design in ways that are related directly to scientifically creditable indicators or interpretations of wellness (1991, p. 99).

Stress is defined by Taylor as "a negative emotional experience accompanied by predictable biochemical, physiological, cognitive, and behavioral changes that are directed either toward altering the stressful event or accommodating its effects" (2012, p. 139). Stress can be acute or chronic and can affect both the sympathetic and parasympathetic nervous systems, causing a chain reaction of short and long-term effects. During and immediately following stressful events, physiological symptoms include an increase in heart rate, blood pressure, cortisol levels, sweating, and constriction of peripheral blood vessels. Sleep disturbance is also often one of the first direct results of stress. Long-term, or chronic, stress can lead to direct and indirect health problems, including gastritis and other digestive disorders, high blood pressure, heart disease, dermatitis, depression and anxiety, sleep disorders, headaches, obesity, type 2 diabetes, and dementia (Taylor, 2012). Particularly important for healthcare organization is the negative effect of stress, even for a short time, on the immune system. For example, higher stress is associated with slower wound healing; stress reduction therapies, including exercise, to reduce stress have been found to promote wound healing (Gouin & Kiecolt-Glaser, 2012). Stress can also reduce positive behaviors such as exercising and socializing, and increase negative behavior such as smoking and alcohol consumption. Taylor asserts, "The relationship of stress, both short and long term, is now so well established that stress is implicated in most diseases, either in their etiology, their course, or both" (2012, p. 147).

Ulrich proposes the following factors as essential in providing stress-reducing supportive design:

1. A sense of control of one's physical and social surroundings;
2. Access to social support;
3. Access to positive distractions in one's physical surroundings.

Although visual and physical privacy are not directly listed, Ulrich notes that "control" subsumes the issue of privacy; provision of visual and physical privacy is included under the first factor. Ulrich's definition of positive distraction is "an environmental feature or element that elicits positive feelings, holds attention and interest without taxing or stressing the individual, and therefore may block or reduce worrisome thoughts (1991, p. 102). The most effective positive distractions are "happy, laughing, or caring faces," animals; and elements of nature such as plants and water (1991, p. 102)

Ulrich's Theory of Supportive Gardens. Ulrich built his Theory of Supportive Gardens (1999) upon his Theory of Supportive Design. As contact with nature has been shown to reduce stress, gardens in healthcare facilities can amplify stress reduction. Many people—most who are not aware of the "evidence"—seek out nature-dominated settings to reduce stress (Francis & Cooper Marcus, 1991). The fact that stress is a pervasive, well documented, and important health-related problem in hospitals implies major significance for the finding that restoration is the key benefit motivating persons to use gardens in healthcare facilities.

Four (plus one) key factors: In the Theory of Supportive Gardens, Ulrich proposes the same three factors from his Theory of Supportive Design: sense of control, social support, and positive distractions (though in the Theory of Supportive Gardens, he emphasizes positive *natural* distractions). He then adds a fourth factor, physical movement and exercise, to the list. Although security and a *sense* of security are not one of the four specified factors, Ulrich asserts that both are essential backdrops for all four of the other conditions (1999).

1. Sense of control (actual and perceived) and access to privacy: Research by Evans and Cohen (1987), Glass and Singer (1972), and others has shown that people who feel a sense of control experience less stress; are better able to cope when faced with stress; and are healthier than people who experience a loss or lack of control. People in healthcare environments are often stripped of control—of their body, their diet, their privacy, and what others can do to them. They also have very little control of their physical environment. Lack of a sense of control can have deleterious effects, causing greater stress and adversely affecting outcomes (Proshansky, Ittelson, & Rivlin, 1975). A garden, as well as elements within the garden, can provide a sense of control by allowing people a means of mental or physical temporary escape from a stressful environment and situation (Ulrich & Addoms, 1981).

2. Social support: Ulrich defines social support as the emotional, material, and/or physical aid and caring that a person receives from one or more other individuals. Research has revealed that higher levels of social support, and lower levels of perceived loneliness and isolation, improve recovery (Spiegel, Kraemer, Bloom, & Gottheil, 1989; Kiecolt-Glaser, Dyer, & Shuttleworth, 1988; Ulrich, 1991).

3. Natural distractions (positive distraction through contact with nature): Ulrich defines positive distraction as "an environmental feature or situation that promotes an improved emotional state in the perceiver, may block or reduce worrisome thoughts, and fosters beneficial changes in physiological systems such as lowered blood pressure and stress hormones" (1999, p. 49). Along with laughter, music, art, and companion animals, nature has been found to be one of the best forms of positive distraction.

4. Physical movement and exercise**:** Ulrich's Theory of Supportive Garden Design emphasizes the ability of outdoor spaces to promote movement and exercise, which can reduce stress and depression and improve mood and other positive health outcomes (1999).

Interestingly, in his seminal article on the Theory of Supportive Design (1991), Ulrich pointed out that the focus of research should not necessarily focus solely on stress:

> …there is no suggestion here that the theory is comprehensive or that it encompasses in some complete way all factors that might influence wellness. For instance, it is conceivable that a patient's physiological well-being might also be positively affected if he or she rated, say, the hospital room furniture as high in quality or attractive, and this in turn somewhat enhance the individual's self-esteem or self-images. However, the reality is that there is a lack of sound research on this and many other possible mechanisms through which design might promote wellness (p. 99).

As one example, Ulrich cites a study of unstressed individuals who were better able to concentrate, reported more positive affect, and, according to brain scans, were more "wakefully relaxed" when viewing slides of nature as opposed to slides of built scenes (1991, p. 99).

The Kaplans' Attention Restoration Theory (ART). Whereas Ulrich's research and theory has emphasized stress reduction, especially for patients in healthcare settings, Stephen and Rachel Kaplan have focused on attention restoration. The Kaplans' Attention Restoration Theory (ART) identifies two interrelated attention systems (Kaplan 1995; Kaplan & Kaplan, 1989). *Directed attention* involves concentration on a specific, often difficult or stressful task (e.g., taking a test, walking down a busy city street, performing surgery) that simultaneously requires blocking out distracting sensory stimuli. Prolonged periods of directed attention without restoration lead to mental, and even physical, fatigue. Prolonged mental fatigue can result in an increase in irritability, impatience, unhappiness, and even hostility. Furthermore, mental fatigue can lower an individual's proper judgment and ability to concentrate, thus increasing the potential for errors. Restoration from mental fatigue, through *indirect attention* or *involuntary attention*, is essential. The terms i*ndirect attention* and *involuntary attention* were first coined by William James in 1892 to define a form of attention that does not require effort and thus restores mental fatigue. The Kaplans propose that certain environments, including nature, are particularly effective at fostering recovery. They identify *being away*, *extent*, f*ascination*, and *compatibility*, as described below, as the four primary characteristics of restorative settings (Kaplan, Kaplan, & Ryan, 1998).

***Being away*:** Escape or withdrawal from the source of fatigue or stress. Being away can be physical, such as traveling into a forest, or stepping outside for a breath of fresh air; visual, such as looking out a window or even at a picture; or mental, such as imagining a real or made-up place one wants to be.

***Extent*:** A space with enough "scope" to allow someone to feel that they are away in a completely different place; a place, either physical or in the imagination, that is large or detailed enough to invite exploration. Such a place should also engender fascination.

Fascination: A setting, or object, that is interesting enough to hold one's attention. "Fascination derives not only from interesting things or places, but also from processes such as thinking, doing, and wondering…Nature is well endowed with objects of fascination in flora, fauna, water, and the endless play of light" (Kaplan, Kaplan, & Ryan, 1998, pp. 20–21).

Compatibility: A situation in which a person's inclinations are compatible with their environmental circumstances. For example, a desire be alone in a quiet place, and finding a bench tucked away in a corner. An example of *incompatibility* might be the desire to go outside not being met due to bad weather or locked doors.

Scenic preferences and design implications of Attention Restoration Theory. The Kaplans' research has found the following four factors to be high in preference and thus most likely to facilitate attention restoration (Kaplan, Kaplan, & Ryan, 1998): (a) *coherence*—A setting that is orderly and organized into clear areas so that people can easily see and make sense of a place; (b) *complexity*—A "rich" setting with many opportunities for sensory engagement. A coherent setting can (and should) also be complex. The two are not mutually exclusive; (c) *legibility*—A distinct setting that has at least one memorable component that helps people remember the place and enables them to navigate easily through the space; (d) *mystery*—A setting that one feels compelled to explore and discover.

It could be argued that ART plays its greatest role in places of work, learning, and general living (cities, neighborhoods). When applied to healthcare, attention restoration through nature contact may be most beneficial to staff who must focus on difficult, taxing activities for much of the work-day. From a safety perspective, the need for attention restoration for staff is paramount in helping to reduce the likelihood of medical errors and to optimize patient care. In a study by Pati, Harvey, and Barach (2008), nurses with a window view onto a nature scene exhibited less fatigue and less acute and chronic stress, and a stronger ability to concentrate and focus on tasks, than those with no view or a non-nature view.

Importance of attractiveness - The "aesthetic placebo"? Healthcare design research has confirmed what people in industries such as hotels, restaurants, casinos, offices, and retail environments have known for a long time—that how a place *looks* affects how people *feel*, and can also affect how they *behave*. *A*n attractive, well-designed and maintained healing environment reassures people that they will be given an equally high level of attention and care. A facility's physical attractiveness, both indoors and out, has been directly linked to stress reduction, patient satisfaction, and perceived quality of care (Becker, Sweeney, & Parsons, *2008;* Dijkstra, Pieterse, & Pruyn, 2008). In *Healing Spaces: The Science and Place of Well-Being* (2010), the neuroscientist Esther Sternberg discusses the "placebo effect" in relation to human responses to aesthetics. Expectation plays a pivotal role in the placebo effect: "When you feel better because you believe that something will heal you—whether that something is a drug, an action, a person, a procedure, or a place—you are experiencing the placebo effect" (p. 191).

Salutogenic design. Salutogenic design, like preventive medicine, promotes health rather than trying to heal what has been broken (Antonovsky, 1979; Dilani, 2011). The medical field has begun to adopt a biopsychosocial model, in which mind and body are viewed as inextricably linked, rather than the biomedical model, in which the body takes precedence over the mind/thoughts/emotion (Taylor, 2012). These changing views are encouraging for designers who seek to integrate patient- , family- , and community-centered care into design. The Public Health professor Howard Frumkin states, “We probably need to learn to measure positive outcomes and not just negative outcomes—health and well-being, and not just pathology—a challenge for both psychology and medicine,” (2008, p. 113). More research needs to be conducted on the salutogenic, health-*promoting* effects of nature in healthcare settings, offices, schools, neighborhoods, and urban areas.

1.2.2 Benefits of Access to Nature in General Settings

Most research on the positive effects of nature on human health and well-being has occurred outside of the healthcare setting. Studies have been conducted in schools (Honeyman, 1992; Matsuoka, 2010; Ulrich, 1979; Wells, 2000); workplaces (Dravigne, Waliczek, Lineberger, & Zajicek 2008; Gray, 2011; Heerwagen & Orians, 1986; Kahn et al., 2008; Larsen, Adams, Deal, Kweon, & Tyler, 1998; Leather, Pyrgas, Beale, & Lawrence, 1998; Randall, Shoemaker, Relf, & Geller, 1992); prisons (Lindemuth, 2011; Moore, 1981; Spafford, 1991; West, 1986); and neighborhoods and disadvantaged communities (Bell, Wilson, & Liu, 2008; Kuo, 2001; Kuo & Sullivan, 2001; Mason, Kearns, & Bond, 2011; Taylor, Kuo, & Sullivan, 2002; Ward Thompson et al., 2012). Research has also been conducted in a variety of settings (e.g., wilderness areas, forests, public parks) with members of the general public who were not part of any specific population type (Berman, Jonides, & Kaplan, 2008; Bratman, Hamilton, Hahn, Daily, & Gross, 2015; Hartig, 1996; Kaplan, 1995; Li et al., 2007, 2008; Mason, Kearns, & Bond, 2011; Nakamura & Fujii, 1990, 1992; Park, Tsunetsugu, Kasetani, Kagawa, & Miyazaki, 2010; Roe & Aspinall, 2011; Ward Thompson et al., 2012).

While most research has focused on the visual aspect of nature contact, a few studies have looked at the role of sound (Diette, Lechtzin, Haponik, Devrotes, & Rubin, 2003; Kline, 2009); scent (Li et al., 2006, 2007, 2008; Oka, et al., 2008) and even ingestion or inhalation of beneficial bacteria found in soil (Matthews, 2010; Lowry et al., 2007). Some studies have also focused on the benefits of active interaction with nature, particularly gardening and horticultural therapy (Hayashi et al., 2008; Sato, Metoki, Iwamoto, & Satoh, 2003; Turner, Bass, Ting, & Brown, 2002; Wichrowski, Whiteson, Haas, Mola, & Rey, 2005; Wang & MacMillan, 2013).

Several literature reviews, including systematic reviews and meta-analyses, have examined the health benefits of nature connection to human health and well-being (Bowler, Buyung-Ali, Knight, & Pulin, 2010; Buck, 2016; Kuo, 2015; McMahan & Estes, 2014; Ohly et al., 2016; Wolf, Flora, & Housley, 2012; World Health Organization, 2016).

Outcomes. The most frequently documented positive outcomes involve reduction in stress, anxiety, and depression (e.g., Berman, Jonides, & Kaplan, 2008; Bratman, Hamilton, Hahn, Daily, & Gross, 2015; Gray, 2011; Heerwagen & Orians, 1986; Kaplan & Kaplan, 1989; Li et al., 2006, 2007, 2008; Ward Thompson et al., 2012). A systematic review in 2010 by Bowler and colleagues found greater positive effects from green natural environments when compared with built environments as related to anger, depression, mental fatigue, energy, and attention. Faber Taylor and Kuo (2009) found a positive correlation between time spent in a nature-dominated park and reduction in need for Attention Deficit Hyperactivity Disorder medication, methylphenidate (Ritalin) in children. Just being near nature has health benefits: Trees, greenery, and other nearby nature improve girls' test scores (Taylor, Kuo, & Sullivan, 2001); curb crime, including domestic violence, even in high-crime neighborhoods (Kuo & Sullivan, 2002); ease the burden of poverty (Kuo, 2001); and improve health perception (Kardan et al., 2015). Some researchers have found a positive relationship between neighborhood greenness and birth weight, indicating better mother and infant health due to green space (e.g., Agay-Shay et al., 2014; Dadvand et al., 2014; Donovan, Michael, Butry, Sullivan, & Chase, 2011; Hystad et al., 2014; Laurent, Wu, Li, & Milesi, 2013; Markevych et al.,2014). A systematic review and meta-analysis by Dzhambov, Dimitrova, and Dimitrakova (2014) found a weak but positive association between residential greenness and birth weight.

Studies have documented better memory performance and attention span (Berman, Jonides, & Kaplan, 2008) and improved student and staff performance, productivity, and satisfaction (e.g., Dravigne, Waliczek, Lineberger, & Zajicek, 2008; Hamman, 2013; Heerwagen & Orians, 1986;

Honeyman, 1992; Kahn et al., 2008; Larsen, Adams, Deal, Kweon, & Tyler, 1998; Randall, Shoemaker, Relf, & Geller, 1992; Ulrich, 1979; Wells, 2000). Ohly and colleagues (2016) focused their systematic review specifically on Attention Restoration Theory research.

Improved immune function from nature exposure has been documented (Li et al., 2007, 2008; Mao et al., 2012; Park, Tsunetsugu, Kasetani, Kagawa, & Miyazaki, 2010). In a literature review of 21 plausible pathways between nature and human health, Kuo identifies enhanced immune functioning as a potential "central pathway" (2015).

Mechanisms for health and restoration with nature. There are many different ways that passive and active nature connection benefit people (De Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003; Groenewegen et al., 2006, 2012; Hartig, Mitchell, De Vries, & Frumkin, 2014; Kuo, 2015; Sugiyama, Leslie, Giles-Corti, & Owen, 2008). Several of these mechanisms are described below.

Sunlight and daylight exposure: Being outdoors in sunlight is important for the body's production of Vitamin D, which is critical for bone health and reduced risk of Osteoporosis. Vitamin D deficiency has also been linked to common cancers, cardiovascular disease, autoimmune diseases, type 1 diabetes, depression, rickets, and myopia (Bowcott, 2010; Healthfacts, 2005; McBrien, Morgan, & Mutti, 2008; Rose et al., 2008). Elderly stroke patients with fifteen minutes a day of sunlight exposure had 84 percent fewer hip fractures than those not regularly exposed to sunlight (Sato, Metoki, Iwamoto, & Satoh, 2003). Turner, Bass, Ting, and Brown (2002) found that women who gardened had a higher bone density than women who performed other forms of mild exercise. They posited that exposure to sunlight may have been a factor. Exposure to light balances circadian rhythms, which are important for sleep, especially in people with dementia (Balan et al., 2001) and depression (Bendetti, Colombo, Barbini, Campori, & Smeraldi, 2001). Outdoor activity by residents with dementia in the morning "greatly reduced unwanted behaviors later in the day and has helped cut its use of psychotropic medication by 40%" (Gold, 2004).

Better air quality: Through transpiration, plants absorb carbon dioxide and produce oxygen as they bring moisture into the air. They also reduce particle matter and air pollution (Akbari, 2012; Dadvand et al, 2012; Dela Cruz, Christensen, Thomsen, & Müller, 2014); reduce the heat island effect of high temperatures in urban areas (Susca, Gaffin, & Dell'Osso, 2011); and dampen sound (Van Renterghem, Botteldooren, & Verheyen, 2012).

Phytoncides: Trees give off phytoncides, antimicrobial volatile organic compounds (wood essential oils) that have been found to reduce blood pressure and boost immune function, including stimulating the production of NK cells—natural killer cells that fight cancer cells (Dayawansa et al., 2003; Komori, Fujiwara, Tanida, Nomura, & Yokoyama, 1995; Li et al., 2006, 2007, 2008). The greater the density of trees, the higher the concentration phytoncides. In 2008, Li and colleagues compared the effects of walking in a forest with walking in a city. A high concentration of phytoncides were detected in forest air, and in contrast, almost none were present in the city air. The study found that only the forest walking, and not the city walking, increased NK activity and number and decreased the concentration of adrenaline (a stress indictor) in urine. The effects of the forest walks were found to last at least seven days. A larger-scale study by Park and colleagues (2010) of 260 people in 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 that of people performing a similar activity in urban settings.

***Negative ions*:** Negative ions, present in water and transpiring plant material, can reduce depression. Researchers posit that negative ions stimulate the release of serotonin, dopamine, and oxytocin, all of which induce positive feelings and contribute to stress reduction (Goel, Terman, Terman, Macchi, & Stewart, 2005; Nichols, 2014; Ryushi et al., 1998; Terman, Terman, & Ross, 1998).

Scent*:* The scent of plants has also been linked to improved health. For example, pine needle scent was found to decrease blood pressure and confusion and to increase memory and vigor (Jo, Fujii, & Cho, 2010). Fujita, Ueki, 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 mouse offspring. Watanabe et al. (2011) found that “green odor” (a 50:50 mixture of trans-2-hexenal and cis-3-hexenol) had not only a therapeutic but also a potentially preventive effect on depressive-like states in rats. Oka and colleagues (2008) found that green odor (a mixture of equal amounts of 2*E*-hexenal (leaf aldehyde) and 3Z-hexenol (leaf alcohol) attenuated stress responses of systolic and diastolic blood pressure in humans.

Soil bacteria: A bacterium present in many soils, *Mycobacterium vaccae*, has been found to increase the release of serotonin, an important hormone in stress reduction, in mice. Mice who ingested the bacteria displayed fewer signs of stress, and had improved mood and cognitive function (Lowry, et al., 2007; Matthews & Jenks, 2013).

***Increased movement and exercise, “green exercise”*:** As little as five minutes of “green exercise”—physical activity in a *nature-rich, outdoor* space—can improve health, including mood and self-esteem (Barton & Pretty, 2010). Green exercise has been found to be more beneficial than indoor or urban exercise (Bratman, Hamilton, Hahn, Daily, & Gross, 2015). Berman, Jonides, and Kaplan reported that participants did not necessarily need to enjoy the exercise; participants experienced the same benefits in mild, sunny summer weather as in the winter when temperatures at 25 degrees Fahrenheit (2008).

Social integration and support: A study by Weinstein, Przybylski, and Ryan (2009) found that when people viewed images of nature as opposed to urban scenes, they were inclined to be more social, more caring towards others, more community-oriented, and more generous (see also Coley, Sullivan, & Kuo, 1997; Mapes & Hine, 2009; Zhang, Piff, Iyer, Koleva, & Keltner, 2014).

***Physiological health markers*:** Other physiological health markers of nature connection include lowered inflammatory cytokines (Mao et al., 2012), which may be associated with reduction in stress and depression and lowered blood glucose levels in diabetic patients (Ohtsuka, Yabunaka, & Takayama, 1998).

1.2.3 Benefits of Access to Nature in Healthcare Settings

Reduced anxiety and stress. The most frequently documented benefits of access to nature in healthcare facilities are reduced stress, anxiety, depression, and aggression (Balan et al., 2001; Calkins & Connell, 2003; Cooper Marcus & Barnes, 1995; McMinn & Hinton, 2000; Pati, Harvey, & Barach, 2008; Rodiek, 2002; Sherman, Varni, Ulrich, & Malcarne, 2005; Toone, 2008; Ulrich et al., 2008; Wichrowski, Whiteson, Haas, Mola, & Rey, 2005; Whall et al., 1997). Verderber (1986) reported that in a questionnaire of patients severely disabled by illness or accidents, nature scenes were highly preferred in hospital window views. Toone (2008) found that pre-post test study participants who spent time in the Healing Garden Courtyard at Dell Children's Medical Center showed statistically significant stress recovery, unlike the participants who spent time in two of the hospital's indoor lounges. Behavior mapping showed that people in the garden were also more active and engaged with their surroundings than the two indoor groups. Heerwagen and Orians (1990) found that patients in dental clinics reported feeling less stressed on days when a large mural with a nature scene was hung on the waiting room wall than on the days when no mural was present. Heart-rate measurements also indicated lower amounts of stress, confirming the self-reported data. Katcher et al. (1984) also studied dental patients and found that when an aquarium with fish was present prior to surgery, participants experienced significantly less discomfort and anxiety. Patient compliance during surgery also increased.

Coss (1990) studied patients who were on gurneys just before they entered surgery, where the presurgical holding room had either "serene" (water and other nature) or "arousing" (a sailboat in the wind, a zebra looking directly at the camera) nature pictures mounted on the ceiling. Patients found both images to be aesthetically pleasing but systolic blood pressure was lower when participants observed the "serene" images. Coss concluded that the serene pictures were safer and more appropriate for acutely stressed surgery patients. In a two-year study by Ulrich and Lunden (1990) at Uppsala University Hospital in Sweden, post-operative open heart surgery patients exposed to pictures of nature dominated either by water or trees had less anxiety than those who had pictures of both rectilinear and curvilinear abstract forms (who exhibited *increased* anxiety) or no picture at all. Patients with the nature + water pictures fared best.

Notably, all patients who had seen pictures performed better in a visual/perceptual functioning test than those who had had no picture.

In a POE of three gardens at Children's Hospital and Health Center in San Diego, Sherman and colleagues (2005) used a version of Varni's Pediatric Quality of Life Inventory Present Functioning Module (PedsQL PFM) to measure levels of anxiety, sadness, anger, worry, fatigue, and pain of survey participants inside the hospital building and outside in the gardens. Preliminary results found a correlation with lower self-reported distress in the gardens than in the hospital, "with the largest effects demonstrated for pain, worry, and sadness, followed by anger, anxiety, and fatigue" (p. 178).

Reduced need for medication. Some evidence links access to nature to a reduced need for pain medication (Diette, Lechtzin, Haponik, Devrotes, & Rubin, 2003; Keep, James, & Inman, 1980; Kline, 2009; Oka et al., 2008; Tse, Ng, Chung, & Wong, 2002; Ulrich, 1984; Ulrich et al., 2008; Walch et al., 2005) and reduced length of stay (Beauchemin & Hays, 1996; Ulrich, 1984). In his famous "View Through a Window" study (1984), Ulrich found that patients recovering from gall bladder surgery who had a window view of a small stand of trees fared better than those whose view was of a brick wall. Positive outcomes in the nature view patients included shorter hospital stays (7.96 instead of 8.70 days), fewer negative evaluative comments from nurses (such as "upset and crying," "needs more encouragement," fewer minor post-surgical complications (such as nausea or headache), and a decreased need for strong narcotic pain medication than the brick wall view patients.

Improved cognitive function. Some studies have linked visual and physical nature access with increased healthcare staff focus, concentration, performance, and productivity (Cimprich, So, Ronis, & Trask., 2005; Gray, 2011; Pati, Harvey, & Barach, 2008).

Improved satisfaction. Researchers have documented the importance of the physical environment, including outdoor space, in patients' perception of the care they receive, and in their satisfaction with the facility as a treatment and work environment (Becker, Sweeney, &

Parsons, 2008; Dijkstra, Pieterse, & Pruyn, 2008; Irvine, 2004; Rodiek, Boggess, Lee, Booth, & Morris, 2013; Sorensen, 2002). In her dissertation, Whitehouse cited research by Reidenbach and Sandifer-Smallwood (1990), where the authors found a strong and significant correlation between physical attributes of the facility and people's overall rating of service, satisfaction, and willingness to recommend. Whitehouse argued that healing gardens could play a part in the physical appearance of a HCF and thus might also affect satisfaction indices (1999). As part of Whitehouse's POE of the Leichtag Family Healing Garden at San Diego Children's Hospital, survey questions addressed whether and how the garden affected people's perception of the HCF as a whole. In response to the question, "Does the healing garden increase your overall satisfaction with this Children's Hospital?" 80 percent of survey participants answered yes; 12 percent had no opinion, and 8 percent answered no (2001).

Higher return on investment. It stands to reason that if the healthcare organization is saving money on patient care, attracting and keeping staff, reducing the number of staff errors, and improving both client and staff satisfaction, a more positive return on investment (ROI) will be achieved (Berry et al., 2004; Cooper Marcus & Sachs, 2014; Machlin & Karper, 2007; Rodiek, Boggess, Lee, Booth, & Morris, 2013; Terrapin Bright Green, 2012).

1.2.4 Additional Research

Not all studies have found positive correlations between nature contact and health. Due to the lack of reporting and citing of negative findings, such studies are more difficult to find but are equally important in examining existing research. Wunsch, Gersheengorn, Mayer, and Claassen (2011) found no significant difference in secondary outcomes ("length of mechanical ventilation, time until the patient was able to follow commands, need for percutaneous gastronomy tube or tracheotomy, ICU and hospital length of stay, and hospital, 3-month and 1-year mortality") between patients with and without windows (p. 1). Their study, as well as Diffey and Storey (1998) focused on a potential difference in outcomes when patients were exposed to more natural light. Diffey and Storey found no significant difference in patients' length of stay whether they were admitted in the summer (with higher light levels) or in the winter. Kohn, Harhay, Cooney, Small, and Halpern (2013) found no significant difference between outcomes (mortality, readmission, delirium, length of stay, and costs) of patients with natural vs. industrial views in medical and surgical ICUs.

Different patient populations have different needs. Not all healthcare users want or need the same thing, and not all spaces can fulfill the needs of all people at all times. Just as indoor spaces vary according to the different types of patient and residents, so, too, must outdoor spaces. Gardens for hospice, pediatric, assisted living, dementia care, cancer care, behavioral health, and rehabilitation all serve different groups of people with different treatments and needs (Carpman & Grant, 1993; Cooper Marcus & Barnes, 1999; Cooper Marcus & Sachs, 2014; Paine, Francis, Cooper Marcus, & Barnes, 1990). Whitehouse (2001) and Sherman, Varni, Ulrich, and Malcarne (2005) found that patients, visitors, and staff used the same spaces in significantly different ways. In Sherman's research, staff and parents of patients used the space for more sedentary activities (sitting, eating, reading) but parents of patients also interacted more with garden features, especially with their children. Children were far more active, interacting with plants and built features (e.g., sculptures, water fountains) as well as each other and their parents. Cooper Marcus and Sachs (2014) note that different users' needs may sometimes even be in conflict. For example, in a small pediatric garden where some parents may be grieving, well child siblings may want to run, play, and make noise.

Patients, visitors, and staff have different needs. Several studies have found that staff are sometimes, if not often, the primary users of healthcare gardens (e.g., Cooper Marcus & Barnes, 1995; Naderi & Shin, 2008; Pasha, 2013; Whitehouse, 2001), and that patients often make up the smallest percentage of users, usually due to poor health. Studies have also noted conflicting needs and perceptions of the built environment in patients/visitors and staff (Cooper Marcus & Barnes, 1995; Cooper Marcus & Sachs, 2014; Davis, 2011; Naderi & Shin, 2008; Nejati, Rodiek, & Shepley, 2016; Pasha, 2011; Sherman, Varni, Ulrich, & Malcarne, 2005; Whitehouse et al., 2001). Nejati, Shepley, Rodiek, Lee, and Varni (2016) and Pasha (2013) noted a strong preference among nursing staff for a separate outdoor break area. Sherman and colleagues noticed that staff tended to spend more time in the garden that was least accessible to patients and visitors (2005). Davis (2011) suggested that staff might use the garden more if there were a separate, semi-secluded space for them. There is also anecdotal evidence from conferences, online discussions in forums such as Linked In, Facebook, and Twitter, and personal communications with the researcher, that both staff and patients would prefer to have separate garden spaces; visitors do not want to be reminded of the hospital from which they are momentarily escaping, and staff do not want visitors or patients bothering them during their precious break time.

1.2.5 Barriers to Healthcare Garden Use

Just as important as what people want to see in a healthcare garden, and what they think contributes most to their health are the *barriers* to garden use. Healthcare garden evaluations have provided substantial insight into what prevents or inhibits people from using the space. Table 1.1 provides a summary of what patients, visitors, and staff reported as barriers to use.

Lack of garden awareness. Regardless of how successful the actual garden is, people will not use a space if they do not know about it. Whitehouse (2001) found that 80% of San Diego Children's Hospital patients, 48% of families, and 10% of staff did not know about the hospital's healing garden. Additionally, 95% of families, 90% of patients, and 28% of staff reported never having visited the garden. In surveys of five pediatric gardens in Texas, Pasha (2013) found that 27% of hospital visitors were not aware of the garden at all. Although signage, brochures, and word of mouth can help, one of the best ways for people to find out about a garden is to *see* it (Cooper Marcus & Sachs, 2014).

Table 1.1 Primary barriers to garden use. Results from eight healthcare garden evaluations. Note: See References for full citations.

Barriers to use	**Cooper Marcus & Barnes, 1995**	**Davis, 2011**	**Heath & Gifford, 2001**	**Naderi & Shin, 2008**	**Pasha, 2013**	**Rodiek & Lee, 2009**	**Sherman, Varni, Ulrich, & Malcarne, 2005**	**Whitehouse et al., 2001**
Lack of garden awareness	✓	✓	✓	✓	✓			✓
Lack of visual access to garden		✓		✓		✓		
Lack of physical access to garden (doors locked, no automatic doors, garden too far)	✓	✓	✓	✓		✓		✓
Weather (heat, cold, rain)	✓	✓	✓	✓	✓			
Insufficient shade or other cover (from sun, rain)	✓		✓	✓	✓	✓		✓
Not enough "nature" (more trees, flowers, greenery)	✓	✓	✓	✓		✓		✓
Poor maintenance (of plants and/or other materials)	✓	✓				✓		✓
Insufficient or uncomfortable seating	✓	✓	✓	✓	✓	✓		✓
Staff (may) want their own garden space		✓			✓		✓	

Table 1.1, continued

Barriers to use	Cooper Marcus & Barnes, 1995	Davis, 2011	Heath & Gifford, 2001	Naderi & Shin, 2008	Pasha, 2013	Rodiek & Lee, 2009	Sherman, Varni, Ulrich, & Malcarne, 2005	Whitehouse et al., 2001
Lack of privacy, lack of separation (between public and private spaces)		✓		✓		✓	✓	✓
Medical condition of patient/ resident (not able at all, or only when accompanied)	✓		✓	N/A	✓		✓	✓
Too busy (primarily staff, but also patients and visitors)	✓	✓		✓	✓			
Smoking	✓		✓					✓

Other barriers or features respondents said they wanted

Cooper Marcus & Barnes: Add drinking fountain; make garden larger; reduce noise; ban dogs; add water features; add Japanese gardens.

Davis: Add restroom.

Heath & Gifford: No place to actively garden (installed after POE conducted); some respondents wanted water features removed (but other respondents liked them).

Naderi & Shin: Add water features.

Rodiek & Lee: Round-trip walkways were an important factor that contributed to usage; also that walkways had good views.

Whitehouse et al.: People not sure garden is "for them"—staff think garden is only for patients; visitors think garden is only for children, etc.; want water feature, music or wind chimes.

Lack of physical access. Although a small percentage of gardens are designed solely for viewing and not for people to enter at all, most healthcare gardens are intended for active use by patients, visitors, and/or staff. If a garden is to be occupied by people, it needs to be physically accessible. In visits to 24 hospital healing gardens in Northern California, Cooper Marcus and Barnes (1995) were surprised at how many gardens were inaccessible because the doors from inside were locked. When doors are not locked, they must also be easy for even the frailest of users, including those with wheelchairs, walkers, and even gurneys to get through. Heath's POE of a multi-level senior care facility found one of the greatest barriers to garden use was the lack of automatic doors (2004). As a result, automatic doors were installed following publication of the study. A multiregional study of assisted living facilities found residents' usage of gardens nearly tripled when door thresholds were low enough to allow wheelchairs and walkers to cross easily. The study also found that people in facilities with automatic doors to the garden were significantly more likely to spend time outdoors (Rodiek & Lee, 2009). Davis (2011) and Whitehouse (2001) found that a garden's distance from the building (even as little as 500 yards, in Whitehouse's study of San Diego Children's Hospital) or from specific parts of the HCF reduced the number of visitors. With Whitehouse, survey participants also complained about the lack of available wheelchairs to transport children from the hospital to the garden area. Naderi and Shin (2008) found that the nurses who used the garden most were those whose work stations were closest. The further away a nurse's unit, the less likely they were to visit the garden.

Health of patients or residents. Almost all studies found that patients were the smallest user group when compared with visitors and staff. Sherman, for example, found that only 4% of garden users were the children with cancer for whom the gardens had been designed. The largest user group was visitors (adults and well siblings), followed by staff (2005). Sherman, Cooper Marcus and Barnes, and others posited that inpatients would be less likely to go outside than outpatients, visitors, or staff due to their medical condition. As patients stays have grown shorter, acuity of inpatients during their hospital stay is higher. An exception was Davis (2011), in which the majority of users were rehabilitation patients and their visitors. Very few staff members used the garden, and those who did were usually therapists working with a patient.

This makes sense, since the garden was designed specifically for patients to use once they were out of bed and had begun the rehabilitation process. Heath and Gifford reported that many of the senior residents could not visit the garden without a staff member, and staff did not feel they had enough time to take residents out (2001).

Weather. Most healthcare garden evaluations found that weather (heat, cold, rain, snow) was a significant barrier to use. Naderi and Shin (2008), for example, found that weather was the most significant limiting factor (54% survey respondents reported rain as a limiting factor in garden usage and 44% reported heat). Pasha noted that weather was a barrier for 24% of staff and 15% of patients and visitors (2013). Although weather cannot be changed, design solutions can help to protect garden users and make them more comfortable.

Insufficient cover. Related to concerns about weather, many HC garden evaluation participants noted that the garden did not have enough cover, either from trees or built structures; participants wanted protection from sun and rain. In Heath and Gifford's POE of eight gardens in a multi-level senior care facility (2001), the most frequently requested addition was shade (20.7%), followed by cover from rain (15.1%). Cooper Marcus and Francis (1998), Sachs (1999) and Ulrich (1999) note that shade is particularly important in hot climates and for populations such as the elderly and people on psychotropic medications who are more vulnerable to the sun's ultraviolet rays and glare.

Not enough "nature." Participants in almost every study wanted more trees, flowers (especially colorful flowers), greenery, wildlife, water, and other nature elements, even in gardens with a high ratio of plantings to paving. Relatedly, in every study, plants and greenery were cited as one of the top components that contributed to people feeling better or the garden being perceived as therapeutic.

Poor or improper maintenance. Related to people wanting more natural features were responses that people felt the garden was not sufficiently or properly maintained. People noticed plant material, in particular—dead plants, bare patches in planting beds, areas of the garden that needed weeding. Davis (2011) noted that many of the plantings in the southwestern corner of the garden had died, something survey participants remarked on as well. One patient in the Davis study remarked that the corner "looked unfinished and needed more work. 'It looks like they ran out of money,' the patient exclaimed. Another patient pointed out that the dead weeping willows needed replacing…" (p. 31).

Insufficient or uncomfortable seating. All but one of the evaluation studies found that garden users were not satisfied with the seating (Sherman, 2005, did not interview or survey garden users). Primarily, participants wanted more seating and wished that it were more comfortable. Pasha looked at correlation between quality and quantity of seating and found that "…dissatisfaction with the quality of seats proved to decrease duration and frequency of garden visitation among staff, and a negative significant correlation was observed between these variables. While visitors also realized deficiencies of seating options, this did not affect their garden visitation," p. 93. Other issues with seating included concerns about safety (for example, whether seats would tip over (Cooper Marcus & Barnes, 2005), or that there was not enough contrast between seating and paving material (Shepley & Wilson, 1999)), location of seating, and whether it could be moved by garden users. Participants in some studies also asked for tables.

Desire for separate areas – private vs. social, and staff vs. patient/visitor. Several studies reported that participants wanted more social and private spaces, or a greater separation between the two. The garden design proposed for St. Joseph Hospital, which was primarily for staff, initially had large areas for group gatherings such as meetings and celebrations. But after behavior observation, a survey about garden preference, and a survey about the two designs proposed, the design was changed to accommodate nurses' desire for small, private spaces where they could be alone or with one or two other people (Naderi & Shin, 2008). In open-ended survey responses from staff, Pasha (2013) found that staff on breaks tended to seek refuge from patients and visitors. Sherman and colleagues (2005) noticed from behavior observation that staff used the Friendship Garden "overwhelmingly" more than the other two gardens. They posited that since there was no direct access to that garden from patient rooms or the playroom, it was an outdoor space where staff could escape from patients and family members:

> If staff members go to the garden for their breaks, it is logical that they actively seek the garden most spatially isolated from patients, where they are least likely to be interrupted by patients, or reminded of the concerns of their work. It is conceptually reasonable that an environment in which patients and families approach staff with questions and other concerns would not be ideally suited for stress amelioration for staff, and consequently would not be a maximally restorative experience (p. 180).

Schedule. Pasha (2013) found that almost half (47%) of staff reported that they did not visit the garden because they were too busy. While one might expect this response from staff, Pasha also found that visitors (25%) reported being too busy as a barrier to garden visitation. Twenty-five percent of visitors also listed their child's condition as a barrier to visiting the garden; there may have been crossover between health of visitors' children and busy schedule. In Davis (2011), "rehabilitation patients responded that scheduled therapeutic activities, most of which occur indoors, were the biggest hindrance to garden use, and they expressed a desire to be in the garden more often" (p. 34).

Smoking. Most HCFs in the United States no longer allow smoking indoors, in small outdoor spaces, or even on the entire campus. Four evaluations (see Table 1.1 and Shepley & Wilson, 1999) found that while some people visited the healthcare garden specifically to smoke, most of the non-smoking users were adamantly against smoking in the garden and were deterred from using it if they saw people smoking.

1.3 Conceptual Framework

Figure 1.1 summarizes the conceptual model associated with the variables of interest in this study. A successful hospital garden facilitates positive health outcomes, including reduction of stress and enhancement of physical, mental, emotional, and perhaps also spiritual restoration, for all users—patients, visitors, and staff. Design factors, including the garden's location at the facility; connection with the building(s) via windows, doors, and walkways; overall garden design and layout; and specific elements within the garden such as plants, seating, and paving influence whether or not people know about the garden (awareness); whether they use it; and how often and for how long they visit. These physical design factors also influence people's enjoyment of the garden and the therapeutic benefits derived from its use. Conversely, poor design can inhibit use and benefits.

In addition to design, policy—such as whether and when doors to the garden are locked; whether patients and visitors are told about the garden; and whether staff are allowed or encouraged to use the garden in their free time— also contributes to people's awareness, use of, and benefits from healthcare gardens. Programming of therapeutic and social activities such as horticultural or physical therapy, performances, and seasonal events can also increase awareness, use, and enjoyment of healthcare gardens.

Even when people do not physically visit the garden, they can benefit by knowing that it is there (having a sense of control and a sense of "escape") and by viewing it (visual connection from indoors). The greatest benefits of a healthcare garden, however, occur when people can physically be in the space.

High satisfaction with the garden can lead to higher satisfaction with the HCF's overall physical environment and with its care for clients (patients and visitors) and staff. Although not stated in the Conceptual Model diagram, research indicates that greater health outcomes and higher satisfaction among patients, visitors, and staff will, theoretically, also lead to greater return on investment (ROI) for the healthcare organization.

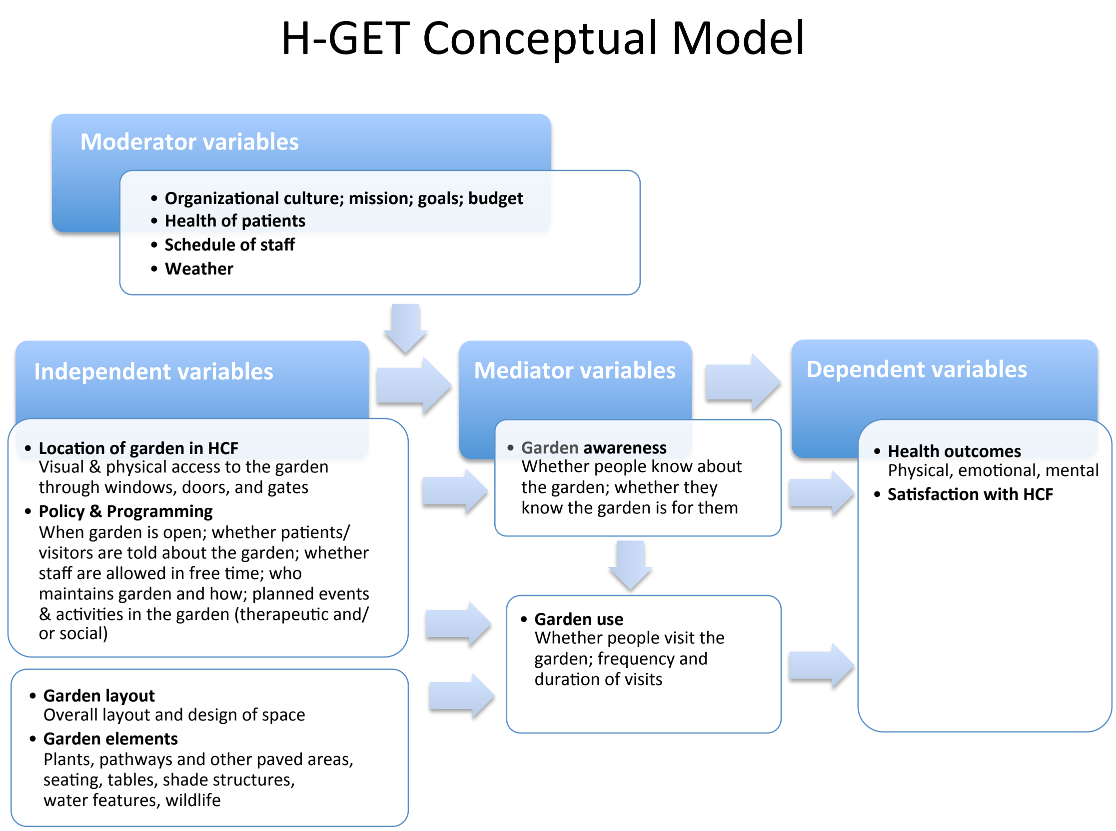

Figure 1.1 Conceptual model for Healthcare Garden Evaluation Toolkit research.

1.4 Hypotheses

As a result of the literature review, the following hypotheses were explored during development and testing of the H-GET:

1. Gardens are used more when people are: (a) aware of them; (b) have easy visual access to them; and (c) have easy physical access to them;

2. Although the physical design of the garden, and its relationship to the building, is important, other factors such as policies, programming, and organizational culture also affect garden usage;
3. Garden *use* is a good indicator of garden *success*; in other words, there will be a strong positive correlation between gardens that score highly and those that have many users;

4. Patients/visitors and staff prefer to have outdoor garden spaces that are separated from one another;
5. There will be a strong positive correlation between "successful" gardens—gardens that receive high scores with the Garden Assessment Tool for Evaluators (GATE) and patient, visitor, and staff outcomes such as self-reported feelings after garden visits; satisfaction with the HCF; and likelihood to recommend the HCF to others.

1.5 Conclusion

Two related movements—an increase in demand for evidence-based design and an increase in acceptance of nature contact as a vital component of healthcare facilities' environment of care—have converged to elicit a greater demand for healthcare gardens that are not just based on the designer's intuition or past experience but on evidence from published research and best practice. Although a large body of literature documents the many physical, psychological, and emotional benefits of nature outside of and within healthcare environments, less research has specifically examined existing healthcare gardens to reveal what about them facilitates the best outcomes for patients, visitors, and staff. Post-occupancy and other types of evaluations provide the most comprehensive and detailed evidence on what design and programming aspects of healthcare gardens work or do not work, as well as what encourages or hinders people's use of these outdoor spaces.

Future healthcare garden evaluations, and the field of healthcare design in general, will benefit from research that is more rigorous and generalizable beyond individual sites. A validated, reliable set of evaluation instruments and a standardized methodology for their use will enable researchers—including design practitioners and healthcare organizations—to collect, analyze and share data about individual and multiple sites. This standardized, rigorous methodology and the instruments used will not only enable better evaluation; they will also serve as design tools for the next generation of evidence-based healthcare gardens, and as research tools for detailed questions about the effect of nature connection on patients, visitors, and staff.

This study has focused on the development and testing of a standardized set of four evaluation instruments to be used in general acute care hospital gardens: The Healthcare Garden Evaluation Toolkit (H-GET). Development of the tools has also resulted in development of the overall research process, or methodology, that takes place with a healthcare garden evaluation, beginning with the site and research questions and ending with sharing the research.

CHAPTER II

METHODS: APPROACH AND OVERVIEW

2.1 Introduction

This chapter covers the overall methods that were used in identifying and developing the four Healthcare Garden Evaluation Toolkit (H-GET) instruments. In subsequent chapters, an overview will also be given on instrument testing and data analysis, with more detail on each instrument. Like most forms of facility evaluation, this study utilized a mixed methods approach. Johnson and colleagues define mixed methods as

> "…the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the purposes of breadth and depth of understanding and corroboration" (2007, p. 123).

A literature review, as described in the previous chapter, identified goals and objectives for the research as well as instruments that could be used as parts of the H-GET or models for H-GET instruments.

2.1.1 Study Goals

Two overarching goals in development of the H-GET were that it be (a) applicable to as many different sites as possible, and (b) usable by as many different people as possible. General acute care hospitals (often called "general hospitals") serve a broad population and often encompass other more specialized care. For example, one of the research sites—Baylor Scott & White Hospital—is a general hospital that also has an oncology department that provides comprehensive cancer care. Once a garden evaluation methodology is established for acute care hospitals, changes can be made for specialty care facilities such as pediatric, behavioral health, and hospice. The H-GET instruments were also designed to be usable at general hospitals throughout the United States, regardless of the facility's geographic location, size, the garden's location within the facility, and other individual differences.

The H-GET instruments were designed for use by a range of practitioners (e.g., architects, landscape architects, interior designers, and engineers), healthcare providers (such as nurses, therapists, doctors, and administrators), and researchers from multiple disciplines, including academic faculty and students at both graduate and undergraduate levels. Simplicity was an important component of this broad applicability: While technology exists for some of the instruments, such as computer programs and hand-held devices for behavior observation, many practitioners would not have the budget to obtain that technology or the time to learn the hardware and software. The goal is to enable research that is both rigorous and straightforward.

2.1.2 Identification of H-GET Instruments: Background Research

Professor of Health Psychology Clare Bradley once said, "Psychologists would rather use each others' toothbrushes than each others' measures" (Bradley, 1998). While this may or may not be true for psychologists, this researcher wanted very much to use instruments that had already been developed and tested. The original intention for this study was to identify what instruments would be needed for a rigorous and comprehensive healthcare garden evaluation; find those instruments; and compile them together to create a standardized method. Although some useful instruments were identified, none could be adopted, without changes, for use in the H-GET.

Literature review for similar evaluation and instruments. There is a dearth of published research on evaluation of outdoor spaces in healthcare facilities. See Tables 2.1 and 2.2 for an overview and Appendix 2.1 for a detailed list of references with abstracts. Note that for the instruments listed, the tables maintain the original terminology used by the authors. Most are post-occupancy evaluations (POEs) (Cooper Marcus & Barnes, 1995; Davis, 2011; Heath & Gifford, 2001; Pasha, 2013; Rodiek & Lee, 2009; Shepley & Wilson, 1999; Sherman, Varni, Ulrich, & Malcarne, 2005; Whitehouse et al., 2001). Naderi and Shin (2008) is the only published *pre*-occupancy evaluation (PreOE) of a healthcare healing garden that was found. POEs by Cooper Marcus and Barnes (2009) and Garcia (2010) were conducted but were not published.

Table 2.1. Evaluations of Gardens in Healthcare Facilities: Subjects and Sites
Note: Abstracts and full citations located in Appendix.
All studies used a qualitative, mixed methods approach.

Citation	Subjects	Site(s)
Cooper Marcus & Barnes, 1995	▪ Patients ▪ Visitors ▪ Staff ▪ Community	24 sites: In depth at five hospitals in San Francisco Bay Area; additional research at 19 hospitals in Northern California
Davis, 2011	▪ Patients ▪ Staff	1 site: Rooftop therapy garden at Patricia Neal Rehabilitation Center, Atlanta
Heath & Gifford, 2001	▪ Residents ▪ Family ▪ Staff ▪ Volunteers	8 sites: 8 gardens at the Lodge at Broadmead, multilevel elder care facility, Victoria, British Columbia
Naderi & Shin, 2008	▪ Nursing staff	1 site: Healing Garden at St. Joseph Hospital, Bryan, TX
Pasha, 2013	▪ Parents of patients ▪ Staff	5 sites: Five gardens at four pediatric healthcare facilities in Texas
Rodiek & Lee, 2009	▪ Residents ▪ Staff	68 sites: 68 randomly selected assisted living facilities in Houston, Chicago, and Seattle
Sherman, Varni, Ulrich, & Malcarne, 2005	▪ Patients ▪ Visitors ▪ Staff	3 sites: Three gardens at Children’s Hospital and Health Center, San Diego
Whitehouse et al., 2001	▪ Patients ▪ Parents/ Visitors ▪ Staff	1 site: Leichtag Family Healing Garden, San Diego Children's Hospital

Table 2.2 Evaluations of Gardens in Healthcare Facilities: Instruments used.
Note: Abstracts and full citations located in Appendix.
All studies used a qualitative, mixed methods approach. "Instruments available" = whether original instruments (e.g., surveys, behavior mapping protocol) could be accessed.

Citation	Instruments Available	Instruments
Cooper Marcus & Barnes, 1995	Yes	▪ Site analysis ▪ Behavior observation and mapping ▪ User interviews
Davis, 2011	Yes	▪ Site analysis ▪ Behavior observation and mapping ▪ Interviews with (a) lead therapist, (b) garden designer ▪ Surveys of (a) patients, (b) staff (based on Cooper Marcus & Barnes, 1995)
Heath & Gifford, 2001	No	▪ Site visits ▪ Surveys of (a) residents, (b) family, (c) staff and volunteers
Naderi & Shin, 2008	No	▪ Site analysis ▪ Behavior observation and mapping ▪ Surveys of staff about (a) garden use, (b) proposed designs
Pasha, 2013	Yes	▪ Site visits and site analysis ▪ Behavior mapping ▪ Space syntax ▪ Interviews with (a) designer, (b) key staff ▪ Surveys of (a) parents, (b) adult non-patient visitors, (c) staff (based on Sherman, 2005 and literature) ▪ Audit Tool (Cooper Marcus' Children's Hospital Garden Audit Tool)
Rodiek & Lee, 2009	Yes	▪ Site visits ▪ Surveys of (a) residents, (b) staff ▪ Audit Tool (early version of Rodiek's Seniors' Outdoor Survey)
Sherman, Varni, Ulrich, & Malcarne, 2005	No	▪ Behavior observation (based on Whitehouse 2001 (based on Cooper Marcus & Francis, 1990)) ▪ Surveys on Present Functioning (PedsQL PFM) of (a) patients, (b) visitors, (c) staff
Whitehouse et al., 2001	Yes	▪ Site analysis ▪ Historical analysis ▪ Behavior observation (based on Cooper Marcus & Francis, 1990) ▪ Surveys of users, followed by brief interviews ▪ Semi-structured Interviews (based on Cooper Marcus & Barnes, 1995) with (a) patients, (b) visitors, (c) staff

All of the healthcare garden evaluations reviewed for this study used a mixed methods approach. Most methods and instruments were qualitative, although some had quantitative components. Instruments used included site analysis, audit/checklist, behavior observation, trace observation, questionnaires, surveys, focus groups, interviews, and space syntax analysis. Space syntax analysis was only used by one researcher (Pasha, 2011), who reported that it was less useful in her research than the other instruments (personal correspondence, February 9, 2015).

In all studies, the researchers observed and/or surveyed a combination of patients, visitors, and/or staff. All studies except Heath and Gifford (2001) used some form of behavior observation, defined as "…systematically watching people use their environments" (Zeisel, 2006, p. 191). All studies except Sherman (2005) used surveys, questionnaires, and/or interviews with patients, visitors, and/or staff.

All authors used a combination of between two and five instruments (some more qualitative, some more quantitative); some authors used the same or similar instruments from previous researchers; for example, Whitehouse (2001) based her surveys on Cooper Marcus and Barnes' 1995 surveys, and Sherman (2005) based her surveys on Whitehouse's surveys. Several researchers used behavior mapping described by Cooper Marcus and Francis (2009). One researcher (Whitehouse) received instruction on behavior mapping directly from Cooper Marcus. However, most of the tools and methods used in these evaluations were not rigorously tested for reliability, and validity was often not established as part of the published research. The lack of established reliability and validity meant that each instrument would have to undergo testing before it could be used for the H-GET.

Furthermore, most of the healthcare-related instruments that were developed, tested, and published were for specific types of care, namely for pediatric (Pasha, 2011; Sherman, Varni, Ulrich, & Malcarne, 2005; Toone, 2008; Whitehouse et al., 2001); senior (Heath & Gifford, 2001; Rodiek & Lee, 2009); rehabilitation (Davis, 2011); and AIDS (Shepley & Wilson, 1999) patients or residents. Only two studies, by Cooper Marcus and Barnes (1995) and Naderi and Shin (2008) took place in general acute care hospitals.

Research on and instruments for evaluation of indoor HCF environments is more plentiful (e.g., Joseph et al., 2014; Shepley, Rybkowski, Aliber, & Lange, 2012; Sherman, Malcarne, Roesch, Varni, & Katz, 2011; Varni et al., 2004), but translation of the instruments from an indoor to an outdoor application was not practical. The same is true for evaluative research on non-healthcare outdoor environments (e.g., Cooper Marcus & Francis, 1990; Lee, Kim, Dowdy, Hoelscher, & Ory, 2013; Moos & Lemke, 1996; Zimring, 1987).

For data analysis, most of the healthcare-garden-specific evaluations used descriptive statistics (Cooper Marcus & Barnes, 1995; Davis, 2011; Heath & Gifford, 2001; Naderi & Shin, 2008). Other commonly used statistical tests included t-tests (usually two-tailed), ANOVA, and Chi-square. For establishment of instrument reliability, most researchers used Intraclass correlational coefficient and Kappa for interrater and test-retest reliability. To establish instrument validity, researchers used cognitive interviews; expert opinion; and triangulation of methods and findings. Many studies used content analysis for questionnaires and interviews, though most did not state a specific methodology.

Expert Conversations. To further strengthen the foundation of the present study, in addition to reviewing the literature on existing healthcare gardens, “Expert Conversations” (ECs) were held with practitioners who had conducted similar research. These ECs further helped to inform the choice of methodologies, instruments, and statistical analysis strategies for this study. The semi-structured interviews were called “Expert Conversations” to make a clear distinction between ECs and the fourth H-GET instrument, “Stakeholder Interviews.” EC participants were identified through the literature and from conference presentations at Healthcare Design 2013. The sessions were held in 2014 and 2015 with the following professionals (dates of their relevant publications are cited here unless they were co-authored, in which case both authors and the publication date are cited): Jeffrey Anderzhon (American Institute of Architects, 2010); Clare Cooper Marcus (2008; Cooper Marcus & Barnes, 1995; Cooper Marcus & Francis, 1990);

Brad Davis (2011); Debbie Franqui (dissertation not yet published); Jody Rosenblatt Naderi (Naderi & Shin, 2008); Upali Nanda (Joseph et al., 2014); Samira Pasha (2011, 2013); and Patrick Thibaudeau and Kara Freihoefer (2015).

Most ECs took place over the phone. They were recorded with pen and paper and then transcribed into narrative format using Microsoft Word. Institutional Review Board approval was not required. In addition to their thoughts and experiences, several participants shared original materials, such as surveys, that had not been included in their original published work. ECs were useful in identifying what instruments other experts thought were essential, such as behavior mapping and surveys; what methodologies or instruments had been less useful, such as space syntax; and pitfalls to avoid, such as surveys that were too long or behavior mapping software and hardware that was difficult to use.

2.2 The Healthcare Garden Evaluation Toolkit (H-GET)

The Healthcare Garden Evaluation Toolkit, or H-GET, is a standardized set ("kit") of four instruments ("tools") designed for the evaluation of gardens in general acute care hospitals. The four instruments are the (a) Garden Assessment Tool for Evaluators (GATE); (b) Surveys of Patient/Visitors and Staff; (c) Behavior Mapping; and (d) Stakeholder Interviews.

2.2.1 Description of Instruments

1. Garden Assessment Tool for Evaluators (GATE). The Garden Assessment Tool for Evaluators (GATE) is an environmental assessment instrument that facilitates standardized, systematic evaluation of physical, programmatic, and policy features related to healthcare gardens. The GATE focuses on elements that can potentially be modified through physical or policy-related interventions. It is intended for use by researchers, designers, and healthcare staff and administrators. It can be used in diverse climates and geographic regions and with diverse hospital garden typologies (e.g., courtyard, rooftop, front entry). Of the four H-GET instruments, the GATE provides the most objective form of assessment. Items are worded and presented to minimize subjectivity and bias in the evaluator, and a Likert-type scale enables scoring of individual items, domains, and the garden as a whole. A total of 150 GATE assessments were conducted at 33 gardens. The GATE is described in detail in Chapter III.

2. Surveys of Patients, Visitors and Staff. Surveys of patients, visitors, and staff are intended to gauge, both qualitatively and quantitatively, how users think and feel about the garden and how the presence of the garden and/or their use of it affects their satisfaction with the HCF. A combination of Likert-type and open-ended questions ask garden users about their awareness of the garden; how often they visit and how much time they spend there; barriers to garden visitation and use; what aspects of the garden they like most and least; whether/how their use of the garden affects their feelings about the overall HCF; and how they feel about patients, visitors, and staff sharing the same space. Two surveys were developed and tested: The H-GET Visitor Survey, for patients and visitors (96 surveys collected), and the H-GET Staff Survey, for healthcare staff and volunteers (853 collected). Surveys are described in detail in Chapter IV.

3. Behavior Mapping. Behavior Mapping (BMap) is a form of systematic behavior observation of *who* (types of users) is doing *what* (behaviors) *when* (times of year or month or day) and *where* (specific locations in a space). BMap enables specific data collection in real time of how people use a particular space. In addition to the evidence generated from the behavior mapping process, BMap can be an effective tool in triangulating evidence from other research instruments. Behavior Mapping took place in a total of eleven gardens at the eight H-GET Pilot Test sites. Behavior Mapping is described in detail in Chapter V.

4. Stakeholder Interviews. Stakeholder Interviews are structured interviews with key people who are or were involved in the garden's design, construction, maintenance, and programming. Structured Interviews are a tool to gain information about the garden; a method of triangulating and corroborating the other research instruments and data collected; and a tool for gaining information about common issues and themes with gardens in HCFs in general. Interviews can provide "detailed information about facts, behaviors, motives, feelings, reasons for decisions and actions, and people's opinions and beliefs about all of the above" (Leedy & Ormrod, 2013, p. 153). H-GET Stakeholder Interviews were developed for the HCF's (a) lead landscape architect or garden designer; (b) a staff member or administrator who was part of the original design team; (c) the HCF's current Facilities Manager. A total of ten Stakeholder Interviews were conducted. Stakeholder Interviews are described in detail in Chapter V.

For this dissertation, discussion of Behavior Mapping and Stakeholder Interviews are combined in Chapter V. Due to the qualitative nature of the data from both of these instruments and time limitations that prevented in-depth qualitative analysis, these two instruments were more exploratory in nature.

2.3 Methodology for H-GET Testing

After development and pre-testing of the individual H-GET instruments in Phase I, the H-GET Method (all four instruments tested together at each Pilot Test site) was tested in Phase II.

2.3.1 Study Site Selection

Eight healthcare facilities in four diverse geographic locations (the Pacific Northwest; Central Texas; the Northeast; and Northern California) in the United States were selected as Pilot Test sites for testing the four H-GET instruments in concert. See Table 2.3 for a list of all H-GET sites, and see Appendix 2.2 for a detailed description of each Pilot Test site. Each facility had one garden that was the primary Pilot Test garden. A selection criterion for the primary Pilot Test gardens was that they had been designated by the HCF as "healing gardens"—gardens specifically intended to provide emotional and/or physical respite to patients, visitors, and/or staff. Some of these gardens were literally called "Healing Gardens" (for example, at Baylor Scott & White Hospital); others had a different name (for example, the Serenity Garden at Kaiser Oakland Medical Office Building, or the Community Garden at Greenwich Hospital); but all were offered as restorative spaces, not merely outdoor spaces for entering the facility, or for dining. Some facilities, such as Smilow Cancer Hospital and Legacy Salmon Creek, had additional gardens or outdoor spaces that were used for comparison.

For each of the four geographic regions, 1–3 additional gardens were selected as sites for training Research Assistants (RAs) prior to Pilot Testing. Budget did not allow for the same RAs to travel from state to state; separate teams of RAs were recruited, hired, and trained for each region. For testing inter-rater reliability and scoring of the Garden Assessment Tool for Evaluators, 25 sites were selected in the Houston Medical District. These are listed and described in Chapter III.

A key goal for the H-GET is that it be applicable in as many different general acute care hospitals as possible. Thus, unlike some site-specific studies where researchers attempt to limit confounding variables, it was important instead to test the H-GET in a wide variety of situations—size and location of city (representing diverse climates, levels of urbanness/urbanicity, population served), organizational culture of the HCF, size of HCF and garden, age of the HCF and garden, and location, type, and style of garden. For example in Oakland, California, Kaiser Permanente has two facilities, each with a healing garden designed by INTERSTICE Architects, almost directly across the street from each other. In the Medical Office Building, the Serenity Garden is a large (20,000 square feet), sloping, low-water-use "back yard" garden with California native and adaptive plants. The Special Medical Office Building's Healing Garden, on the other hand, is a small, shady courtyard (2,500 square feet) in the center of the hospital, planted with "Jurassic" ferns and bamboo. The perceived success of the gardens also varied; some were chosen because they had won awards, from *Healthcare Design Magazine*, the American Society of Landscape Architects, or the American Horticultural Therapy Association, while others were chosen because they were thought to be less successful. Two additional limitations guided site selection: First, because permission and/or Institutional Review Board approval or exemption was required not just from Texas A&M University but from each of the eight sites, plus the training sites, an effort was made to find HCFs healing gardens by the same HC organization. For example, Kaiser Permanente in Oakland (and San Leandro for training); Legacy Health System for the three hospitals in the Pacific Northwest; and Yale-New Haven Hospital in Southern Connecticut.

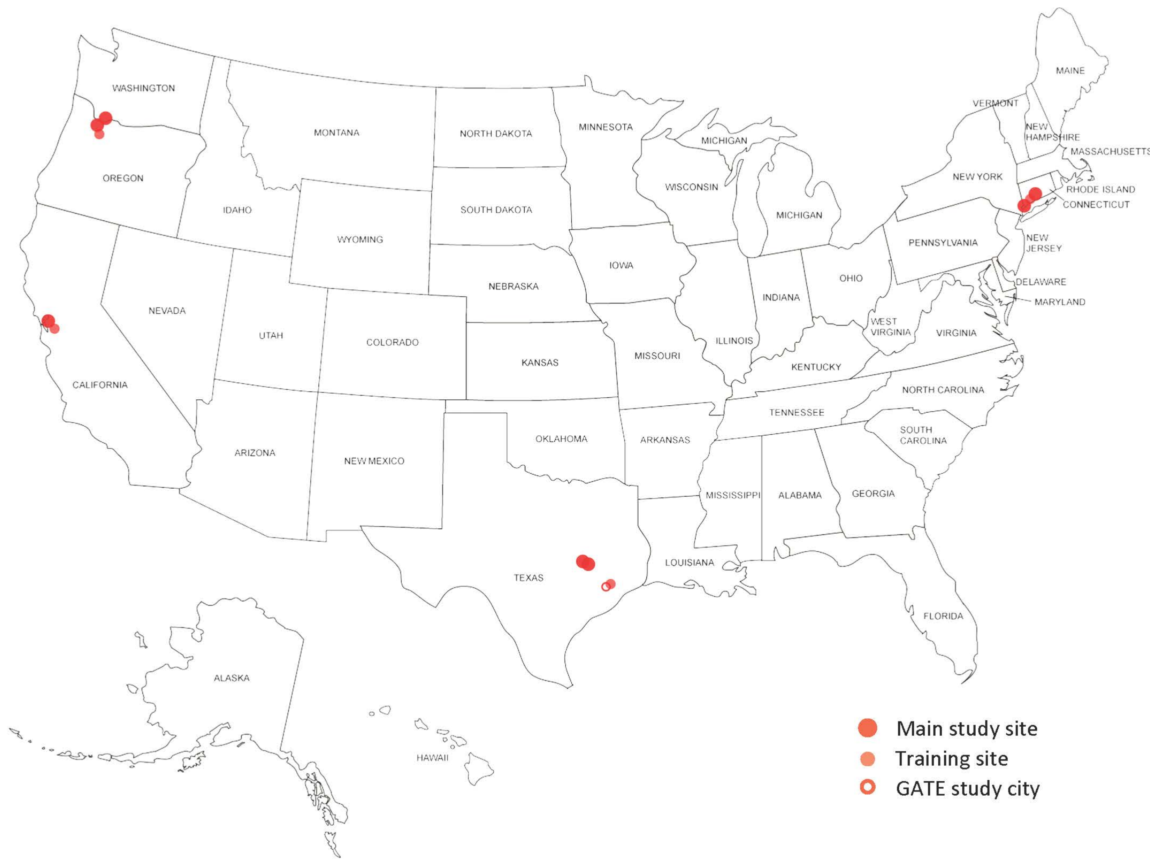

Figure 2.1 Map with Pilot Test, training, and GATE study sites.

Table 2.3 H-GET Test Sites

Note: HCFs listed in order of when research was conducted and by geographical region.
Research Assistant Training Sites denoted by *italics* and *.

Healthcare Facility	**Garden**	**Geographical Region and Site Visit Date**	**City, State**
Legacy Good Samaritan Medical Center	Stenzel Healing Garden	Pacific Northwest October 2015	Portland, OR
Legacy Salmon Creek Medical Center	3rd Floor Terrace Garden	Pacific Northwest October 2015	Vancouver, WA
*Legacy Meridian Park Medical Center**	*Lewis & Floetta Ide Healing Garden*	*Pacific Northwest October 2015*	*Tualatin, OR*
Baylor Scott & White Hospital	Healing Garden	Central Texas October 2015	College Station, TX
St. Joseph Hospital	Marshal Verne Ross Memorial Healing Garden	Central Texas October 2015	Bryan, TX
*MD Anderson Cancer Center**	*Hudson Garden and Melcher Fountain*	*Central Texas October 2015*	*Houston, TX*
Kaiser Oakland Broadway Medical Office Building	Serenity Garden	Northern California October 2015	Oakland, CA
Kaiser Oakland Medical Center and Specialty Medical Office Building	Courtyard Garden	Northern California October 2015	Oakland, CA
*Kaiser Oakland Medical Center and Specialty Medical Office Building**	*Landscaped front entry*	*Northern California October 2015*	*Oakland, CA*
*Kaiser Permanente San Leandro Medical Center**	*Courtyard garden*	*Northern California October 2015*	*San Leandro, CA*
Smilow Cancer Hospital	Betty Ruth & Milton B. Hollander Healing Garden	New England June 2016	New Haven, CT
Greenwich Hospital	Community Garden	New England June 2016	Greenwich, CT
*Griffin Hospital**	*Cafeteria Garden, Birthing Garden*	*New England June 2016*	*Derby, CT*
*The Center for Cancer Care at Griffin Hospital**	*Viewing Garden*	*New England June 2016*	*Derby, CT*

2.3.2 Recruitment and Training of Research Assistant Evaluators

For each of the four regions, research assistants (RAs) were recruited, hired, and trained to conduct the H-GET Pilot Testing. A total of eleven RAs were recruited and trained. One RA dropped from the study after the first day of data collection, and that data was not included in the analysis.

Recruitment. RAs were recruited through local universities, colleagues, and friends. Although the original intention was to use graduate students in psychology, it was difficult to find people who could devote three full days for two separate weeks. RAs were required to be certified through Collaborative Institutional Training Initiative (CITI) or other human subjects protection training. RAs were paid hourly for their time after completing data collection.

Training. Training took place for one full day, one day before Pilot Testing, at the designated training facility. The researcher met RAs at the H-GET training site, and together they met with a member of the HCF's administration or staff to obtain necessary orientation, guest badges, and so on. The researcher gave an overview of the research and then went into detail about the protocol for the two H-GET instruments that RAs would be using to collect data: The Garden Assessment Tool for Evaluators (GATE) and Behavior Mapping. In the morning, RAs and the researcher conducted at least one GATE evaluation of the training site garden and discussed results and questions. In the afternoon, training for Behavior Mapping took place at the same training site garden for at least two sessions, followed by discussion and questions. RAs were encouraged to ask general and specific questions and also to provide feedback on the instruments; they also reported whether anything was unclear, or if they had an idea of how a particular aspect of the instrument or methodology might be improved.

2.3.3 H-GET Testing

The day after training, H-GET Testing took place for two consecutive weekdays (e.g., Monday-Tuesday, Tuesday-Wednesday) and then for one of the same weekdays approximately one week later (e.g., a Monday or Tuesday if the first two research days had been Monday-Tuesday). Weather and RAs' schedules usually dictated what day the second round of research took place. At each site, as with the training sites, the researcher and RAs first met with the HCF's liaison (previously arranged by the researcher over email or phone). Protocol varied with each healthcare organization and at each site. The liaison usually introduced the researchers to personnel in Security. At most sites, badges or nametags were provided. The liaison, or someone else in the organization, sometimes gave a brief tour of the facility, or at least of the garden.

Once introductions were made and security clearance obtained, data collection began in the Pilot Test garden with the Garden Assessment Tool for Evaluators (GATE). This process took approximately 30 minutes. The rest of the day was spent with Behavior Mapping. BMap protocol varied on a site-by-site basis depending on size of the garden, number of people in the garden, and number of researchers present. In HCFs that had more than one garden, two researchers conducted BMap in the primary Pilot Test garden and one or two researchers conducted BMap in the secondary or tertiary spaces. This process is described in greater detail in Chapter V.

At most sites, the researcher spent part of the first day working with the HCF liaison to finalize plans for distributing Staff and Visitor Surveys. At four of the eight sites, paper surveys were set out on the second day of data collection. RAs were responsible for picking up paper surveys from the HCFs every few days. At two sites, the researcher conducted Stakeholder Interviews with HCF staff in person during one of the research days.

For the second round of H-GET testing, RAs conducted data collection on their own; the researcher was only in the region for the first week of data collection. As with the first week, data collection began with all RAs conducting the GATE, and the rest of the day was spent with Behavior Mapping. RAs were also responsible, if paper surveys were set out, for ensuring that the surveys, pencils, and signage were present and tidy. After all data had been collected, one RA mailed all completed GATES and surveys, plus any other additional information, to the researcher for data entry and analysis.

2.3.4 Institutional Review Board

A "human subject" is defined by the U.S. Department of Health and Human Services (2011) as "a living individual about whom an investigator conducting research obtains 1) data through intervention or interaction with the individual, or 2) identifiable private information" (*Code of Federal Regulations, Title 45—Protection of Human Subjects (Part 46.10*). This study involves human subjects and, therefore, required Institutional Review Board (IRB) approval. IRB approval was first obtained on April 18, 2014 from Texas A&M University (TAMU) prior to data collection (IRB2014-0182). As instruments were finalized, amendments were made to the original IRB application. Final approval was granted on September 9, 2015 before data collection at the Pilot Test sites (see Appendix 2.3). Each healthcare organization was different in what was required for human subjects protection. Some required a full IRB review before granting approval or exemption. Others provided permission based on TAMU's IRB approval, and additional paperwork was not required.

Because the IRB process is often one of the major stumbling blocks for those conducting facility evaluations, a goal in developing the H-GET was to simplify the IRB process. Some of the instruments require less interaction with human subjects than others. The Garden Assessment Tool for Evaluators (GATE) requires no interaction with garden users. In fact, the garden can be completely empty of people while the evaluators are conducting the GATE. Behavior Mapping requires that garden users be present, but no direct interaction is necessary. In fact, RAs were told *not* to interact with garden users, except if they (the RAs) were approached by someone (for example, a visitor asking for directions, or if someone was curious about the work). Surveys were either anonymous (Visitor Surveys) or confidential (Staff Surveys in which participants voluntarily entered their email address to be eligible for a gift card drawing); confidential surveys did not use any email addresses in data analysis. Stakeholder Interviews did not involve vulnerable populations (patients or visitors), and participants gave written consent prior to the interview.

2.4 Conclusion

The Healthcare Garden Evaluation Toolkit (H-GET) is a mixed methods approach to evaluation and research of gardens in general acute care hospitals. Two primary goals for the H-GET were that it be applicable to as many different sites throughout the U.S. as possible and that it be usable by people from a diverse array of disciplines. In order to choose what instruments would comprise the H-GET, the researcher conducted an in-depth literature review and conversations with experts who had published similar studies. Most previous healthcare garden evaluation studies used a mixed methods approach, utilizing between two to five instruments. From this background research, four instrument methods were chosen for the H-GET: 1) An environmental audit tool (the Healthcare Garden Evaluation Toolkit); 2) Surveys of (a) patients and visitors, and (b) staff; 3) Behavior Mapping; and 4) Stakeholder Interviews. None of the instruments from the previously published studies could be used without minor to major modifications. In order to test the H-GET instruments together, eight Pilot Test sites were selected from four different geographic regions in the U.S. An attempt was made to use a diverse array of HCFs and gardens. Teams of Research Assistants were hired to conduct the H-GET testing, with the researcher, in all four regions; each team of RAs was trained at a separate HCF garden the day before Pilot Testing began. Description of each instrument's development, testing, and results is shown in the subsequent chapters.

CHAPTER III

THE GARDEN ASSESSMENT TOOL FOR EVALUATORS (GATE)

3.1 Introduction

3.1.1 Background and Intent

The number of hospital healing gardens has grown steadily, but very few evaluations have been undertaken to assess how well these spaces perform in terms of intended outcomes for the users (Cooper Marcus & Sachs, 2013). Although some of evaluations have built upon earlier methodologies and instruments, only one comparable published instrument, the Seniors' Outdoor Survey (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2016), has been found that has undergone rigorous psychometric testing to support validity and establish reliability. This chapter describes development and testing of the Garden Assessment Tool for Evaluators (GATE), the first of four instruments in the Healthcare Garden Evaluation Toolkit (H-GET). Like all of the H-GET instruments, the GATE is a new tool that was developed specifically for this study (see Appendix 3.1 and 3.2). A hospital garden audit instrument by Cooper Marcus and Barnes (2012) served as the GATE's foundation, and other existing instruments served as additional models as the instrument was adapted. The GATE underwent an iterative process of development and psychometric testing for scoring protocol and establishment of interrater reliability. Support for validity is offered from the existing tools used as foundations and models, an extensive literature review, expert opinion feedback, and statistical analysis of the GATE testing results.

3.1.2 Brief Description of the GATE Instrument

The Garden Assessment Tool for Evaluators (GATE) is an environmental assessment, or audit tool, that facilitates standardized, systematic evaluation of physical, programmatic, and policy features of gardens in general acute care hospitals. Like Rodiek's Seniors' Outdoor Survey (2016) and Lee and colleagues' Texas Childhood Obesity Prevention Policy Evaluation School Environmental Audit Tool (2013), the GATE is focused on elements of outdoor spaces (in this case, in general acute care hospitals) that can potentially be modified through physical or policy-related interventions. The GATE is intended for use by researchers, designers, and healthcare staff and administrators. It can be used in diverse climates and geographic regions and with diverse hospital garden typologies including entry, courtyard, and rooftop gardens. The GATE is one of four tools in the Healthcare Garden Evaluation Toolkit (H-GET), which combines qualitative and quantitative methods to evaluate hospital gardens. Of the four standardized H-GET instruments, the GATE provides the most objective form of assessment. Items are worded and presented to minimize subjectivity and bias in the evaluator, and a Likert-type scale enables scoring of individual items, domains, and the garden as a whole.

The GATE as a design and research tool. In addition to its role as an evaluation tool, the GATE can be used as a *design* tool, serving as a preliminary checklist for garden programming and design prior to construction. Because it provides standardized evaluation and baseline scores, the GATE can also be used as a *research* tool; for example, in establishing a benchmark for pre- and post-occupancy evaluations. Finally, as data are collected from practitioners, the GATE's systematic approach can facilitate future "apples-to-apples" comparisons of gardens across the country (and possibly in other countries) as well as the compilation of a healthcare gardens database. Cooper Marcus and Sachs described this last benefit: "The added benefit of a standardized audit tool is that, as audits are performed and information is gathered, we begin to build a database and a collection of case studies of existing built works, something that is sorely lacking in the scholarship of healthcare design" (2013, p. 81).

Audits as objective and subjective measures of the built environment. One of the benefits of environmental assessments, or audits, compared with more qualitative forms of evaluation, is their use of objective built environment measures. *Objective built environment measures* are aspects (objects or phenomena) of the built environment that can be measured objectively by the researcher through counting, measuring, or other non-biased observation and recording. Such measures include decibels of sound, air temperature and humidity, length of a path, or percentage of vegetation in a garden. *Perceived, or subjective, built environment measures* are a person's or group of people's perceptual experience of a built environment or specific elements within that environment. Using the above-listed examples of objective built environment measures, similar perceived built environment measures could be for sound:

“nice and quiet;” for temperature/humidity: “too hot/muggy”; for hallway length/distance: “too far to walk;” and for percentage of vegetation: “lush and nurturing.” For Lee and colleagues’ Street Audit Instrument (2014) some measures were purely objective (e.g., presence of specific commercial and recreational amenities, number of street lights, sidewalk slope and width). Subjective measures were separated into individual items that would, in concert, create a more objective picture of the user’s experience. For example, under “Unattractive items,” evaluators could check items such as presence of graffiti, broken bottles, abandoned cars, or drug-related paraphernalia. In a study that measured objective versus subjective measures of the built environment, Lin and Moudon (2010) found that objective measures of environmental attributes were stronger at capturing associations with walking than subjective measures of the same environmental attributes. In their literature review, they found subjective measures (for example, “accessibility to or convenience of destinations”) to be more difficult to compare across studies due to different contexts such as geographic location and measures used for walking. This created another problem, in that the results “…also lacked instructive information for policy implications. The mechanisms shaping how and why individual perceptions were formed needed to be explicated before environmental change could be conceptualized” (p. 340). The more objective measures “had the advantage of facilitating the translation of study results directly into intervention strategies. Furthermore, objective measures could serve as a tangible and measurable counterpart to self-report measures, helping to clarify or even corroborate the meaning of the self-report measures, and possibly justifying the value of using both types of measurements” (p. 340).

3.2 Methodology for GATE Instrument Development

After the researcher decided to use an environmental assessment/audit tool as one of the H-GET instruments, the correct tool needed to be identified or, if no suitable tool was available, a new tool needed to be developed and tested. Audit instruments must be designed for specific populations and usage because they are highly dependent on the target outcomes, users, study settings, and other contextual factors (Cutler, 2000). Although many audit instruments exist for evaluation of indoor healthcare spaces (including the overall facility, patient rooms, and waiting rooms) and outdoor built environments for other settings (such as senior and dementia care facilities, playgrounds, parks, nature trails, and schools and routes to schools), these existing audit instruments are not completely and directly applicable to gardens in general acute care hospitals. The Garden Assessment Tool for Evaluators (GATE) is the first tool for evaluation of general acute care hospital gardens to be rigorously psychometrically tested.

3.2.1 The Importance of Validity and Reliability in Audit Instruments

Validity. "Validity" in instrument development means that the instrument successfully measures what it is supposed to measure (Loewenthal, 2001). Validity is easier to establish with objective measures such as temperature, time of day, or number of seats in a space. More difficult is the establishment of validity in subjective measures such as aesthetic qualities or affordances. Unlike reliability, validity "usually is a matter of degree rather than an all-or-none property, and validation is an unending process" (Nunnally, 1978, p. 84). Nunnally also points out that one "validates the use to which a measuring instrument is put rather than the instrument itself" (1978, p. 84). There are many different ways to demonstrate support for an instrument's validity.

Content validity is the extent to which an instrument accurately represents all facets of a given construct (Anastasi, 1982; Leedy & Ormrod, 2013). Content validation is a process that derives from the literature review that informed the theoretical framework and development of the instrument, existing similar instruments, opinions from experts about the instrument, and the research conducted during instrument testing.

Face validity is how well an instrument *looks like* it will measure what it is intended to measure (Anastasi, 1982; DeVellis, 2003). On the surface, or at face value, does the instrument appear to be valid? Face validity is subjective and is itself difficult to measure.

Convergent validity can be described as, "…the extent to which an instrument measures a characteristic that cannot be directly observed but is assumed to exist based on patterns of people's behaviors" (Leedy & Ormrod, 2013, p. 90). With convergent validity, the researcher's variables correlate the way they were intended to. Divergent (or discriminant) validity is a different type of content validity in which the researcher's variables do not correlate to what they should not. This research did not have specific hypotheses about what would not correlate, so divergent/discriminant validity was not explored. Support for content validity is described in this section, and support for convergent validity is described in this chapter's Results section. In this study, primary emphasis for the GATE was on content validity and convergent validity.

Reliability. "Reliability" in instrument development is based on consistency, specifically "the consistency with which a measurement instrument yields a certain, consistent result when the entity being measured hasn't changed" (Leedy & Ormrod, 2013, p. 91; Loewenthal, 2001). Statistical analysis can reveal error—the degree to which the instrument does not provide a true or optimal result (Jupp, 2006). As Leedy and Ormrod (2013) point out, "We can measure something accurately only if we can measure it consistently. Hence, by increasing the reliability of a measurement instrument, we might also increase its validity" (p. 92). Establishing an instrument's reliability is important for its use by different evaluators on different sites in the future. In terms of an audit tool, interrater reliability refers to the level of agreement among different raters. Another type of reliability relevant to audit tools is test-retest reliability—the extent to which the same instrument gives the same or similar results for the same people at the same location on more than one occasion (Leedy & Ormrod, 2013; Loewenthal, 2001). This study focused on interrater reliability, because not enough data were available from GATE testing to warrant statistical analysis for test-retest reliability.

3.2.2 Comparable Instruments

Some audits, although not germane to the topic of hospital garden evaluation, were useful as models that informed the GATE's theoretical framework, format, methodology, or statistical analysis. The Patient Room Interior Design Checklist and Evaluation Tool (Joseph et al., 2014; The Center for Health Design, 2015) and the (pediatric) Built Environment Checklist (Sherman-Bien, Malcarne, Roesch, Varni, & Katz, 2011), both developed for use in interior healthcare spaces, were useful in early stages of formulating the GATE's theoretical framework and methodology. The AIA Design for Aging Post-Occupancy Evaluation Evaluator's Toolkit (AIA, 2010), with its clear instructions, clean graphics, and color coding was an excellent visual model. Although the target population and location were not healthcare-related, Lee and colleagues' Texas Childhood Obesity Prevention Policy Evaluation (TCOPPE) School Environmental Audit Tool (2013) was a useful model for evaluator training, establishing instrument reliability, and for a potential future User Manual.

Texas Childhood Obesity Prevention Policy Evaluation School Environmental Audit Tool (TCOPPE). The TCOPPE is an audit tool for assessing outdoor school environments and their surroundings. It has three components, plus a training manual, all of which were designed to be relatively short and easy to use by researchers, students, teachers, and other members of the community: (a) street audit (2-5 pages); (b) school site audit (1 page); and (c) map audit (4 pages). Several pre-existing instruments that had been developed and used for streets, parks, and trails served as models for the TCOPPE. Built environmental factors related to outdoor physical activity were developed based on a conceptual model, the Behavioral Model of Environment (BME). Audit variables were selected based on their known and hypothesized associations with bicycling and walking to school, on the literature about general walking behaviors, and on pre-existing environmental audit tools. The TCOPPE was developed in an iterative process in which trained auditors from varying backgrounds tested the instrument at several different sites to assess the items in the tool, the coding system, and the instrument's overall reliability. Pre-testing of the audit tool revealed the need for a training manual and certification protocol, which was developed alongside the TCOPPE instrument. The final instrument, training manual, and training protocol were compiled into a format for distribution online, via PowerPoint, and on paper. Although the population and setting for this tool is different from healthcare gardens, its development process and testing methodology was rigorous and was seen as potentially replicable for the GATE.

Two models for the GATE. The following two instruments—Cooper Marcus and Barnes' Therapeutic Garden Audit for Acute Care Hospitals (referred to here as the "CMB Audit," 2012, Appendix 3.3) and Rodiek's Seniors' Outdoor Survey (SOS Tool, 2016, Appendix 3.4)—were identified as the most promising models for the GATE in terms of the environmental features to be assessed. The SOS Tool and the CMB Audit based their support for content validity on different sources, but both incorporated literature reviews, the findings from previous studies, and expert opinions.

The Seniors' Outdoor Survey (SOS Tool): The Seniors' Outdoor Survey Tool (SOS Tool) (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2016) is an audit instrument for the evaluation of outdoor spaces in residential long-term care settings. Like the TCOPPE, development of the SOS Tool was rigorous and well documented. Outcomes for interrater and test-retest reliability were high, and support for content validity was well established. The SOS Tool is the *published* tool most similar to the GATE and most applicable to gardens in general acute care hospitals (Cooper Marcus and Barnes' Audit tool was not published). The primary difference between the gardens evaluated with the SOS Tool and the GATE is that SOS Tool gardens are in residential care homes for older adults. Although gardens in acute care general hospitals serve a high percentage of elderly people, they also serve patients of every other age and ability and are usually designed for visitors and staff as well as patients. Additionally, the average length of stay for inpatients in general acute care hospitals is usually only about five days (Weiss & Elixhauser, 2014), and many people served at hospitals are now outpatients. The SOS Tool evaluates outdoor spaces intended for long-term residents, many of whom who are living out the final years of their life with the garden as their primary place to access the outdoors.

Rodiek and colleagues used an extensive literature review as well as previous field research to establish the following goals for the SOS instrument:

> [It] should be: (a) *Comprehensive*—addressing the full spectrum of physical environment issues affecting outdoor usage; (b) *Observational*—focused on observable physical features, rather than policy or programs; (c) *Empirically derived*—based on empirical support for items, rather than inference from latent therapeutic goals; (d) *User centered*—focused on supporting the usage and satisfaction of residents; (e) *Multidisciplinary*—usable by providers, researchers, design practitioners, and consumer advocates, without specialized expertise, to allow comparison among stakeholders; and

(f) *Widely applicable*—appropriate for a range of residential care settings, to reflect the increased blurring between different levels of care (2016, pp. 223).

The SOS Tool contains 60 items, ratable on a 7-point Likert-type scale, organized into five domains (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2016, p. 222):

1. Access to nature
2. Outdoor comfort and safety
3. Walking and outdoor activities
4. Indoor-outdoor connection
5. Connection to the world

Rather than relying on an inventory-based approach (e.g., number of benches in a space, square footage of seating areas, weight of door to the garden), the SOS Tool uses Gibson's theory of *affordances*, in which spaces and elements of spaces are assessed by how people perceive and use them (Gibson, 1979; Bardenhagen & Rodiek, 2016). Wording emphasizes *usability*, and raters are instructed to employ the following criterion for each item: "How well is this space (or feature) supporting specific needs and preferences of this user group?" (Bardenhagen & Rodiek, 2016, p. 150). The authors assert that the affordance-based approach makes the instrument more adaptable to a variety of users, environmental settings, and raters (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2014).

Psychometric testing of the SOS Tool used multiple methods in a series of studies to confirm the environmental features most important in supporting the outdoor preferences and usage of elderly residents. Content validity was supported by a literature review in which the authors identified the conceptual framework, domains, and individual items on the instrument. The authors then conducted focus groups and preference surveys with residents to learn what was and was not important to them in their outdoor spaces. Staff at senior facilities were also surveyed to find out what outdoor features they thought tended to encourage or discourage outdoor usage by residents. A preliminary version of the SOS Tool was tested at 152 assisted living outdoor spaces in three different US locations (Chicago, Houston, and Seattle). The tool was subsequently revised based on the analysis of results and comments from users (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2016). At these facilities, levels of outdoor usage by 1,128 residents were compared with the quality of environmental features assessed by the SOS Tool to learn which features were associated with higher levels of usage (Rodiek & Lee, 2009). The authors also received feedback on the domains and items through a survey of 53 subject matter experts in the field; their input was used to refine the tool for further reliability testing.

The preliminary version of the SOS Tool had demonstrated adequate reliability for most items in the multiregional study. The revised tool was tested at 22 outdoor spaces at senior facilities in Central Texas by two graduate students (one from landscape architecture and one from psychology), neither of whom had previous knowledge of the topic. The raters received six hours of training similar to that in the multiregional study. For test-retest reliability, the same evaluators conducted the SOS Audit again in each location after approximately seven weeks. Interrater and test-retest reliability coefficients for the overall tool, the domains, and the individual items were high, with a mean interrater reliability of .91 for the overall instrument, and most items exceeding the acceptable range of minimum values (.60–.75). The same version of the SOS tool was subsequently tested at 94 senior living outdoor spaces in Milan, Italy, with interrater and test-retest findings comparable to those in the U.S. (Bardenhagen et al., 2017).

Therapeutic Garden Audit for Acute Care Hospitals (CMB Audit): The Therapeutic Garden Audit for Acute Care Hospitals (Cooper Marcus & Barnes, 2012), referred to here as the "CMB Audit," was identified as the most applicable and easily translatable instrument on which to model the GATE. The CMB Audit was first developed in 2006 as a way for Cooper Marcus' students, on field trips to hospitals, to focus on specific garden features. She refined the tool and developed the Alzheimer's Garden Audit Tool, or AGAT, for evaluation of gardens in dementia care facilities (Cooper Marcus, 2008). The AGAT was adapted for use in gardens for the frail elderly and for gardens at pediatric facilities. The CMB Audit (2012) was refined over several years by Cooper Marcus and Barnes, with input from other landscape architects and a horticultural therapist. The authors circulated the Audit to the American Society of Landscape Architects Healthcare and Therapeutic Design Professional Practice Network in 2012, requesting feedback. However, only a few completed audits were returned to Cooper Marcus and Barnes, an insufficient number to conduct further data analysis.

The CMB Audit contains a total of 104 items and is divided into seven domains:

1. Location and Entry to the Garden
2. Layout and Pathways
3. Seating
4. Planting
5. Design Details
6. Garden Atmosphere
7. Maintenance and Amenities

Interestingly, Cooper Marcus envisioned the final Audit tool as having a different set of categories, which would be more similar to the SOS Tool and the GATE. The proposed categories were: (a) Visual and Physical Accessibility; (b) Safety, Security, and Privacy; (c) Nature Distraction/Engagement; (d) Social Connection and Support; (e) Physical Movement and Exercise; (f) Sense of Control; and (g) Adequate Maintenance (Cooper Marcus & Sachs, 2013).

For the 2012 CMB Audit used as the GATE's model, each item was scored on a 4-point Likert-type scale, with 1 indicating "Feature not present or Quality missing," 2 indicating "Poor," 3 indicating "Moderately successful," and 4 indicating "Very successful." A rating of 0 denoted "Not applicable."

Because the CMB Audit was not published, support for validity was not documented. However, the tool was based on over two decades of research and practical experience with healthcare gardens and their design, on the part of both Cooper Marcus and Barnes. As described in Chapter II, Cooper Marcus and Barnes conducted and published the first available systematic healthcare garden POEs in 1995. The items in the CMB Audit were derived from their own research and practice-based guidelines (see Cooper Marcus & Barnes, 1995, 1999; Cooper Marcus & Francis, 1990) as well as from other researchers' work (Carpman & Grant, 1993; Paine, Francis, Cooper Marcus, & Barnes, 1990; Heath & Gifford, 2001; Sherman, Varni, Ulrich, & Malcarne, 2005; Whitehouse et al., 2001). Cooper Marcus and Barnes' book, *Healing Gardens*, published in 1999, described available research and provided detailed design guidelines for general acute care and specialized healthcare facilities (e.g., pediatric, hospice, psychiatric). Input on the tool from other design and healthcare professionals well-versed in healthcare garden design helped to establish content validity.

Although the CMB Audit (and the AGAT) were pilot tested by different groups at different times, reliability results were not conclusive and the instrument needed further testing before it could be incorporated into the H-GET. Cooper Marcus and Barnes gave permission for the CMB Audit to be further developed and tested as a component of the H-GET.

3.2.3 Validity Support for the GATE

Content validity. Development of the GATE was based on a number of sources, which contributed to support the content validity of the instrument. In addition, preliminary field-testing of the GATE in this study made it possible to conduct subsequent analyses to examine convergent validity.

***Literature review*.** The items in the GATE received validity support in part from an extensive literature review, conducted initially for the researcher's book, *Therapeutic Landscapes: An Evidence-based Approach to Designing Healing Gardens and Restorative Outdoor Spaces* (Cooper Marcus & Sachs, 2014) and then more recently for this study.

Professional and practice-based input. In the initial stages of development of the GATE, the researcher used "Expert Conversations"—semi-structured interviews with practitioners who had conducted similar research, as described in Chapter II—to identify methodological and structural strategies for what items to include, wording of the items, and overall structure and format of the instrument. In addition, the researcher's twelve years of experience as Director of the non-profit organization, the Therapeutic Landscapes Network, contributed to best practice knowledge, as it entailed frequent correspondence with professionals in healthcare design, healthcare garden design, healthcare research, and related fields.

Previous instruments and design guidelines. The content validity of the GATE was also strengthened by being modeled on two instruments (the CMB Audit and the SOS Tool) that had been previously developed by noted experts in the field of healthcare garden design and access to nature in residential healthcare settings, respectively. The high levels of overlap of similar items on these two instruments, as well as the overlap with design guidelines from previous research on healthcare gardens (Carpman & Grant, 1993; Cooper Marcus & Barnes, 1995, 1999; Cooper Marcus & Sachs, 2014; Paine, Francis, Cooper Marcus, & Barnes, 1990; Shukor, Stigsdotter, & Nilsson, 2012), provide substantial support for content validity of the domains and individual items in the GATE, as shown in Table 3.1.

***Expert opinion*.** During its iterative development and refinement, the GATE was reviewed by architects, landscape architects, interior designers, healthcare design researchers, occupational therapists and OT students, horticultural therapists and HT students, doctors, nurses, and other clinical and non-clinical healthcare staff, who provided valuable insights into various aspects of healthcare gardens and usage. Experts in audit instrument development also reviewed the GATE in multiple stages.

In early stages of development, experts gave feedback on the what items should be included; wording of individual items with the goal of clarity and brevity, both of which are essential for instrument reliability and low respondent (evaluator) burden; and overall structure and organization of the instrument

After the GATE wording and structure had reached a near-final draft, but before data collection at any of the Pilot Test sites began, experts and lay people reviewed the instrument again. Review methodology included the following: (a) experts reviewed and made notes on the GATE, either by hand or digitally in Microsoft Word Track Changes; (b) the researcher held cognitive interviews with three experts, who were selected based on their expertise in healthcare garden design, in which they “walked through” the GATE instrument, item by item, with the researcher, commenting on what did and did not make sense and what they thought was unclear and how it could be clarifie; (c) selected experts used the GATE instrument in healthcare gardens with the researcher present and provided feedback during and immediately after the testing process.

In addition to expert opinion, feedback from people beyond the healthcare design and research field provided valuable perspectives on the tool. These “lay people” included fellow graduate students of the researcher; colleagues and friends, some of whom worked in the healthcare industry as staff or administrators; and family members, including two retired psychology professors who had experience in instrument development. Feedback from the researchers' research assistants during and after GATE training and data collection was also helpful in identifying aspects of the GATE that needed further refinement.

Face Validity. During instrument development, versions of the GATE were shown to the experts, lay people, and research assistants described above for comments not just on the *content* but on the *look and feel* of the instrument to ensure that it made sense, looked professional and legitimate, and looked, at face value, like it would provide an accurate assessment of the garden qualities and elements being evaluated.

TABLE 3.1. Support for GATE Content Validity

Note: Full references are at end of table.

Garden Assessment Tool for Evaluators (GATE) domains and items	CMB Audit	Rodiek SOS	Shukor	Carpman	Paine
ACCESS & VISIBILITY: Visual Access to the Garden					
Visible from main public indoor areas.	✓	✓	✓	✓	✓
Visible from indoor areas that involve waiting.	✓	✓	✓	✓	✓
Visible from floors above.			✓	✓	✓
Entrance to garden is easy to find.	✓	✓	✓	✓	✓
Doors to garden are glass or have a window in or next to them.	✓		✓	✓	✓
Garden looks appealing/inviting from indoors.	✓		✓	✓	✓
Signage TO garden from indoors.	✓		✓	✓	✓
Signage for garden ON OR NEXT TO garden doors.					
Information about garden is available.			✓	✓	✓
ACCESS & VISIBILITY: Physical Access to the Garden					
Garden open 24/7.	✓	✓			
Automatic doors to garden.	✓	✓	✓	✓	✓
Non-automatic doors are easy to operate.	✓	✓	✓	✓	✓
Doorway thresholds flat and smooth.	✓	✓	✓	✓	✓
Space just outside main doorway is covered/roofed.	✓	✓	✓		
Seating for at least 2 just outside main doorway.	✓	✓	✓		
"Destination" feature draws people into garden.		✓	✓		✓
Restroom near the garden.	✓	✓	✓		✓
Garden has an emergency phone.				✓	
SENSE OF "BEING AWAY": Sense of "Being Away"					
People can find a desirable sense of enclosure in garden.	✓			✓	✓
People can find privacy in at least one part of garden.	✓	✓		✓	✓
People in garden cannot look into adjacent private indoor areas.	✓	✓			✓
Garden has at least one fully covered (roofed) area.	✓		✓		
Seating area protected from climatic/weather extremes.	✓	✓	✓	✓	✓
SENSE OF "BEING AWAY": Aesthetics & Maintenance					
Some features provide a rich, multi-sensory experience.	✓	✓	✓		✓
Garden is free from unpleasant sounds.	✓	✓			✓
Garden is free from bad odors.	✓				
Plants hide or soften unsightly views.	✓	✓			
Garden is free from trash.	✓	✓	✓	✓	
Garden has at least one trash can.	✓				✓
Garden has shed or other place to store tools.	✓		✓		✓

TABLE 3.1, continued

Garden Assessment Tool for Evaluators (GATE) domains and items	CMB Audit	Rodiek SOS	Shukor	Carpman	Paine
NATURE ENGAGEMENT: Plantings					
More than half of garden surfaces are planted.	✓	✓		✓	✓
Rich variety of plants.	✓	✓			✓
Plants at multiple heights.	✓	✓			
Plants that stimulate the senses.	✓	✓	✓	✓	✓
Plants are intriguing, provide "fascination."	✓	✓			✓
Planting provides year-round interest.	✓		✓	✓	✓
Plants provide bright colors.		✓		✓	✓
Planting BEDS look well-maintained.	✓	✓	✓		
PLANTS look well-maintained and healthy.	✓	✓	✓		
Plants are sturdy.	✓				
NATURE ENGAGEMENT: Other Natural Features					
Plants provide food and/or habitat for wildlife.	✓	✓	✓		
Garden has at least one water feature.	✓	✓	✓		✓
Water feature looks clean and well-maintained.			✓		
Water feature design and location minimizes slipping hazards.	✓				
Water feature has minimal splash.					
Sound from water feature is pleasant and soothing.	✓				✓
Seating available near water feature.					✓
WALKING & ACTIVITIES: Primary Walkway					
Primary walkway is relatively flat.	✓	✓	✓	✓	✓
Primary walkway does not have steps or steep ramps.	✓	✓	✓	✓	✓
Primary walkway is smooth but non-skid.	✓	✓	✓	✓	✓
Primary walkway is at least six feet wide or has passing areas.	✓			✓	✓
Primary walkway has a curb or raised edges.	✓				
Primary walkway has seating approximately every 30 feet.	✓	✓		✓	
WALKING & ACTIVITIES: All Paved Areas					
Gaps or cracks in paving narrow for wheeled mobility devices.	✓	✓	✓	✓	✓
Paving does not create glare.	✓	✓	✓		
Paved areas clear of debris and other obstacles.	✓		✓		
Trees/plants along walkways, other paved areas do not drop leaves, etc.	✓				
WALKING & ACTIVITIES: Lighting, Wayfinding, & Amenities					
Landmarks and/or signage in garden to help people navigate.	✓		✓		
Drinking fountain in or near garden.	✓	✓	✓	✓	✓
Lighting for night usage.	✓			✓	
If garden has lighting: Walkways are evenly lit.	✓				
If garden has lighting: Lighting does not shine into patient rooms.	✓				
WALKING & ACTIVITIES: Variety & Activities					
Garden has more than one walkway, variety of routes, etc.	✓	✓	✓		✓
At least one secondary walkway offers levels of difficulty.	✓				
Spaces/features for therapists to work with patients.	✓		✓		
Garden is safe for children.	✓		✓		

TABLE 3.1, continued

Garden Assessment Tool for Evaluators (GATE) domains and items	CMB Audit	Rodiek SOS	Shukor	Carpman	Paine
PLACES TO REST: Seating Availability & Type					
Garden offers many places to sit.		✓	✓		✓
Variety of types of seating.		✓	✓	✓	✓
Movable seating is available.	✓	✓	✓	✓	✓
At least 50% of seating has backs and arms.	✓	✓		✓	✓
There is a place where someone could lie down.	✓				
PLACES TO REST: Private or Social					
Separate areas for activities, socializing vs. contemplation, quiet conversation.	✓	✓	✓	✓	✓
Garden provides place where 3 or more people can sit together.	✓	✓	✓	✓	✓
Some seating areas allow people to interact with passers-by.	✓	✓			
Garden provides semi-private seating for one or two people.	✓	✓	✓	✓	✓
Some seating makes it possible to watch others from a distance.	✓			✓	
PLACES TO REST: Aesthetics & Sun					
Choice of seating in sun or shade throughout most of the day.	✓	✓	✓	✓	✓
Seating does not produce glare.					
Seating material does not get too hot or too cold.	✓	✓		✓	✓
Seating, tables, and other furniture look well-maintained.	✓	✓	✓		
Some seating has attractive or interesting views.	✓	✓			
PLACES TO REST: Tables					
Garden has at least one table.	✓	✓		✓	✓
Some seats have tables next to them.		✓		✓	✓
At least one table large enough for four or more people.		✓			✓
Table that can accommodate wheelchairs or scooters.	✓				✓
Tables do not tip.					

References:

CMB Audit: Cooper Marcus & Barnes (2012). Therapeutic Garden Audit for Acute Care Hospitals, unpublished.

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3.2.4 Testing and Revision of the Cooper Marcus and Barnes (CMB) Audit

The CMB Audit was identified as the best instrument to use as a foundation for development of the new H-GET audit tool (now called the GATE). However, testing of the CMB Audit tool revealed the need for significant changes in wording and format. This section describes the first stage in development of the GATE: testing and revising the CMB Audit.

First testing of the CMB Audit tool. In March, 2014, the first test of the CMB Audit tool was conducted. The researcher recruited eight people from the Texas A&M University (TAMU) College of Architecture to test the Audit. Participants from the Department of Architecture included five doctoral students, one Masters student, and one faculty member. Two doctoral students from the Department of Landscape and Urban Planning also participated. The participants were given written instructions, including an explanation of the purpose of the pre-test, and two paper copies of the CMB Audit. The researcher read the instructions aloud during a brief orientation. Following Rodiek's SOS Tool methodology, participants were asked to think about "affordances"—whether the gardens were likely to support the needs of patients, visitors, and/or staff. The instructions read, "For this exercise, Langford A is now a hospital. Imagine yourself as a patient, visitor, or employee (nurse, therapist, etc.). Imagine using the space if you are tired, or in a wheelchair, or stressed out after visiting a loved one or caring for a sick patient." Participants were told that they were not just rating the *gardens* but also rating the Audit *tool*; therefore, they were asked to "make notes about the items or the tool in general….I want to know how easy this tool is to use, and how it could be improved." The two CMB Audit pre-test gardens were "the Moat," a sunken landscaped area just outside the ground floor of the College of Architecture (COA) and a small sculpture garden located approximately 300 feet away from the COA. With each space, participants were asked to imagine that the space was a healing garden, with the COA as "Langford Hospital." The researcher identified the primary doors and the space that would serve as the "lobby" for the purposes of the pre-test. Participants performed the CMB Audit in both spaces.

Findings from the first CMB Audit testing. After both groups finished both gardens, all participants reconvened for post-test discussion and what Rodiek refers to as "calibration" (personal correspondence, 2014). Rodiek and colleagues viewed the process of calibration as essential in development of the SOS Tool and in training the raters. It may be that the tool's high reliability is due in part to detailed calibration during the training sessions. The process entailed raters going over the SOS Tool of the garden that was just rated, item by item, and reporting to each other the score they assigned to each item. When raters arrived at different scores (for example, one rater assigned an item a "1" and another rater assigned the same item a "5"), the two raters discussed why or how their numbers were so different. Perhaps the wording was confusing or unclear, or one rater interpreted the item or what they saw in the garden differently from the other rater. Calibration is important for instrument development because it can reveal what aspects of the tool need improvement. It is also critical for training, to ensure that all raters are in agreement regarding how to use a tool.

Issues with the CMB Audit identified through testing. Post-test discussion about the CMB Audit identified weaknesses with the instrument and the training, and suggested possible strategies for improvement. One problem was with the affordances-related wording in the instructions and the researcher's verbal explanation. Some participants took the instructions of "put yourself into the shoes of one of the garden users" literally, thinking that they had to pretend that they were a patient (or visitor, or staff) as they performed the Audit. Some participants had trouble imagining the College of Architecture building and its two gardens as a hospital and healing gardens, and therefore found it difficult to use the Audit to rate the spaces. Several aspects of the CMB Audit were found to need improvement. Participants commented on the following:

- The form itself, with 104 individual items on six pages, was too long and seemed, in the words of one participant, "daunting."
- The rating system was confusing, and participants also noted that the rating scale was skewed toward the positive because it offered two options on the positive end of the continuum and only one on the negative end (0 = Not applicable, 1 = Feature not present or Quality missing, 2 = Poor, 3 = Moderately successful, 4 = Very successful). There was also concern that different raters' varying definition of "successful" might introduce too much subjectivity.

- Participants thought that several items (e.g., “Garden is open in all seasons,” “The garden has more than one entry,” “Primary pathway has no steps”) should be rated as ‘Yes’ or ‘No’ rather than on a Likert-type continuum.
- Some of the wording and questions were ambiguous and thus open to too much interpretation and subjectivity. For example (key words are italicized), “A *variety* of views are available from seating areas in the garden,” “Planting and layout of the garden provides *a significant degree* of privacy in rooms adjacent to the garden,” “The garden is *attractive*, and *rich with* amenities.”
- Some items were seen as too technical and only understandable by designers. Even this group of participants from the College of Architecture did not fully understand the concept of Universal Design; were uncomfortable judging whether the pathway slope was two percent or less; and did not want to gauge distance measurements without a tape measure (e.g., 6-foot wide pathways, and $1/8^{th}$-inch gaps in pavement).
- Most participants, even those with a landscape architecture background, also felt that they were not qualified to assess plant material questions (e.g., “Plants receive appropriate sun exposure,” “Plant selection is appropriate for local climate,” “Avoidance of plants that are highly toxic or have common allergy-triggering properties”).
- Some participants suggested that two separate tools, one for design practitioners (landscape architects, architects, interior designers) and one for healthcare providers (administrators, nurses, therapists) might eliminate some of the confusion.
- Some participants for whom English was not a first language needed to look up words—for example, “orientation features,” “sub-spaces,” “expansive,” “non-ambiguous”—on their phones for translation and definition. They recommended simpler wording.

Findings from the second CMB Audit testing. Based on the participants’ comments, the researcher created a revised draft of the CMB Audit. Items were still grouped in the same domains, but were separated into Yes/No and Likert-type scale rated items. The number of choices increased to include: (a) the Yes/No items; (b) a 5-point Likert-type scale ranging from

Poor (1) to Fair (3) to Very good (5); and options for (c) Feature or quality is not present (0), (d) Don't know (DK), and (e) Not applicable (NA). Written instructions were also clarified. Two participants who had taken part in the first CMB Audit test—one Architecture Ph.D. candidate and one Urban and Regional Science Ph.D. student (both female, both Chinese)—tested the revised CMB Audit at the same two COA gardens. They were again instructed to consider the COA building as the hospital and the two gardens as hospital healing gardens. Feedback from these two raters was mostly positive. They felt that the revised tool was overall easier to use, but they found the separation of Yes/No and continuous scale items confusing. While they liked having more choices with the 5-point scale, and liked that the scale options were now balanced between negative and positive, the number of options was now too many. Both participants still struggled with the wording and felt that many of the items' sentences were too long, which led them to guess the answer. Both participants agreed that having explanations in parentheses after the primary statement (e.g., "Plants offer a degree of 'fascination' (intricate flowers, unusual growth habit, swaying in the wind)") helped to clarify the primary statement and made the sentences seem less long.

Findings from the third CMB Audit pre-testing. Three days later, the same two participants tested a further-revised CMB Audit at three senior housing residences in the Bryan/College Station area. This time, the instrument was entered into Qualtrics, an online survey software program, before on-site testing, and it was printed out for the participants and researcher to use on site. In this next iteration, the main emphasis of each statement was bolded. For example, "**Movable seating** is available (light enough to move yet sturdy enough to prevent tipping)" and "Garden has an **emergency phone** that connects with the hospital front desk or security." This change received good feedback. The scoring, however, was still confusing to the raters; they had difficulty translating a statement (e.g., "Provision of graphic signage and visual cues," or "Seats have backs and arms") into a number. A researcher with a background in instrument development suggested that the GATE use a scale of *agreement,* where a rater would agree or disagree with each item along a numbered (Likert-type) continuum, rather than a rating scale. This change was well received by raters in subsequent testing.

Further instrument refinement – From the CMB Audit to the "GATE." Overall goals during testing of the CMB Audit and revision of the Audit into the Garden Assessment Tool for Evaluators were: (a) keep tense and grammar consistent so that an evaluator could easily utilize the agreement continuum; (b) make each statement a complete sentence; (c) keep statements as short as possible; (d) eliminate double-loaded questions (e.g., "The garden is comfortable and inviting"); (e) reduce ambiguity and subjectivity;(f) use simple, non-technical words and phrases; (g) reduce the number of 'contingent' items (items that could only be answered if the answer to the previous item was 'yes'); (h) reduce questions that non-designers would not be able to answer; and (i) eliminate items that were simply 'nice to have' rather than 'essential' (e.g., "Some benches or chairs have cushions or fabric seats").

3.3 Final Instrument: The Garden Assessment Tool for Evaluators (GATE)

In Spring 2015, the H-GET audit tool, which had used the CMB Audit as its foundation, was named the Garden Assessment Tool for Evaluators (GATE) because the many substantial changes made to the instrument warranted a new title that was specific to the H-GET. The GATE went through further revisions and was re-tested in May, 2015 at Rush University Medical Center in Chicago and in mid-May and early June, 2015 in College Station, TX. Because it was intended for use by a wide variety of people, feedback—including cognitive interviews—on each iteration of the GATE was sought from people of many different backgrounds, including landscape architects, architects, healthcare design researchers, healthcare practitioners such as doctors, nurses, occupational therapists, and horticultural therapists, and the researcher's fellow students, friends, and family members.

Figure 3.1 The Garden Assessment Tool for Evaluators (GATE).

3.3.1 Description of the GATE Instrument

The current version of the GATE is a six-page, 96-item audit tool for evaluating specific physical features of gardens in general acute care hospitals. As with the CMB Audit and SOS Tool, items in the GATE are divided into groups, referred to here as "domains." Each GATE domain contains at least one subdomain, and each subdomain contains at least four "items," statements that the evaluator can agree or disagree with on a 4-point Likert-type scale (for example, "Garden is visible from main public indoor areas," "Garden has plants that stimulate the senses").

Domains. Like the SOS Tool, the GATE's five domains are organized into affordances (the domains themselves, however, are different). The GATE domains are: Access & Visibility; Sense of "Being Away"; Nature Engagement; Walking & Activities; and Places to Rest. The SOS Tool domains are Access to Nature; Outdoor Comfort and Safety; Walking and Outdoor Activities; Indoor-Outdoor Connection; and Connection to the World. The five GATE domains were chosen based on the literature review, design guidelines, and the similar audit tools (the CMB Audit and the SOS Tool) discussed above. The domains Nature Engagement, Walking & Activities, and Places to Rest are derived from Ulrich's Theory of Supportive Garden Design (1999) (described by Ulrich as "positive natural distractions," "physical movement and exercise," and "access to social support" (p. 49). The Sense of "Being Away" domain is derived from the Kaplans' Attention Restoration Theory ("Being Away"). The Access & Visibility domain is derived from the literature and the CMB Audit and SOS Tool. Additional latent variables that were evaluated but not listed specifically as domains were Ulrich's security (or safety) and a *sense* of security; and a sense of control and access to privacy (1991, 1999).

Sub-domains. The sub-domains add clarity and reduce the length of any one domain list. Long lists on audits and surveys can overwhelm participants and increase respondent burden (Dillman, Smyth, & Christian, 2014). Breaking up lists, even just visually on the page, can reduce participants' feelings of being overwhelmed. Subdomains were created so that no one group of items (domain or subdomain) would be longer than ten items. Visually, this breaks up the page and also allows for a more conceptually fine-tuned evaluation. For example, with the domain "Access and Visibility," evaluators look first at what affords "visual access to the garden" and then "physical access to the garden."

The specific domains, subdomains, and number of items are as follows (see Appendix 3.1 and 3.2 for the full GATE, in color and grayscale):

1. Access and Visibility
    a. Visual Access to the Garden (9 items)
    b. Physical Access to the Garden (11 items including two write-in)
2. Sense of "Being Away"
    a. Sense of "Being Away" (5 items)
    b. Aesthetics & Maintenance (7 items)

3. Nature Engagement
    a. Plantings (10 items)
    b. Other Natural Features (8 items including one write-in)
4. Walking & Activities
    a. Primary Walkway (Path or Paved Thoroughfare) (6 items)
    b. All Paved Areas (Walkways and Patios) (4 items)
    c. Lighting, Wayfinding, and Amenities (5 items)
    d. Variety & Activities (4 items)
5. Places to Rest
    a. Seating Availability & Type (5 items)
    b. Private or Social (5 items)
    c. Aesthetics & Sun (5 items)
    d. Tables (5 items)

3.3.2 The GATE Rating Scale for Scoring

For garden rating/scoring, a 4-point Likert-type scale was developed in which Strongly Agree = 4, Somewhat Agree = 3, Somewhat Disagree = 2, and Strongly Disagree = 1. A "Not Sure or Not Applicable (N/A)" option was also provided. All items were worded so that the desired feature, if it were present and good, would receive Strongly Agree/4. For example, a successful garden would, ideally, draw people out into it ("Garden looks appealing/inviting from indoors"), have many different plants to provide interest ("Garden has a rich variety of plants") and provide sufficient seating ("The garden offers many places to sit"). This wording and scoring—having the desired elements receive the highest scores—enables evaluators to not to have to second-guess their responses. It also allows the instrument to be used as a set of design guidelines; if a designer follows all of the statements, then the garden should, in theory, be successful.

A forced choice 4-point scale was chosen because the researcher wanted to prevent raters from opting for a mid-point answer (e.g., "Neutral" or "Neither Agree nor Disagree"). Furthermore, space on the page was limited, and having a 4-point rather than 5-point (or higher) scale enabled the entire tool to fit onto fewer pages while maintaining a legible font size. Research indicates that in some situations, a 4-point scale can be frustrating or upsetting because it forces the participant to choose one side or the other. This may be especially problematic when the subject matter is personal or emotional for a survey participant (Losby &

Wetmore, 2012; Wivagg, 2011). Because the GATE is about gardens—something outside of the participant's personal realm— there is less risk of frustration and disconcertion.

The "Not Sure or Not Applicable" option

"Not Sure." Although wording of items was designed for lay people with varying backgrounds and expertise, pre-testing still revealed some areas, especially regarding plant material, where participants felt unqualified to respond. For example, "Planting provides year-round interest (always something to see such as flowers, leaves, berries, bark, evergreens, etc.)." Even trained designers, if they were not familiar with the plant material of the region, would have difficulty identifying what plants in the garden might provide seasonal interest at times of year other than at the moment of the audit. There was concern that if a rater were unfamiliar with an item or an aspect of the item, they might make a guess and skew the results. Thus, it was important to allow raters to have a Don't Know or Not Sure option. In pre-testing, raters preferred the softer Not Sure wording to Don't Know.

"Not Applicable." Some items in the GATE will, in certain situations, warrant a "Not Applicable" (N/A) response. For example, if a garden has no chairs or benches, the response to most of the seating-related items would be N/A. Separating Not Sure and N/A may have provided for more accurate assessment and statistical analysis, but feedback from pre-testing strongly indicated that having too many options tended to overwhelm the participants. Evaluator instructions on the first page of the GATE state, "For each statement on the next five pages, check the box that best represents your level of agreement. If you are unsure, or if the statement is not applicable (N/A), check the last box. Note: It is better to check "Not sure or N/A" than to make a guess!" This statement was repeated on page two of the GATE (the first page of the actual evaluation). During training for Pilot Testing the H-GET (including the GATE and Behavior Mapping), these instructions were reiterated: if evaluators did not know or were not sure about the answer to something, they should check the "Not Sure or N/A" box rather than making a guess.

PLACES TO REST 5

SEATING AVAILABILITY & TYPE	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
01 The garden offers **many places to sit.**	X				
02 People can choose a **variety of types** of seating (benches, chairs, etc.).		X			
03 **Movable seating** is available (light enough to move but sturdy enough to prevent tipping).	X				
04 At least **50% of the seating in the garden has backs and arms** (so that people can easily get up and down).	X				
05 There is a **place where someone could lie down** for a rest (chaise longue, bench, lawn).				X	
PRIVATE OR SOCIAL					
06 Garden has **separate areas for activities and socializing,** compared with **contemplation/quiet conversation.**			X		
07 Garden provides a place where **3 or more people can sit together.**	X				
08 Some seating areas **allow people to interact with passers-by.**	X				
09 Garden provides **semi-private seating for one or two people.**			X		
10 Some seating makes it **possible to watch others from a distance.**		X			
AESTHETICS & SUN					
11 There is a **choice of seating in sun or shade** throughout most of the day.		X			
12 Seating **does not produce glare** (is not metal, white, etc.).			X		
13 Seating material **does not get too hot or too cold.**			X		
14 Seating, tables, and other furniture look **well-maintained.**		X			
15 Some seating has **attractive or interesting views.**			X		
TABLES					
16 **Garden has at least one table.** If NO, skip the next four questions.	YES			NO	
17 Some **seats have tables next to them.**	X				
18 There is at least one table **large enough for four or more people.**	X				
19 There is at least one **table that can accommodate people in wheelchairs or scooters.**		X			
20 **Tables do not tip** (for example, when people use as leverage to sit down and get up).				X	

Figure 3.2 Page 6 of the Garden Assessment Tool for Evaluators (GATE). For scoring, Strongly Agree = 4, Somewhat Agree = 3, Somewhat Disagree = 2, and Strongly Disagree = 1. Not Sure or N/A responses were not counted for scoring or for Kappa and ICC, but were counted for percent agreement. Scoring for Yes/No responses is described in Results section.

3.3.3 Formatting of the GATE

After the GATE's content was established, a graphic designer from a landscape architecture firm was hired to develop the visual format of all of the H-GET instruments, including the GATE. Design goals were to create: (a) an overall recognizable "brand" for the H-GET; (b) legible instruments; and (c) instruments that were easy, and even a pleasure, for evaluators to use. Based on volunteer evaluators' and other people's comments, one of the largest obstacles to the CMB Audit and early GATE iterations was the length. The final GATE instrument has the same number of pages (six) as the CMB Audit, but it has fewer items (96 rather than 104) and more white space and separation of items for clarity and legibility. Each of the five domains fits on one page and is a different color. The introductory first page is turquoise, Access & Visibility is blue, Sense of "Being Away" is a darker blue, Nature Engagement is green, Walking & Activities is orange, and Places to Rest is dark purple. Note that although people who reviewed and tested the GATE reacted positively to the color version, color printing was expensive. When the color version was printed in black and white, the grays were only slightly different and did not read well. Therefore, the graphic designer also created a grayscale version of the GATE specifically for black and white printing.

GATE introductory page. The first half of the GATE first page, as shown in Figure 3.3, contains instructions for use:

> STEP 1: ESTABLISH CONSENSUS. There should always be at least two evaluators. Evaluators must agree on the 1) Garden boundaries 2) Main doorway 3) Primary pathway.
> STEP 2: WALK THROUG THE GARDEN BEFORE YOU START. Think of the garden from the point of view of a frail patient. Walk through the entire garden, test the furniture, look at the area from different positions—including wheelchair and child height. Ask yourself, "How well does this garden support the needs of patients, visitors, and staff?"
> STEP 3: EVALUATE THE GARDEN. For each statement on the next five pages, check the box that best represents your level of agreement. If you are unsure or if the statement is not applicable (N/A), check the last box. Note: It is better to check "Not sure or N/A" than to make a guess! A tape measure will be useful for some of the items.

STEP 4: RETURN THE FORMS. Return by mail to [with information about the researcher's home address, email addresses, and phone number to contact with any questions or concerns].

The second half of the first page asks for demographic information about the evaluator: "Your name," "Your Role/profession (landscape architect, nurse, etc.)"; the date, time, weather "(sunny, cloudy, windy, etc.)", and temperature; and demographic information about the site: "Name of facility and location (city, state), Name of garden (if it is named), Type of facility or patients served, Location and type of garden (e.g., front entry, central courtyard, rooftop, etc.)." The last questions in this section asks for a Yes or No response to "Are there other gardens and/or outdoor sitting areas at the facility?" and "If YES, please list" with a space for a write-in response.

"Overall Impression" item. Before rating the individual items, the GATE asks evaluators to record their overall impression of the garden as a whole. At the bottom of the first page is a 10-point scale with the instructions, "On a scale of 1-10, how would you rate the **overall restorativeness** of this garden? "Restorative" = Able to restore a person's strength, health, or well-being." At the top of the 1–10 numbers are the words "Not restorative at all" (above 1–4) → "Completely restorative" (above 6–10). This question enables a more intuitive, pre-cognitive response to the garden before evaluators start to think more objectively and systematically as they work through the GATE. The 1–10 score on this item, compared and correlated with the GATE score from all of the items, became an important part of GATE and H-GET Survey instrument validation, as will be discussed in the Results section.

HEALTHCARE
GARDEN
EVALUATION
TOOLKIT

GARDEN ASSESSMENT TOOL FOR EVALUATORS

INSTRUCTIONS — PLEASE READ BEFORE YOU BEGIN

STEP 1: ESTABLISH CONSENSUS
There should always be at least two evaluators. Evaluators must agree on the 1) Garden boundaries 2) Main doorway 3) Primary pathway.

STEP 2: WALK THROUGH THE GARDEN BEFORE YOU START
Think of the garden from the point of view of a frail patient. Walk through the entire garden, test the furniture, look at the area from different positions – including wheelchair and child height. Ask yourself, "How well does this garden support the needs of patients, visitors, and staff?"

STEP 3: EVALUATE THE GARDEN
For each statement on the next five pages, check the box that best represents your level of agreement. If you are unsure or if the statement is not applicable (N/A), check the last box. Note: It is better to check "Not sure or N/A" than to make a guess! A tape measure will be useful for some of the items.

STEP 4: RETURN THE FORMS
Return by mail to Naomi Sachs, 800 Gilchrist Avenue, College Station, TX 77840 or scan and email to nsachs@tamu.edu.
Questions or concerns? Email nsachs@tamu.edu or call (845) 264-2026.

GENERAL QUESTIONS

01	Your name:		
02	Your role/profession (landscape architect, nurse, etc.):		
03	Date:	Time:	AM or PM (circle one)
04	Weather (sunny, cloudy, windy, etc.):	Temp (°F or warm, cool, etc.):	
05	Name of facility and location (city, state):		
06	Name of garden (if it is named):		
07	Type of facility or patients served:		
08	Location and type of garden (e.g., front entry, central coutyard, rooftop, etc.):		
09	Are there other gardens and/or outdoor sitting areas at the facility?	YES	NO
	If YES, please list:		

OVERALL RATING

NOT RESTORATIVE AT ALL → COMPLETELY RESTORATIVE

* On a scale of 1-10, how would you rate the **overall restorativeness** of this garden? *"Restorative"= Able to restore a person's strength, health, or well-being.*	1	2	3	4	5	6	7	8	9	10

Figure 3.3 First page of the Garden Assessment Tool for Evaluators (GATE). The top half of first page has instructions for use. The bottom half asks for information about the evaluator, weather conditions, and the site, and for the evaluator's intuitive rating ("Overall Impression") of the garden before they conduct the GATE.

3.4 Methodology and Protocol for GATE Instrument Testing

After development and pre-testing, the GATE was tested along with the other three H-GET instruments at the eight Pilot Test sites, as discussed in Chapter II. The GATE was also tested for scoring and reliability at 25 sites in the Houston Medical District. On-site data collection for the GATE and Behavior Mapping (see Chapter V) was performed by the researcher and two to three trained research assistant (RA) evaluators at each site. As was described in Chapter II, RAs local to the area conducted H-GET Pilot Testing in each geographic region. In total, four sets of RAs participated in testing the GATE.

3.4.1 GATE Evaluator Training

In order to improve reliability, all RAs were trained according to a standardized protocol developed by the researcher. The training protocol was similar to that used by Rodiek and colleagues for the SOS Tool (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2016).

GATE training protocol

Introductions and instructions. In each region, with each set of RAs, at least one institution was identified as a training site for the H-GET GATE and Behavior Mapping. Training took place one to two days before H-GET Pilot Testing. Copies of the color GATE were printed out single-sided for the training and for the first Pilot Test site. Black and white copies were used after that. All trainings began with the GATE and ended with Behavior Mapping. In all states, training began on site at the designated training facility, usually inside in the coffee shop or cafeteria. Materials were handed out to each RA—clipboards, print-outs of the GATE instrument, and garden plans (maps of the garden) for Behavior Mapping. RAs received a description of the H-GET project. They were told that testing and evaluation of the instruments were as important as rating of the gardens, so feedback and discussion was welcome. RAs were walked through the first page of the GATE, including discussion of affordances and how to apply the theory in conducting the assessment. The researcher also explained how the domains and sub-domains were organized. RAs were asked to read through all of the items carefully before beginning the GATE and to ask for clarification on any overall protocol or specific items. Questions that arose were discussed while all RAs were present so that they could learn from each other. The researcher took notes, either on a separate piece of paper or directly on the GATE form, about all questions and comments.

Affordances. Instructions were reiterated before beginning the GATE: walk around the entire site, sit on different chairs and benches, feel different materials, make sure you take it all in before starting. Think about the garden from the point of view of a frail patient—someone who gets tired easily, or is using a walker or wheelchair, or someone who has just gotten some bad news and needs a place to process the information, by themselves or with a family member or staff. The reasoning behind some items was explained; for example, that elderly people and patients on certain medications are more susceptible to ultraviolet rays of the sun and to glare from light and shiny surfaces; that IV pole and walker wheels are small and more sensitive to changes in grade (door thresholds, gaps or cracks in pavement); and that aerosolized water from decorative fountains can spread Legionella bacteria.

GATE post-test training protocol. The researcher conducted the GATE with the RAs and stayed in a location that was easily accessible in case questions arose. When all RAs had completed the first GATE, they gathered with the researcher —usually in the garden, unless weather was too inclement or discussion of the GATE would disturb garden users, for calibration, the item-by-item walk-through of the GATE. First, all raters (including the researcher) discussed any general issues or questions that arose. Second, the researcher facilitated calibration. The researcher marked each evaluator's response on her original GATE tool so that all responses were easily visible. Calibration was an excellent means for addressing ambiguity and answering lingering questions. It was also a good way to clarify some of the more subjective questions. For example, with privacy, how much privacy? "Barometer" examples were given to help the RAs understand the questions in context, with affordances. For example, with the question, "Garden is safe for children (e.g., physically enclosed; easily viewed from nearby seating areas; plantings and other features are not harmful," the barometer was "Would you let your own child (or a nephew, niece, etc.) play in this garden?" Strongly Disagree = Not at all, I would hold their hand the whole time; Somewhat Disagree = Yes but only with full supervision; Somewhat agree = Yes but I would still want to be in the garden, close-by; Strongly Agree = I could be inside the facility and feel safe with my child being outside. And with “People can find privacy in at least one part of the garden,” Strongly Agree = I could find a place where I could cry, or carry on a difficult conversation with a patient/doctor/family member.

3.4.2 GATE Testing at H-GET Pilot Test Sites

H-GET testing of all four instruments at each of the eight Pilot Test sites included the GATE, Surveys, Behavior Mapping, and Stakeholder Interviews. As will be discussed in detail in Chapter IV, at most facilities the healthcare facility staff members were notified of the online and paper surveys on the second day of Pilot Testing. Paper copies of the Patient/Visitor and Staff Surveys were also usually put out for people to participate in on the second day of Pilot Testing. As will be discussed in Chapter V, the researcher had conducted some Stakeholder Interviews prior to on-site Pilot Testing; some interviews were conducted during Pilot Testing; and some were conducted after Pilot Testing had been completed.

GATE testing at each Pilot Test site took place in the morning of each day before Behavior Mapping. Whenever possible, all evaluators conducted the GATE evaluation at approximately the same time to reduce measurement error due to differences in weather, availability of shade in the garden, and so on. Each evaluator filled out one GATE form per garden per day. The researcher then collected all completed forms and entered the data into the Qualtrics survey data management platform.

3.4.3 GATE Testing for Interrater Reliability and Scoring: The Houston Medical District

At least two raters are needed for interrater reliability (IRR) (Anastasi, 1998), though more are acceptable. Generally, the larger the number of raters, the greater the likelihood of high IRR (Anastasi, 1998). For accurate statistical analysis of IRR, a minimum of approximately 25 sites must typically be scored by the same raters. Due to the relatively small number of H-GET Pilot Test sites, with each region having a separate set of evaluators, a larger sample of gardens rated by one evaluator team was needed. The goal was to find 20-30 gardens in a close radius that could be rated as a group in a short period of time. The Houston Medical District was identified as a site where enough outdoor spaces at or near healthcare facilities could be found.

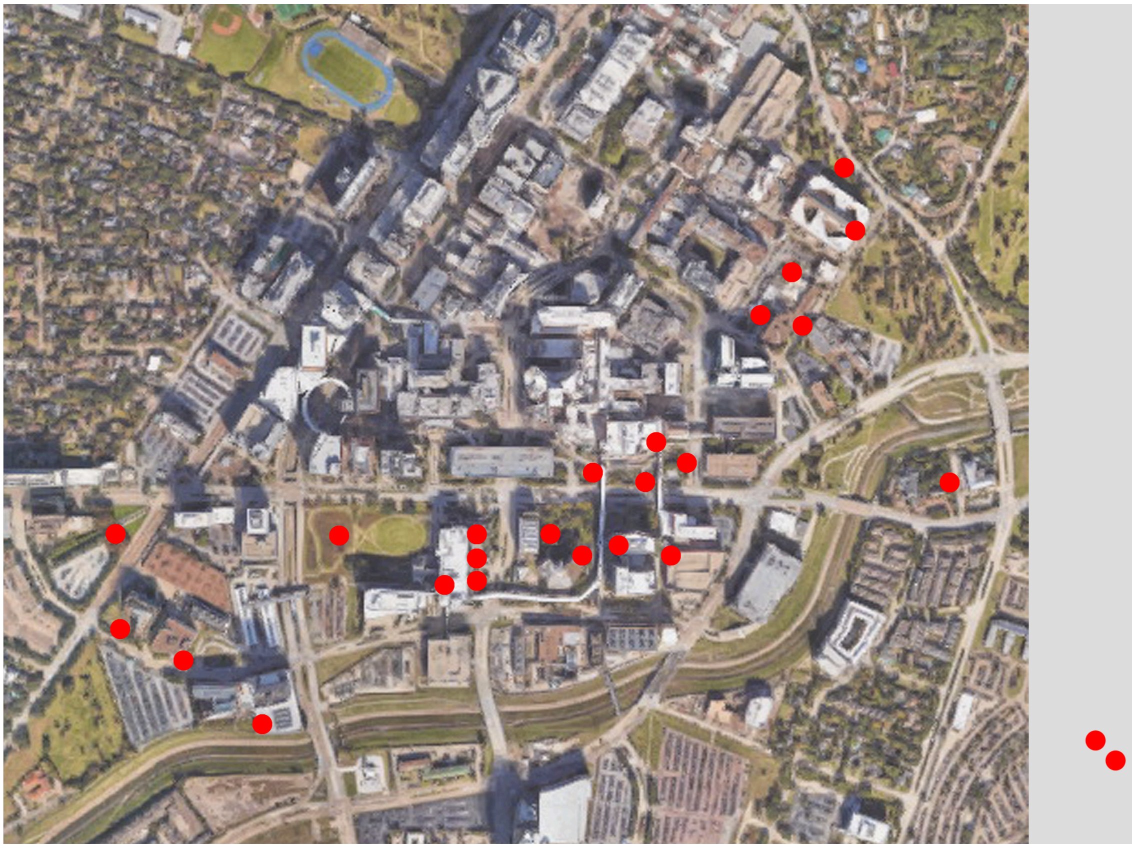

Figure 3.4 Map of Houston Medical District with 25 GATE test sites indicated in red dots. Two sites—Harris Health Clinic and the UT School of Dentistry—are slightly outside of the map's boundaries.

Site Selection. The basic sampling strategy was to include as many of the healthcare gardens located in the Houston Medical District as feasible (see Figure 3.4), which includes a large collection of sizeable medical facilities. From Google Earth images and a Texas Medical Center parking map (which clearly labeled each healthcare facility, parking, and nearby streets), other potential sites were located based on: (a) whether or not there was a healthcare facility; and (b) whether there was green space or something that looked like a garden. The Facilities Project Manager at MD Anderson Cancer Center arranged for use of the GATE at all twelve gardens on their campus (two of which had been the Texas H-GET training sites) and also recommended other sites within the Houston Medical District: Harris Health Clinic, the University of Texas School of Dentistry, Texas Children's Hospital, a public park across from Ben Taub Hospital, and Texas Medical Center's Gus S. and Lydall F. Wortham Park. All but one of the MD Anderson gardens were used (time did not allow for the Radiological Outpatient Center). The researcher visited all potential sites a week before data collection to make sure that they were appropriate for GATE testing and that access was possible. Some sites were eliminated (for example, the play garden at Texas Children's and the public park across from Ben Taub Hospital) and others were added (for example, several small gardens at TIRR Memorial Hermann). The researchers contacted all facilities where permission might be needed. Some gardens did not require permission because they were open to the public and the buildings were not in use on the weekend. Meeting days and times were arranged. The schedule was as follows:

Sunday, 3/13/16

1. **Harris Health Clinic** – Entry garden
2. **UT School of Dentistry** – Courtyard garden
3. **Houston Hospice** – Healing Garden
4. **UT Institute of Molecular Medicine** – Courtyard water garden
5. **Shriner's Hospital for Children** – Front entry
6. **Texas Medical Center -** Gus S. and Lydall F. Wortham Park (public park)
7. **Houston Community College** – Small "Zen" entry garden

Monday, 3/14/16

8. **MD Anderson Mays Clinic Level 8** – Barbara's Garden
9. **MD Anderson Mays Clinic Level 8** – Rita's Garden
10. **MD Anderson Mays Clinic Level 8** – Bartalotta Family Garden
11. **MD Anderson Mays Clinic Level 2 -** Weingarten Schnitzer Family Garden
12. **MD Anderson Mays Clinic Level 2** – Podium Garden
13. **MD Anderson Cancer Center** – Prairie Garden
14. **MD Anderson Cancer Center** - Saeger Garden
15. **MD Anderson Cancer Center** - Hudson Garden
16. **MD Anderson Cancer Center** - Melcher Fountain
17. **MD Anderson Cancer Center** - Fountain of Joy
18. **MD Anderson / Rotary House International** - Well of Life Fountain garden

Tuesday, 3/15/16

19. **Ben Taub Hospital Healing Garden**
20. **TIRR Memorial Hermann** – Entry Plaza
21. **TIRR Memorial Hermann** – Prometheus Garden
22. **TIRR Memorial Hermann –** Cafeteria Patio
23. **TIRR Memorial Hermann** – Greenhouse Garden
24. **UT School of Nursing / UT School of Public Health** - Grant Fay Park (public park)
25. **UT School of Nursing** - Rooftop garden

Houston GATE testing protocol. Two of the three Research Assistants who had participated in the Fall 2015 Texas H-GET testing were available for the three days of Houston GATE testing. Because of the 100-mile distance to Houston from College Station, the three raters drove to Houston on a Sunday morning, spent two nights near the Houston Medical District, and drove home on Tuesday afternoon. Institutional Review Board was not needed, but administrators at the following facilities were contacted prior to testing and the following facilities provided written or verbal consent: Houston Hospice, UT School of Nursing, MD Anderson Cancer Center, TIRR Memorial Herman, and Shriner's Hospital for Children. The last data collection by the two RAs had occurred six months before, so the researcher reviewed the GATE material with them, and calibration was performed at the first two sites (Harris Health Clinic and UT School of Dentistry). Each rater used one paper GATE for each garden. Results were entered into Qualtrics after all data was collected.

Limitations with the Houston GATE testing. For the first day, a Sunday, all but one garden (Houston Hospice) were easily accessible and open to the public, thus no permission was needed to conduct the GATE testing. However, four of the seven sites' buildings were locked, making it impossible for evaluators to answer several items, particularly in the Access & Visibility domain. For example, neither automatic nor non-automatic doors could be tested to see how easy they were to open; evaluators could not assess proximity to indoor bathrooms and water fountains; and they could not determine whether there was signage to the garden from indoors. Thus, evaluators used the "Not Sure or N/A" (NS/NA) option more on this day than on the two following days. As will be discussed in the next section, the higher number of NS/NA answers resulted in a greater amount of missing data for these gardens. One garden, the Texas Medical Center Gus S. and Lydall F. Wortham Park, was a public park that was not adjacent to any building, which again led to more NS/NA answers. Furthermore, the same park had no seating other than the lawn, which led evaluators to answer NS/NA for most seating-related items. This, in turn, affected statistical analysis for reliability. Another potential issue with the Houston sites was that, unlike the eight full H-GET pilot test sites, several of the gardens were not technically "healing gardens" as designated by the HCF, and some were not technically healthcare gardens at all. For example, the entry to Harris Health Clinic was landscaped and offered seating, but may not have been designated or even intended as a healing garden. Gardens or landscaping at the UT School of Dentistry, UT Institute of Molecular Medicine, UT School of Nursing, and Houston Community College were for use by students, faculty, and staff; while there was a healthcare connection and they were in or near the Houston Medical District, they were not designed for, and did not serve, hospital patients, visitors, or staff. Likewise, the two public parks—Texas Medical Center Gus S. and Lydall F. Wortham Park and Grant Fay Park—were affiliated with healthcare facilities or healthcare education, but were not intended as healing gardens. The GATE was developed to be flexible enough for use at a variety of types and sizes of hospital healing gardens, but the fact that several of the Houston GATE test sites were not technically healing gardens may have negatively affected results.

Weather conditions. Weather on the three testing days was similar, ranging from 67°F in the mornings to 89°F in the late afternoon. All days were sunny and breezy; weather was slightly more overcast and humid in the morning of March 14th and more humid throughout the day. Although all *days* were sunny, the gardens were not always in sun while being evaluated.

Recording of results. At the end of each day, the researcher collected all GATE forms and entered the information into the Qualtrics online platform. These data were analyzed as the "Houston GATE data" for descriptive statistics and interrater reliability. Data from the GATE testing at the eight H-GET Pilot Test sites (nine gardens) was combined with the Houston GATE data for final descriptive statistics, factor analysis, correlations, and interrater reliability testing.

3.5 Results from GATE Instrument Testing

One hundred and twenty-one GATE audits were conducted at 34 gardens, as shown in Table 3.2. All results were analyzed using Statistical Package for Social Science (SPSS) 24.0.

Omitted data. Some data collected during GATE testing were not included in the final analysis. In Portland, OR, one of the three RAs completed the training and one day of data collection but did not return for further research. The RAs data was omitted from the study. Also in Portland, Oakland, and Texas, raters were not always able to return to gardens for a second GATE testing due to weather, personal schedules, or lack of transportation. In Texas, RAs were inadvertently given the H-GET Visitor Survey rather than the GATE for the second testing; this data was not used. This last mistake highlights the importance of creating instruments that look different enough from each other to avoid confusion, which might be especially important if the tool is adopted for broad usage in the field.

Table 3.2 H-GET GATE Test Sites and Sessions
Note. *( ) Number of evaluators. **Test sites for GATE scoring and interrater reliability (25 gardens in Houston Medical District, 1 visit per garden during 3/13–3/15/16).

Healthcare Facility	Garden	Geographic Region	First Audit	Second Audit	Third Audit	Total GATE Audits
Legacy Good Samaritan Medical Center	Stenzel Healing Garden	Pacific Northwest	10/6/15 (3)*	--	10/21/15 (1)	4
Legacy Salmon Creek Medical Center	3rd Floor Terrace Garden	Pacific Northwest	10/8/15 (3)	10/15/15 (1)	--	4
Baylor Scott & White Hospital	Healing Garden	Central Texas	10/19/15 (4)	10/20/15 (4)	10/28/15 (1)	9
St. Joseph Hospital	Marshal Verne Ross Memorial Healing Garden	Central Texas	10/19/15 (4)	10/20/15 (4)	--	8
Houston Medical District**	25 gardens sites located in Houston Medical District	Central Texas	3/13/16-3/15/16 (3)	N/A	N/A	25
Kaiser Oakland Broadway Medical Office Building	Serenity Garden	Northern California	10/29/15 (3)	10/30/15 (3)	--	6
Kaiser Oakland Medical Center and Specialty Medical Office Building	Courtyard Garden	Northern California	10/29/15 (3)	10/30/15 (3)	11/5/15 (2)	8
Smilow Cancer Hospital	Betty Ruth & Milton B. Hollander Healing Garden	New England	6/14/16 (4)	6/15/16 (4)	6/22/16 (3)	11
Smilow Cancer Hospital	Cafeteria Garden	New England	6/14/16 (4)	6/15/16 (4)	6/22/16 (3)	11
Greenwich Hospital	Community Garden	New England	6/16/16 (3)	6/17/17 (3)	6/24/16 (3)	9

Table 3.3 GATE Garden Scores (1–4 scale)

Descriptive statistics for totals all GATE gardens (mean, standard deviation, and number of evaluators)

Pilot Test Gardens	***M***	***SD***	**N**
Legacy Good Samaritan Frank R. Stenzel and Kathryn Stenzel Healing Garden	3.37	0.14	4
Legacy Salmon Creek 3rd Floor Terrace	2.61	0.08	4
Kaiser Oakland MOB Serenity Garden	3.06	0.10	3
KaiserOakland SMOB Courtyard Garden	2.93	0.18	5
Scott & White Hospital Healing Garden	3.17	0.29	4
St. Joseph Hospital Marshal Verne Ross Memorial Healing Garden	2.79	0.15	4
Smilow Cancer Hospital Betty Ruth & Milton B. Hollander Healing Garden	3.36	0.10	7
Smilow Cancer Hospital Cafeteria Courtyard	2.45	0.05	7
Greenwich Hospital Carl and Dorothy Bennet Garden	3.12	0.09	6
Houston Interrater Reliability Test Gardens	***M***	***SD***	**N**
Harris Health Clinic – Entry garden	3.13	0.42	3
UT School of Dentistry – Courtyard garden			3
Houston Hospice – Healing Garden	2.78	0.39	3
UT Institute of Molecular Medicine – Courtyard water garden	3.43	0.07	3
Shriner's Hospital for Children – Front entry	2.08	0.09	3
Texas Medical Center Gus S. and Lydall F. Wortham Park	2.27	0.19	3
Houston Community College – Small "Zen" entry garden			3
MD Anderson Mays Clinic Level 8 – Bartalotta Family Garden	3.32	0.10	3
MD Anderson Mays Clinic Level 8 – Barbara's Garden	3.01	0.22	3
MD Anderson Mays Clinic Level 8 – Rita's Garden	3.02	0.07	3
MD Anderson Cancer Center - Hudson Garden	3.12	0.17	3
MD Anderson Mays Clinic Level 2 - Weingarten Schnitzer Family Garden	2.87	0.15	3
MD Anderson Cancer Center - Fountain of Joy	3.01	0.22	3
MD Anderson Cancer Center – Prairie Garden	3.22	0.20	3
MD Anderson Cancer Center - Melcher Fountain	3.04	0.28	3
MD Anderson Cancer Center - Saeger Garden	2.85	0.15	3
MD Anderson Mays Clinic Level 2 – Podium Garden	3.18	0.12	3
MD Anderson / Rotary House International - Well of Life Fountain Garden	3.48	0.07	3
Ben Taub Hospital Healing Garden	2.66	0.26	3
TIRR Memorial Hermann – Oak Plaza	2.85	0.09	3
TIRR Memorial Hermann – Prometheus Garden	3.01	0.12	3
TIRR Memorial Hermann – Cafeteria Patio	2.72	0.18	3
TIRR Memorial Hermann – Greenhouse Garden	2.81	0.21	3
UT School of Nursing / UT School of Public Health - Grant Fay Park	3.35	0.19	3
UT School of Nursing - Rooftop garden	2.77	0.21	3
Total	**2.97**	**0.37**	**120**

M = Mean, SD = Standard Deviation, N = Number of evaluators

3.5.1 Garden Scoring Results

For scoring of individual items, sub-domains, domains, and the overall garden, mean scores from all raters of that particular garden were calculated, as shown in Table 3.3. In order to calculate the mean scores, the following adjustments were made:

Yes/No items scoring. Yes/No scores were originally automatically coded by Qualtrics as 1 = Yes and 0 = No. For scoring and statistical analysis of correlations, these numbers needed to be changed. The scoring needed to be fair to prevent gardens that had even one of the three items present from earning more points than those with no water features, lighting, and/or tables. The three Yes/No items that had other items dependent on them were:

- "Garden has at least one water feature" - 5 dependent items
- "Garden has lighting for night usage" - 2 dependent items
- "Garden has at least one table" - 4 dependent items

For gardens with any of these elements, mean scores of the dependent items were calculated and converted to the same scale as the rest of the GATE items to replace the "Yes." Items with a "No" response (0) were converted to 1, to be the lowest score on the Likert-type scale. To convert the one other Y/N item, "Garden is open 24 hours a day, 7 days a week," "Yes" responses were converted as follows, based on the write-in responses by evaluators: 4 = Open all the time (24/7); 3 = Open approximately 9 a.m.–5 p.m. every day of the week; 2 = Open approximately 9 a.m.–5 p.m. Monday through Friday; 1 = Never open (doors are always locked, garden is not accessible). Although one training garden would have received a score of 1 for this item, none of the actual Pilot Test gardens were always closed, thus scores ranged from 2.0–4.0.

Interdependent items scoring. Scoring was re-coded for the two sets of interdependent items—items where the answer for one item was contingent on or linked with the answer of the item immediately preceding it. The item "Any non-automatic doors are easy to operate" was linked with "Doors to the garden from at least one entry are automatic and easy to use." If a garden did NOT have any automatic doors, then a rater would check "Strongly Disagree" for that item, and would then enter their level of agreement about the non-automatic doors being easy to operate. The dependent item “At least one secondary walkway offers increasing levels of difficulty” would receive a “Not Sure or N/A” rating if the answer to the item “Garden has more than one walkway, with a variety of routes, lengths, and destinations” was “Strongly Disagree.” Because these two items were often interdependent, a mean score of the combined items was calculated for overall scoring purposes.

“Not Sure or Not Applicable” scoring. The “Not Sure or N/A” (NS/NA) option on the GATE was automatically coded by Qualtrics with the number “88.” This number was removed before data was imported into SPSS for analysis so that it did not interfere with scoring and coding of the 1–4 scale. Thus in SPSS, all NS/NA options become de facto missing values: After importing into SPSS, there is no way to differentiate the items marked NS/NA in the raw data set, from the items evaluators actually missed scoring (actual missing values). As was discussed above, some of the Houston GATE test gardens received a higher than average number of NA/NS (see Appendix 3.5 and 3.6 for a breakdown of NA/NS and missing values by item and by facility). The high number of “missing values” (NS/NA and actual missing values), combined with several items that had zero or very low variance, created a challenge for statistical analysis that will be discussed below and in the Limitations and Future Research section of the Conclusion.

3.5.2 Descriptive Statistics

Typically, garden scores clustered in the range between 2.5 and 3.5 (out of 1–4) with a mean of 2.97 and a standard deviation of .37. Out of 120 distributions, the typical distribution was either bimodal or skewed positively or negatively. Interestingly, normality was rare in evaluation responses. As such, SPSS treated these “normal” results as abnormal, compared to the other more common distributions. Other items had very little to no variability, meaning that all raters gave that item the exact or almost the exact same score. This prevented SPSS from completing statistical modeling for those items. These distributions were omitted from further analyses.

3.5.3 Support for Convergent Validity

Two methods were used to explore support for convergent validity: *Principal component analysis* and *correlation of two different GATE scores*. Principal component analysis is useful for streamlining an instrument through identification of whether and how items cluster together and whether they are redundant and can be removed. Correlation involved Pearson correlation of mean total, domain, and sub-domain "Cumulative Item" GATE scores with mean "Overall Impression" scores.

Principal Component Analysis. Both *principal component analysis* (PCA) and *factor analysis* (FA) are often run in multi-scale test development to identify what items load onto what scales (called "factors" in PCA and FA; in this research, factors are called domains) (Comrey, 1988; DeVellis, 2003). The major difference between PCA and FA is that FA is run to test a theoretical model of latent factors and what items might be loading onto them. PCA is a form of dimension reduction used to test what items in the instrument could be removed to (a) streamline the instrument by reducing the number of items, thereby potentially lowering respondent burden; and (b) reduce any redundancy that might weaken the overall instrument (Field, 2013). Another kind of factor analysis, *exploratory factor analysis*, is usually run at the beginning of a project to help determine what items should be grouped together (DeVellis, 2003). *Confirmatory factor analysis* (CFA) is, as a procedure to determine whether items "hang together" in the way that the test developer intended them to. However, in current practice, CFA is used less frequently, having been replaced by structural equation modeling (SEM)—in fact, SPSS does not have a CFA procedure (IBM Support, n.d.).

Principal component analysis results. PCA was run using Varimax rotation with Kaiser normalization using the researcher's GATE data (with the researcher in the role of the "expert") to see whether items loaded onto the same domains (factors) as they were represented in the GATE (for example, whether items listed in the domain "Access and Visibility" actually loaded onto that domain). It was also possible that items would separate out and load onto latent factors such as safety, comfort, or sense of control. Although most items loaded clearly onto distinct factors, they did not align with the GATE's domains or subdomains, nor did they cluster together in a discernable theoretical pattern. This may have been due to little variance, missing values, and/or densely packed distribution. Furthermore, the GATE consists of items measuring a very broad and diffuse construct of “restorativeness” with many variables and facets. Because items showed acceptable or high internal consistency variability in unidimensional analyses, future analyses utilized the scale (domain) level and not the subscale (subdomain). Exploratory factor analysis was run with the same data, with similar results.

Correlation of two scores: “Overall Impression” vs. “Cumulative Item” GATE scores. Additional support for convergent validity was provided by the strong correlation between two types of scores in the GATE (Campbell & Fiske, 1959). The first, the “Overall Impression” GATE score, was from the question on the GATE’s first page, “On a scale of 1–10, how would you rate the **overall restorativeness** of this garden? “Restorative” = Able to restore a person’s strength, health, or well-being” as shown in red in Figure 3.5. This question was answered by evaluators before they began the more cognitive task of item-by-item scoring on pages 2–6 of the GATE . The question enabled evaluators to record a more intuitive, pre-cognitive response to the garden. The Overall Impression score was then compared with the subsequent more objective and systematic GATE scoring, the mean of which is called the “Cumulative Item” GATE score. Comparing these two scores made it possible to see how well, overall, the various items in the GATE captured the overall sense of the quality of the garden.

Method for correlation of “Overall Impression” and “Cumulative Item” GATE scores. In SPSS, mean scores from *all* evaluators (including the researcher’s) were calculated for each garden, including total garden scores, domains, subdomains (see Table 3.4). A mean score of *all* gardens was also calculated, which became the “Cumulative Item” GATE score (2.97 out of 4) for this data collection phase. Because the Overall Impression and the Cumulative Item scores were based on different response categories (1–10 compared with 1–4) they were both converted to a 10-point scale to make comparison easier. When translated to a 10-point scale, the Cumulative Item GATE score became 7.41. A mean score of all Overall Impression GATE scores was also calculated (5.56 out of a possible 10). To compare percentages, we can divide the mean score by the potential highest score (2.97/4 = .74 for the Cumulative Item and 5.56/10 =

.56 Overall Impression). Thus, for the total garden scores, the GATE Cumulative Item and Overall Impression scores differed by only .18. These scores, as well as mean scores for all GATE domains and sub-domains, were correlated with the Overall Impression scores, as shown in Table 3.4. For Pearson Effect Sizes, Cohen's (1988) range was used, where $\geq$ .50 = strong correlation, .30 = moderate, and $\leq$ .10 = weak correlation. Looking at the Pearson correlation in SPSS, we can see that of the 20 Cumulative Item scores that were correlated with the Overall Impression score, 12 (60%) had a strong correlation; 4 had a moderate correlation (20%); and only 4 (20%) had a weak correlation. This indicates strong statistical evidence for convergent validity of the GATE. It is interesting to note that the weak correlations were primarily in the Walking & Activities domain, which has the most items related to paving, an element of gardens that, in contrast to greenery, is not usually considered restorative.

HEALTHCARE
GARDEN
EVALUATION
TOOLKIT

GARDEN ASSESSMENT TOOL FOR EVALUATORS

INSTRUCTIONS — PLEASE READ BEFORE YOU BEGIN

STEP 1: ESTABLISH CONSENSUS
There should always be at least two evaluators. Evaluators must agree on the 1) Garden boundaries 2) Main doorway 3) Primary pathway.

STEP 2: WALK THROUGH THE GARDEN BEFORE YOU START
Think of the garden from the point of view of a frail patient. Walk through the entire garden, test the furniture, look at the area from different positions – including wheelchair and child height. Ask yourself, "How well does this garden support the needs of patients, visitors, and staff?"

STEP 3: EVALUATE THE GARDEN
For each statement on the next five pages, check the box that best represents your level of agreement. If you are unsure or if the statement is not applicable (N/A), check the last box. Note: It is better to check "Not sure or N/A" than to make a guess! A tape measure will be useful for some of the items.

STEP 4: RETURN THE FORMS
Return by mail to Naomi Sachs, 800 Gilchrist Avenue, College Station, TX 77840 or scan and email to nsachs@tamu.edu.
Questions or concerns? Email nsachs@tamu.edu or call (845) 264-2026.

GENERAL QUESTIONS

01	Your name:		
02	Your role/profession (landscape architect, nurse, etc.):		
03	Date:	Time:	AM or PM (circle one)
04	Weather (sunny, cloudy, windy, etc.):	Temp (°F or warm, cool, etc.):	
05	Name of facility and location (city, state):		
06	Name of garden (if it is named):		
07	Type of facility or patients served:		
08	Location and type of garden (e.g., front entry, central coutyard, rooftop, etc.):		
09	Are there other gardens and/or outdoor sitting areas at the facility?	YES	NO
	If YES, please list:		

OVERALL RATING

NOT RESTORATIVE AT ALL → COMPLETELY RESTORATIVE

		1	2	3	4	5	6	7	8	9	10
*	On a scale of 1-10, how would you rate the **overall restorativeness** of this garden? *"Restorative"= Able to restore a person's strength, health, or well-being.*	1	2	3	4	5	6	7	8	9	10

Figure 3.5 Overall Impression score. The question, outlined in red, asks for a 1–10 "Overall Impression" score of the garden before evaluators begin the item-by-item audit process to determine the "Cumulative Item" GATE score.

Table 3.4. Correlation of GATE "Overall Impression" and "Cumulative Item" scores
Note: Overall Impression (*in italics*) score has been converted from original 1–10 to GATE 1–4 for comparison
"Correlation strength" is strength of correlation between Overall Impression score and
all other Cumulative Item scores of garden, domains, and sub-domains from GATE audit.

Variable	**Mean**	***SD***	**Significance**	**Correlation strength**
Overall Impression score	*2.24*	*2.12*	*1.00*	*N/A*
GATE Cumulative Item Score (actual mean score)	2.97	0.37	0.79**	Strong
Access & Visibility (Domain AV)	2.83	0.52	0.54**	Strong
AV - Visual Access to the Garden (Subdomain)	2.75	0.68	0.55**	Strong
AV - Physical Access to the Garden	2.91	0.62	0.30**	Moderate
Sense of "Being Away" (Domain BA)	2.87	0.53	0.71**	Strong
BA - Sense of "Being Away"	2.60	0.73	0.61**	Strong
BA - Aesthetics & Maintenance	3.09	0.54	0.60**	Strong
Nature Engagement (Domain NE)	3.08	0.62	0.71**	Strong
NE - Plantings	3.19	0.63	0.68**	Strong
NE - Other Natural Features	2.54	0.87	0.53**	Strong
Walking & Activities (Domain WA)	2.96	0.37	0.32**	Moderate
WA - Primary Walkway	3.48	0.44	-0.08	Weak
WA - All Paved Areas	3.19	0.52	0.13	Weak
WA - Lighting, Wayfinding, Amenities	2.29	0.80	0.23*	Weak
WA - Variety & Activities	2.16	0.64	0.38**	Moderate
Places to Rest (Domain PR)	3.16	0.55	0.59**	Strong
PR - Seating Availability & Type	2.87	0.82	0.34**	Moderate
PR - Private of Social	3.42	0.61	0.59**	Strong
PR - Aesthetics & Sun	3.33	0.48	0.60**	Strong
PR - Tables	2.71	1.24	0.04	Weak

SD = Standard Deviation
** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

3.5.4 Reliability

Methodology for GATE interrater reliability analysis. Only the Houston GATE data were analyzed for interrater reliability (IRR). Kappa statistics were used for categorical (Yes/No) items and Intraclass Correlation Coefficient (ICC) was used for the ordinal 4-point Likert-type scale items as well as for the overall GATE instrument, domains, and sub-domains. Percentage of agreement was also used for individual ordinal items. For ICC, a two-way random model with absolute agreement and average measurement was employed. The two-way random model was used because raters were considered to be a random sample of all potential future raters, and all 25 gardens were rated by each rater. Results run with Consistency and Absolute Agreement were very similar and not statistically significant; Absolute Agreement is reported here.

Acceptable bounds for Kappa and intraclass correlation coefficient. For Kappa and intraclass correlation coeffient (ICC), values generally range from 0–1, with higher numbers indicating stronger interrater agreement. There is no consensus about acceptable bounds for Kappa and ICC; opinions vary across researchers and disciplines (Loewenthal, 2001; Tavakol & Dennick, 2011). Both Rodiek and Lee, whose audit instruments or methodologies were used as models for the GATE, cited Anastasi (1988), Landis and Koch (1977), and Portney and Watkins (1993) for the ranges they used for interrater and test-retest reliability (Lee, Kim, Dowdy, Hoelscher, & Ory, 2013; Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2016). Rodiek and colleagues used .60–.75 as the acceptable range of minimum values for ICC. The SOS Tool did not have categorical items, thus Kappa was not necessary. For Kappa, Lee and colleagues used .40–.59 as "moderate" reliability, .60–.79 as "good," and over .80 as "outstanding" agreement/reliability. For ICC, below .60 was considered "poor," .60–.75 was "moderate," and above .75 was "good" reliability (2013, p. 953). While these ranges are not as conservative as some—DeVelllis (2003) or Nunnally and Bernstein (1994)—for example) they are more conservative than, for example, Saelens et al. (2006) who used the Kappa range (below .40 as "poor," .41–.60 as "moderate," and above .60 as "good to excellent") for all of their limits of acceptability, including ICC. Computationally, Kappa generally results in lower scores than ICC; therefore, using this range is a more liberal assessment.

As was discussed above, the number of missing values and no or low response variability with some items made calculation of ICC difficult. While it may seem counterintuitive, low variance—when there is perfect or near-perfect agreement between raters—cannot be computed with SPSS and other similar statistical software. Saaelens and colleagues (2006) had a similar issue, which they addressed by looking at percentage of agreement between evaluators. Their percent agreement criteria were: < 60% as “poor,” 60–74% as “moderate,” and ≥ 75% as “good to excellent.” These criteria were also used for the GATE *percent agreement* analysis, as shown in Table 3.5. The *ICC* range for the GATE is as follows: below .60 is the lower threshold (“poor/unacceptable”), .61–.74 is “moderate,” .75–.89 is “good,” and above .90 is “excellent.” The *Kappa* range is: below .6 is “poor/unacceptable,”.40–.59 is “moderate,” 0.60–0.80 is “good,” and above 0.81 is “excellent.”

Three primary analyses for IRR were performed using ICC and Kappa:

1. Two RAs (researcher’s data not included in analysis)
2. Two RAs and researcher (3 evaluators total)
3. Two RAs with 5-point scale

Interrater reliability results

Two evaluators (RAs): As shown in Table 3.5, for the four Yes/No items, Kappa scores ranged from good to excellent (.70–1.00). ICC for the *overall instrument* could not be calculated due to missing values and zero or low variance with too many items. The domain Access & Visibility could also not be calculated due to the missing values and zero or low variance of several items. For the four domains that could be analyzed, ICC scores were “moderate” for Sense of “Being Away” (.68), Nature Engagement (.69), and Places to Rest (.72). Walking & Activities had “poor” ICC (.49), which may have been due to many items having zero or little variance. Three of the 14 *sub-domains* could not be calculated due to missing values and zero variance with too many items. ICC for the remaining 11 subdomains ranged from a low of .25 (for Walking & Activities, All Paved Areas) to a high of .93 (for Nature Engagement, Plantings). Four subdomains had “poor” ICC (.25–.59), two had “moderate” (.64, .69), five had “good” (.77–.82),” and one had “excellent” (.93). Of the 82 individual items analyzed for ICC, four had zero variance and were removed from further analysis. For the 78 items with sufficient variance to be calculated, ICC measures ranged from -.15 (poor) to .98 (excellent). Places to Rest was the only domain with two negative ICC scores. Interrater reliability for 18% of the items was excellent (.90–.98); for 24% of the items was good (.75–.89); for 20% was moderate (.61–.74); and for 38% was poor (-.15–.60). When percentage agreement was calculated for the same 82 items, ratings increased for most, with many more items rating "excellent" (more than 75% agreement; 73% of the items rated as excellent) or "moderate" (60–74% agreement; 21% of the items); and only five items (less than 1%) rating as "poor" (lower than 60% agreement). It is clear from the difference between ICC and percentage agreement ratings that missing values and low variability strongly and negatively affected ICC scores.

Three evaluators (two RAs and researcher): Some research indicates that as the number of evaluators increases, IRR will also increase (Landers, 2016). When the researcher's GATE data were added to reliability calculations, ICC and Kappa scores for most items did improve, but not significantly.

Two RAs with a 5-point scale**: **Would a 5-point scale improve IRR? The researcher wanted to see whether and to what extent inclusion of the "Not Sure or N/A" (NS/NA) responses would change ICC and Kappa results The NS/NA option does not utilize the same response categories as most of the GATE items (ranging from 1–4, Strongly Disagree to Strongly Agree). A score of "0" for the NS/NA would imply "*Very* Strongly Disagree." Therefore, using 0–4, with 0 representing NS/NA, was not an option. Instead, a new 5-point scale was created for this test, where Strongly Agree = 5, Somewhat Agree = 4, NS/NA = 3 (the mid-point on the scale), Somewhat Disagree = 2, and Strongly Disagree = 1. Thus, the rating for Somewhat Disagree and Strongly Disagree did not change at all. The change in ICC, Kappa, and significance (*p*-value) was, for most items, not dramatic. Some scores and significance increased while others decreased. The greatest change was that ICC could be calculated for all domains and subdomains. Domain and subdomain ICC scores also improved with the revised 5-point scale. For domains, Access & Visibility ICC was .63, Sense of "Being Away" was .81, Nature Engagement was .73, and Places to Rest was .70. Walking & Activities was the only domain to remain "poor," and the score dropped, from .49 to .31.

Table 3.5 Interrater Reliability from Houston GATE Testing with 2 Evaluators
ICC and *Kappa (in italics)* scores from 25 gardens in the Houston Medical District
% Agree is percentage of agreement between 2 Evaluators
2-way Random with Absolute Agreement, ICC Average values
M = Mean, *SD* = Standard Deviation

	Item Score						
	M	***SD***	**ICC**	**Pvalue**	**Rating**	**% Agree**	**Rating**
Access & Visibility			*Could not be calculated*			*Not calculated*	
Access & Visibility - Visual Access to the Garden			*Could not be calculated*			*Not calculated*	
Garden is visible from main public indoor areas.	2.60	1.15	0.58	0.02	Poor	76%	Excellent
Garden is visible from indoor areas that involve waiting.	2.50	1.24	0.90	0.00	Excellent	60	Moderate
Garden is visible from floors above.	2.96	1.22	0.91	0.00	Excellent	80	Excellent
Entrance to the garden is easy to find.	3.54	0.69	0.66	0.01	Moderate	84	Excellent
Doors to garden are glass or have a window in or next to them.	3.98	0.10		0.01	0 variance	100	Excellent
Garden looks appealing/inviting from indoors.	3.33	1.04	0.85	0.00	Good	80	Excellent
There is signage TO the garden from indoors.	1.53	0.88	0.41	0.19	Poor	52	Poor
There is signage ON OR NEXT TO garden doors.	1.67	1.21	0.92	0.00	Excellent	76	Excellent
Information about the garden is available.	2.55	1.13	0.33	0.29	Poor	40	Poor
Access & Visibility - Physical Access to the Garden			**0.77**	**0.00**	**Good**	*Not calculated*	
Garden is open 24 hours a day, 7 days a week. (Kappa)	*0.75*	*0.44*	*1.00*	*0.00*	*Excellent*	*100*	*Excellent*
Doors to the garden from at least one entry are automatic and e	3.02	1.38	0.98	0.00	Excellent	96	Excellent
Any non-automatic doors are easy to operate.	2.00	0.81	0.31	0.32	Poor	88	Excellent
Doorway thresholds are flat and smooth.	3.83	0.32	0.64	0.01	Moderate	88	Excellent
The space just outside the main doorway is covered/roofed.	3.27	1.26	0.97	0.00	Excellent	96	Excellent
Space just outside the main doorway has seating for at least 2 p	3.42	0.75	0.07	0.43	Poor	72	Moderate
A "destination" feature draws people into the garden.	2.96	1.12	0.74	0.00	Moderate	80	Excellent
A restroom in the facility is near a garden entry (about 50 feet).	2.32	1.28	0.74	0.01	Moderate	80	Excellent
Garden has an emergency phone that connects with the hospita	2.08	1.40	0.90	0.00	Excellent	84	Excellent
Sense of "Being Away"			**0.68**	**0.00**	**Moderate**	*Not calculated*	
Sense of "Being Away"			**0.81**	**0.00**	**Good**	*Not calculated*	
People can find a desirable sense of enclosure in the garden.	3.18	0.99	0.79	0.00	Good	84%	Excellent
People can find privacy in at least one part of the garden.	2.54	1.06	0.68	0.00	Moderate	72	Moderate
People in the garden cannot look into adjacent private indoor ar	3.85	0.43		0.50	0 variance	80	Excellent
Garden has at least one fully covered (roofed) area.	2.42	1.21	0.59	0.01	Poor	64	Moderate
At least one seating area is protected from climatic/weather ext	2.40	1.14	0.49	0.04	Poor	60	Moderate
Sense of "Being Away" - Aesthetics & Maintenance			**0.64**	**0.00**	**Moderate**	*Not calculated*	
Garden has some features that provide a rich, multi-sensory exp	3.28	0.87	0.75	0.00	Good	88	Excellent
Garden is free from unpleasant sounds.	2.00	0.80	0.55	0.03	Poor	88	Excellent
Garden is free from bad odors.	3.32	0.76	0.69	0.00	Moderate	92	Excellent
Plants hide or soften unsightly views.	2.98	0.91	0.81	0.00	Good	76	Excellent
Garden is free from trash.	3.76	0.46	0.32	0.18	Poor	96	Excellent
Garden has at least one trash can.	3.58	1.00	0.95	0.00	Excellent	96	Excellent
There is a shed or other place to store tools in the garden.	1.52	0.93	0.52	0.05	Poor	56	Poor

Table 3.5, continued

	Item Score						
	M	*SD*	ICC	Pvalue	Rating	% Agree	Rating
Nature Engagement			**0.69**	**0.00**	**Moderate**	*Not calculated*	
Nature Engagement - Plantings			**0.93**	**0.00**	**Excellent**	*Not calculated*	
More than half of the garden surfaces are planted.	2.96	1.12	0.82	0.00	Good	84%	Excellent
Garden has a rich variety of plants.	2.94	0.98	0.79	0.00	Good	88	Excellent
Garden has plants at multiple heights.	3.64	0.49	0.66	0.01	Moderate	100	Excellent
Garden has plants that stimulate the senses.	3.22	0.82	0.75	0.00	Good	100	Excellent
Some plants are intriguing, provide “fascination.”	3.30	0.78	0.55	0.03	Poor	84	Excellent
Planting provides year-round interest.	3.54	0.79	0.73	0.00	Moderate	88	Excellent
Some plants provide bright colors.	3.12	1.10	0.92	0.00	Excellent	100	Excellent
Planting BEDS look well-maintained.	3.16	0.70	0.56	0.02	Poor	96	Excellent
PLANTS look well-maintained and healthy.	3.42	0.72	0.71	0.00	Moderate	96	Excellent
Plants are sturdy enough to tolerate extreme weather, people p	3.70	0.48	0.14	0.36	Poor	88	Excellent
Nature Engagement - Other Natural Features			**0.81**	**0.00**	**Good**	*Not calculated*	
Plants provide food and/or habitat for birds, butterflies, and oth	3.32	0.81	0.85	0.00	Good	96	Excellent
Garden has at least one water feature. (Kappa)	*0.32*	*0.45*	*0.81*	*0.00*	*Good*	*88*	*Excellent*
Water feature looks clean and well-maintained.	3.28	0.91	0.76	0.04	Good	78	Excellent
Water feature design and location minimizes slipping hazards.	2.50	1.00	0.61	0.14	Moderate	67	Moderate
Water feature has minimal splash.	2.25	0.85	0.91	0.00	Excellent	78	Excellent
Sound from water feature is pleasant and soothing.	3.36	0.75	0.69	0.07	Moderate	67	Moderate
Some seating is available near the water feature (within 15 feet)	3.50	1.06	0.77	0.05	Good	67	Moderate
Walking & Activities			*Could not be calculated*			*Not calculated*	
Walking & Activities - Primary Walkway (Path or Paved Thoroughfare)			**0.69**	**0.00**	**Moderate**	*Not calculated*	
Primary walkway is relatively flat (not too steep).	3.77	0.47	0.16	0.35	Poor	92%	Excellent
Primary walkway does not have steps or steep ramps.	3.77	0.51	0.13	0.38	Poor	92	Excellent
Primary walkway is smooth but non-skid, even when wet.	3.67	0.52	0.24	0.21	Poor	84	Excellent
Primary walkway is at least six feet wide or, if narrower, has frec	3.48	0.68	0.64	0.01	Moderate	88	Excellent
Primary walkway has a curb or raised edges.	2.31	1.28	0.77	0.00	Good	72	Moderate
Primary walkway has seating approximately every 30 feet.	3.38	0.86	0.39	0.10	Poor	80	Excellent
Walking & Activities - All Paved Areas (Walkways and Patios)			**0.48**	**0.00**	**Poor**	*Not calculated*	
Gaps or cracks in paving are narrow enough for a wheelchair, str	3.04	0.69	0.49	0.00	Poor	76	Excellent
Paving does not create glare.	3.44	0.74	0.39	0.09	Poor	80	Excellent
Paved areas are clear of debris and other obstacles.	3.48	0.68	0.75	0.00	Good	96	Excellent
Trees/plants along walkways and other paved areas do not drop	2.38	1.08	0.71	0.00	Moderate	72	Moderate
Walking & Activities - Lighting, Wayfinding, & Amenities			*Could not be calculated*			*Not calculated*	
There are landmarks and/or signage in the garden to help peopl	2.92	1.00	0.70	0.08	Moderate	76	Excellent
A drinking fountain is in or near the garden.	1.36	0.64	0.26	0.25	Poor	68	Moderate
Garden has lighting for night usage. (Kappa)	*0.84*	*0.35*	*0.70*	*0.00*	*Moderate*	*92*	*Excellent*
If garden has lighting: Walkways are evenly lit.	2.39	1.06	0.82	0.00	Good	72	Moderate
If garden has lighting: Lighting does not shine into patient rooms	3.97	0.11		0.50	0 variance	56	Poor
Walking & Activities - Variety & Activities			**0.77**	**0**	**Good**	*Not calculated*	
Garden has more than one walkway, with a variety of routes, ler	2.32	1.21	0.80	0.00	Good	72	Moderate
At least one secondary walkway offers increasingly levels of diffi	1.66	0.98	0.70	0.02	Moderate	36	Poor
Garden has spaces/features for therapists (PT, OT, HT) to work v	1.84	0.80	0.18	0.33	Poor	60	Moderate
Garden is safe for children.	2.64	0.77	0.52	0.01	Poor	76	Excellent

Table 3.5, continued

	Item Score						
	M	*SD*	ICC	Pvalue	Rating	% Agree	Rating
Places to Rest			**0.72**	**0.00**	**Moderate**	*Not calculated*	
Places to Rest - Seating Availability & Type			**0.25**	**0.16**	**Poor**	*Not calculated*	
The garden offers many places to sit.	3.38	0.89	0.82	0.00	Good	88%	Excellent
People can choose a variety of types of seating.	2.66	1.26	0.93	0.00	Excellent	92	Excellent
Movable seating is available.	2.20	1.32	0.96	0.00	Excellent	96	Excellent
At least 50% of the seating in the garden has backs and arms.	2.68	1.14	0.92	0.00	Excellent	92	Excellent
There is a place where someone could lie down for a rest.	3.04	0.85	0.64	0.01	Moderate	80	Excellent
Places to Rest - Private or Social			**0.82**	**0.00**	**Good**	*Not calculated*	
Garden has separate areas for activities and socializing, compare	3.16	0.72	0.34	0.04	Poor	68	Moderate
Garden provides a place where 3 or more people can sit togethe	3.36	0.96	0.77	0.00	Good	84	Excellent
Some seating areas allow people to interact with passers-by.	3.88	0.30	neg 0.15	0.62	Poor	88	Excellent
Garden provides semi-private seating for one or two people.	3.52	0.93	0.89	0.00	Good	88	Excellent
Some seating makes it possible to watch others from a distance.	3.63	0.59	0.36	0.16	Poor	88	Excellent
Places to Rest - Aesthetics & Sun			**0.25**	**0.16**	**Poor**	*Not calculated*	
There is a choice of seating in sun or shade throughout most of t	3.15	1.02	0.86	0.00	Good	92	Excellent
Seating does not produce glare.	3.54	0.72	0.50	0.06	Poor	80	Excellent
Seating material does not get too hot or too cold.	3.44	0.60	neg .024	0.53	Poor	68	Moderate
Seating, tables, and other furniture look well-maintained.	3.63	0.52	0.76	0.00	Good	96	Excellent
Some seating has attractive or interesting views.	3.35	0.90	0.91	0.00	Excellent	96	Excellent
Places to Rest - Tables			**0.59**	**0.10**	**Poor**	*Not calculated*	
Garden has at least one table. (Kappa)	*0.66*	*0.45*	*0.71*	*0.00*	*Moderate*	*84*	*Excellent*
Some seats have tables next to them.	3.94	0.16			0 variance	100	Excellent
There is at least one table large enough for four or more people.	3.00	1.19	0.43	0.15	Poor	87	Excellent
There is at least one table that can accommodate people in whe	2.94	1.14	0.87	0.00	Good	87	Excellent
Tables do not tip.	3.61	0.68	0.08	0.45	Poor	67	Moderate

3.6 Conclusion

3.6.1 Discussion

One of four instruments in the mixed methods Healthcare Garden Evaluation Toolkit (H-GET), the Garden Assessment Tool for Evaluators (GATE) was designed to facilitate standardized, systematic hospital garden assessment. The GATE is the first evaluation tool for general acute care hospital gardens known to undergo rigorous psychometric testing. The instrument can be used for evaluation of healthcare gardens after new construction or remodeling projects; it can also be used as a design checklist for new or renovated gardens, and as a research tool to get baseline scores on a garden or specific features in a garden. Individual items, organized into affordance-based domains and sub-domains, enable a diverse variety of evaluators to assess objective and subjective built environment characteristics in a broad range of hospital garden types across the U.S. The GATE's items are worded and presented to minimize subjectivity and bias in the evaluator, and a Likert-type scale enables scoring of individual items, domains, and the garden as a whole. Of the four H-GET instruments, the GATE provides the most objective form of assessment. It is probably also the least time-consuming, taking only an average of 30 minutes for each evaluator to complete, not including “calibration” that might be done before the session to improve accuracy of the results. Data entry and/or data analysis will require additional time, depending on the purpose of the evaluation. Because this is an environmental evaluation that does not collect data on human subjects, use of the GATE may not require Institutional Review Board (IRB) approval in most settings, although permission should always be obtained to visit and evaluate a facility’s gardens. If IRB review is required, it will likely be expedited or exempt for GATE research. Of the on-site evaluation instruments, the GATE is also probably the least intrusive, since garden users need not be present for the evaluation to be carried out. With its clear list of desirable garden elements and standardized evaluation and baseline scores, the GATE can also be used as design and a research tool. The GATE’s systematic approach will also facilitate data collection on and future comparisons of gardens across the country (and, potentially, internationally).

Validity. Support for *content validity* for the GATE was derived from the Cooper Marcus and Barnes’ Therapeutic Garden Audit for Acute Care Hospitals (“CMB Audit,” 2012), Rodiek’s Senior Outdoor Survey (SOS) audit tool (Rodiek, Nejati, Bardenhagnen, Lee, & Senes, 2016), and other previously published audit instruments and healthcare garden design guidelines, as shown on Table 3.1. Further support for content validity comes from the researcher‘s extensive literature reviews, feedback on early and later iterations of the GATE instrument from experts and lay people, and from testing of the GATE alongside the three other H-GET instruments at nine Pilot Test site gardens. Support for *convergent validity* was derived from principal component analysis and from the strong to moderate correlation of “Cumulative Item ” and “Overall Impression” GATE scores in all but four domains and sub-domains. These results indicate that evaluators’ first impression of the garden aligns well with how the garden is rated by the GATE scoring system (Campbell & Fiske, 1959). Further support for convergent validity was provided by correlation of a similar scoring technique in the H-GET Visitor and H-GET Staff Surveys, as will be discussed in Chapter IV.

Reliability. Three data sets from the 25 Houston Medical District testing were analyzed for interrater reliability (IRR) using Kappa for categorical and intraclass correlation coefficient (ICC) for continuous items, sub-domains, and domains. The data sets were from (a) the two Research Assistant (RA) evaluators; (b) the two RAs and the researcher; and (c) the two RAs with the GATE scale converted to a 5-point scale. With all three data sets, Kappa scores ranged from "good" to "excellent." Analysis of ICC was more difficult due to the high number of missing variables and items with zero or low variance. ICC for the *overall instrument* and for the Access & Visibility domain could not be calculated due to too many missing values and zero or low variance. As shown in Table 3.5, the ICC of the four other domains ranged from .49 (poor) to .72 (moderate). ICC numbers for most sub-domains were higher, ranging from .25 (poor) to .93 (excellent). Of the 78 individual GATE items analyzed, ICC measures ranged from -.15 (poor) to .98 (excellent). All five domains had a range of ICC from poor to excellent, but Nature Engagement had only two "poor" ICC values (.55 and .56). Access & Visibility had the most "excellent" values (six, from .90–.98). Places to Rest was the only domain with two negative ICC scores. IRR improved when data from a third evaluator (the researcher's) was added to Kappa and ICC calculations. This was not surprising, as it is known that as the number of evaluators increases, IRR will also increase (Landers, 2016). When the GATE's scale was converted into 1–5 (instead of 1–4) by incorporating the Not Sure/Not Applicable values, IRR scores for individual items were mixed (some items improved, others were worse), but ICC for all domains and sub-domains could at least be calculated, and most scores improved markedly. For domains, Walking & Activities was the only domain to remain "poor." Percent agreement between the two RA evaluators was calculated for individual items to compare with ICC scores. In general, percent agreement ratings were higher than ICC scores, another indicator that missing values and low to no variance in several items confounded ICC calculations.

3.6.2 Limitations and Future Research

Countless papers and conference presentations end with the conclusion that more research is needed ('the research shows that we need more research…'). This study is no different. There is always room for improvement, and instrument development is usually an ongoing, iterative process that does not end when the instrument is released and the first results are published.

As other researchers begin to use the instrument, a feedback loop is created that—when the instrument developer is open to change—allows for continuous improvement. Limitations with the current GATE instrument provide an excellent starting point for its improvement process. The primary limitations in this study, such as the number and location of sites, the number of evaluators, and the depth and breadth of data analysis, were related to time and budget considerations. In future studies, these limitations can be addressed by the researcher, and by others in the field who might find this Toolkit useful.

Validity. This chapter has documented strong support for validity regarding the GATE's conceptual framework, organization, scoring, and visual format. But instrument validation is an ongoing process, and future work will continue to address validity. During instrument development and testing of the H-GET, more data was collected than could be analyzed for this dissertation. For example, future H-GET survey research will include multiple regression and qualitative analysis from survey data, which may add further support for validity of the GATE and other H-GET instruments. Ideally, a system of cross-checking and cross-validation of instruments will be developed for future H-GET users to employ.

Reliability. Interrater reliability (IRR) was more mixed than was anticipated, and future work will focus on IRR, as well as test-retest reliability, which was not possible within the scope of this study. Analysis of IRR with ICC was difficult due to the many missing variables and items with zero or low variance (perfect or near-perfect agreement between raters, which SPSS will not compute). Some possible avenues to explore are the addition of at least one more point to the four-point scale; using a different recording or scoring strategy for the Not Sure/Not Applicable option; and improvement of evaluator training.

Adding to the Likert scale. It may be that the GATE's current four-point scale is not sufficient to capture the range of evaluators' assessments, or that it simply does not provide enough data for reliable statistical analysis. Østerås and colleagues (2008) compared an original four-point scale, the Norwegian Functional Assessment Scale (NFAS), to a new five-point scale version (NFAS-5) and found that the five-point scale had fewer missing data and larger end effects at the item and scale level. Participants also reported that the NFAS-5 was easier to complete. Although levels for both were acceptable, the five-point scale performed better with internal consistency and item-discriminant validity. The authors proposed that the significantly fewer missing data on the NFAS-5 vs. the NFAS-4 “is some indication that the respondents found it easier choosing a suitable response from the five-point scale,” (Østerås et al., para. 29). Nagata, Ido, Shimizu, and Matsuura (1996) had a similar finding when they compared the feasibility of health measurement response scales using four, five, and seven categories and a visual analog scale. Missing data were lowest and responder preference was highest with the five-point scale. In future iterations, a fifth point (probably ‘Neither Agree nor Disagree’) could be added to the GATE for comparison using Østerås’ methodology.

On the other hand, it may be that many more item questions would function just as well, if not better, as Yes/No rather than scale items. The non-normal binomial distribution of both GATE Houston RAs would certainly suggest this. Future data analysis could split the “Agree” and “Disagree” responses to examine Kappa scores for IRR.

“Not Sure/N/A” category. Most of the responses that were treated as “missing” during data analysis were not actually missing; they could not be analyzed because there was no appropriate scale number. Rodiek and colleagues (2016) decided to not include Not Sure or N/A response categories, which was possible due to the emphasis on affordances. In the SOS Tool, raters evaluated each item in terms of the usage it was intended to support; even a missing feature can be evaluated in terms of the extent of support it provides (or lacks) for the intended behavior. Removing the NS and NA response categories from the GATE may yield higher reliability; as another option, separating these two categories (NS and NA) would likely also improve reliability, since they would no longer be bundled.

User Manual. A User Manual will be important in ensuring proper use and higher reliability of the GATE. The TCOPPE School Audit Tool Training Manual (Lee, Kim, Dowdy, Hoelscher, & Ory, 2013) will be used as a model. The GATE User Manual will achieve three aims: first, it will provide context, explaining what the instrument is, why it is important, and how it can be used. Second, it will provide detailed instructions for site visit protocol and data collection, including detailed instructions for coding responses (Cutler, 2000). Third, the Manual will provide specific instructions for data analysis and/or scoring upon completion of data collection. Additional pilot studies should test whether a User Manual is sufficient for correct usage of the GATE or whether formalized training, either in-person or through a webinar-type format, is necessary.

Weighted scores. Scores for individual items were not "weighted." In other words, each item carried the same weight as another. Ideally, some items, such as those addressing safety, should be weighted more heavily. Weighting would provide a more accurate assessment, and a more meaningful score for comparing different domains and different gardens. Few audit tools have weighted scores, and many that do use a rather simplistic method. Bardenhagen, Rodiek, Nejati, and Senes (2016) have recently developed an evidence-based weighted scoring system for the SOS Tool that could, potentially, be used as a foundation for the GATE.

Future analysis of existing and new data. Data from the "demographic" portion of the GATE (e.g., date and time, weather, type of facility and garden) could be analyzed to see if any significant patterns emerge. For example, are evaluators affected by the weather? If they are uncomfortable due to cold, heat, or humidity, is their rating of all or certain domains or items affected? Perhaps a question with a scale rating about personal comfort could be added to the demographic information. With some of the Houston Medical District GATE testing, the researcher measured and noted decibel readings, door weights for non-automatic doors, humidity, and whether or not the garden being evaluated was in shade or sun. Not enough data was collected to warrant statistical analysis, but future versions and testing of the GATE could explore these possibilities.

A note about the GATE as a design tool: A minimum checklist. The GATE is organized so that it can be used as a design tool. Because each item is presented so that Strongly Agree/4 represents the ideal situation, designers and healthcare organizations can use the GATE as a "checklist" and guide for implementing the best solutions. However, the GATE should not be used as an all-encompassing checklist for healthcare garden design. Only the most salient features, and those that were actually observable and ratable, were included. Future GATE iterations may exclude even more items based on statistical analysis and user feedback. Cooper

Marcus and Barnes (2012) eliminated certain items from their CMB Audit—such as "the garden is culturally appropriate"—because wording or the concept was too vague, or too subjective, for participants to be able to rate (Cooper Marcus & Sachs, 2013). The same was done in the GATE's iterative process. Cooper Marcus and Sachs' Chapter 6 of *Therapeutic Landscapes* (2014) provides the most comprehensive published list of design guidelines known at this time. Additional concepts or guidelines that were not included in the GATE, but that should be addressed by designers and facilities, include:

Accessibility, ADA, and Universal Design: Any public space in healthcare in the U.S. must, by law, adhere to stipulations from the Americans with Disabilities Act, which addresses issues such as maximum slope for walkways, use of handrails along ramps and stairs, and maximum height and slope of door thresholds. But gardens in HCFs must go above and beyond the minimum requirements to best meet the needs of all users, including the most challenged and frail. Universal Design (UD) practice, which designs all features to be usable for people with a wide range of abilities, should be employed whenever possible.

Sustainability: Sustainable design and maintenance practices are difficult to measure because they vary greatly from site to site. One site may utilize rain gardens for stormwater management; another may use a green roof; another may use condensate from the building's HVAC system to irrigate the garden, or drip irrigation rather than spray or hand-watering. Such practices are often not visible to the casual observer and may be too complex to summarize in an audit tool.

Population-specific design: The GATE is intended for use in general acute care hospitals where a diverse population of patients is served. Healthcare facilities that serve specific populations—for example, children, hospice, mental and behavioral health, and rehabilitation—may have different or additional requirements. Future GATE tools may address specific populations, for example a "GATE-PDS" for children's hospitals and clinics, a "GATE-MBH" for mental and behavioral health facilities, or a "GATE-HSP" for hospices. Cooper Marcus and Sachs (2014) cover several of these patient and healthcare types in *Therapeutic Landscapes*. Rodiek's SOS

Tool (2016) is an excellent population-specific tool for residential elder care facility gardens. Cooper Marcus' AGAT dementia tool (Cooper Marcus, 2007) may still be the best tool to assess outdoor environments for seniors with dementia.

***The site as healing environment*:** The GATE was designed to assess healthcare gardens that are specifically intended as restorative gardens. The ideal healthcare facility has more than one single "healing garden." Instead, the entire campus, from the entry drive to the parking lot to the cafeteria patio to the healing garden(s), would be rich with plants, seating, and other elements that create a safe, inspiring environment that leads to the best outcomes for patients, visitors, and staff. In future testing of the GATE and other H-GET instruments, it will be interesting to analyze whether the rating system works with outdoor areas that are not discrete, distinct healing gardens.

CHAPTER IV

SURVEYS OF PATIENTS, VISITORS, AND STAFF

4.1 Introduction

4.1.1 Background and Intent

Surveys can provide useful quantitative and qualitative data and can help identify commonalities and differences among groups of people who are answering the same sets of questions. Zeisel remarks that surveys can help investigators learn a great deal in a relatively brief amount of time (2006). Shepley notes in *Health Facility Evaluation for Design Practitioners* (2011) that most facility evaluations involve some kind of survey. In such studies, researchers often employ a mixed methods approach by combining quantitative and qualitative data collection and analysis (Shepley, 2011; Zeisel, 2006).

This chapter focuses on development and testing of two separate but closely related and structurally similar surveys: The Healthcare Garden Evaluation Toolkit *Visitor* Survey (which will be called the "Visitor Survey" in this chapter), designed for use with healthcare patients and visitors, and the Healthcare Garden Evaluation Toolkit *Staff* Survey ("Staff Survey"), designed for use with staff and volunteers. As with all four H-GET instruments, the primary goal in regards to surveys for this dissertation was to develop and test the survey instruments and establish corresponding instrument validity. Support for content, face, and convergent validity will be discussed. Descriptive statistics results from the surveys will also be discussed, as will preliminary statistical analysis for hypothesis testing. Survey reliability was not examined for this dissertation study, but will be in future research.

The H-GET Visitor and Staff Surveys were designed to help researchers, designers, and HCF administrators learn about participants' awareness and use of the HCF garden, barriers to garden use, assessment of specific elements of the garden, and opinions about staff garden use. During survey development, drafts underwent a review and pre-testing process before the final Surveys were administered along with the other three H-GET instruments (Garden

Assessment Tool for Evaluators, Behavior Mapping, and Stakeholder Interviews) at the eight H-GET Pilot Test healthcare facilities (HCFs) described in Chapter II.

4.2 H-GET Surveys Development and Validation Process

The H-GET Visitor and Staff Surveys were developed through an iterative process based on an extensive literature review, use of similar existing instruments as models, expert opinion on the overall survey and specific details such as questions and formatting, and pre-testing before data collection. Survey development begins, through literature review, with identification of the questions to be addressed and the theoretical framework for the research. Development then continues with further literature review, writing of questions, and formatting of the instrument (Shepley, 2011; Zeisel, 2006). To ensure validity and reliability of the instrument before it is distributed for data collection, it is important to get feedback on drafts from experts in the subject field (in this case, healthcare garden design) and in survey design, as well as from people who are similar to those who will be surveyed (Dillman, Smyth, & Christian, 2014). The last step in survey development before it is distributed for data collection is to pre-test the final (or near-final) draft with people similar to those who will be surveyed. The term "pre-test" will be used in this chapter for testing of surveys *before* data collection to differentiate it from "Pilot Test," the term used throughout this dissertation for on-site use of and data collection with the four H-GET instruments.

4.2.1 Support for Validity

In instrument development, the instrument has *validity* when it successfully measures what it is supposed to measure (Loewenthal, 2001). Nunnally points out that validity, especially in qualitative and mixed methods research, is "usually is a matter of degree rather than an all-or-none property, and validation is an unending process" (1984, p. 84). Some forms of validity, such as content and face validity, are addressed primarily in the instrument's development stage, while construct-related validity, such as convergent validity, is supported through data analysis after the instrument has been tested (Leedy & Ormrod, 2013). The types of validity that were examined for the H-GET Surveys are described below:

Content Validity is whether, and how much, a particular instrument represents all facets of an idea (Anastasi, 1982; Leedy & Ormrod, 2013). Content validation for the survey instruments in this study involved (a) review of the literature that informed the underlying theoretical framework and development of the instrument; (b) review of the literature from research that used similar instruments; (c) close review of those similar instruments and use of them as models for the surveys; (d) use of opinions and feedback about the instrument from a range of people, including experts and lay people; and (e) the research conducted during instrument testing.

Face Validity is how well an instrument appears that it will measure what it is intended to measure (Anastasi, 1982; DeVellis, 2003). On the surface, or at face value, does the instrument *look* valid? Does it look professional and legitimate? Does it appear to make sense? In this study, face validity was examined as part of the content validation process.

Convergent validity, a type of construct validity, is "the extent to which an instrument measures a characteristic that cannot be directly observed but is assumed to exist based on patterns of people's behaviors" (Leedy & Ormrod, 2013, p. 90). With convergent validity, the researcher's variables correlate the way they were intended to. Divergent (or discriminant) validity is the second type of construct validity, in which the researcher's variables do not correlate to what they should not. This study tested convergent validity of the surveys by correlating two types of scoring methods of the Pilot Test gardens with each other, as will be described in the Results section. The following steps were taken during instrument development and validation process to support content and face validity.

Literature review. An extensive literature review informed survey development, first between 2011 and 2013 for the researcher's book, *Therapeutic Landscapes: An Evidence-based Approach to Designing Healing Gardens and Restorative Outdoor Spaces* (Cooper Marcus & Sachs, 2014) and then more recently for this dissertation study. Although the literature review for this study included review of more recent general materials on the benefits of nature engagement in and outside of the healthcare setting, described in Chapter I, the primary focus for survey instrument development was on review of similar existing surveys and on survey development in general. H-GET Survey development began with a literature review for HCF evaluations and then close examination of relevant evaluations and tools used for that research, as described in Chapters I and II.

Previous instruments for HCF garden evaluations. For strength of findings, it is best to use previously validated surveys or questionnaires (Zeisel, 2006). When this is not possible, a researcher should model their new survey on similar examples where validity and reliability have been established. For example, Zhu, Yu, Lee, Lu, and Mann (2014) adopted and adapted survey items from multiple previously validated surveys. They based their adaptations on focus group feedback from study participants (2014). For the H-GET Surveys, survey instruments from relevant HCF garden evaluation studies were examined, and questions and methodology were adapted as necessary.

All of the eight HCF garden evaluations that were examined closely for this study used surveys as one of their methods (Cooper Marcus & Barnes, 1995; Davis, 2011; Heath & Gifford, 2001; Naderi & Shin, 2008; Pasha, 2011, 2013; Rodiek & Lee, 2009; Sherman, Varni, Ulrich, & Malcarne, 2005; Whitehouse, 1999, 2001). For a summary of these studies, see Table 2.2 in Chapter II. For full citations and abstracts, see Appendix 2.1. Three of the eight published studies included the original surveys (Cooper Marcus & Barnes, 1995; Davis, 2011; Whitehouse, 1999). Pasha (2011) and Rodiek (2004; Rodiek & Lee, 2009) shared the original surveys with the researcher. Most of the surveys were administered through personal interviews (Cooper Marcus & Barnes, 1995; Davis, 2011; Heath & Gifford, 2001; Rodiek & Lee, 2009; Sherman, Varni, Ulrich, & Malcarne, 2005; Whitehouse et al., 2001). For example, Cooper Marcus and Barnes approached people in the HCF garden and asked if they would participate in a short survey. They then asked them the questions and noted answers on a hard copy of the survey. Whitehouse (2001) conducted in-person surveys and then brief interviews. Davis (2011), too, conducted surveys in person. This face-to-face interaction made it possible for the researchers to collect more detailed, personalized information than one can get usually get from an anonymous, self-administered survey. In-person interviews allow the researcher, when necessary and when the participant is willing, to probe for information beyond the specific survey questions. These face-to-face surveys/interviews also allowed researchers to get immediate feedback when components of the surveys, such as wording or length, needed to be clarified or improved.

However, human subjects protection has become increasingly stringent, and Institutional Review Board (IRB) approval for access—especially impromptu access—to vulnerable populations such as healthcare patients and visitors has become very difficult to obtain, even when no physically invasive procedures (such as blood draws) are involved. Erring on the side of less interaction with human subjects and better feasibility for large-scale surveys, the H-GET Surveys were designed so that no direct interaction with participants was needed.

None of the previously published surveys were fully adequate for capturing all of the information that this study intended to measure. But questions and formatting from the existing surveys, particularly Cooper Marcus and Barnes (1995), Pasha (2011), Rodiek (2004), and Whitehouse (1999), informed the H-GET Surveys. In some instances, direct language from the surveys was used. The book *Internet, Phone, and Mixed-Mode Surveys* by Dillman, Smyth, and Christian (2014) also provided useful guidelines for survey instrument development.

Professional and practice-based input. The researcher used "Expert Conversations"—semi-structured interviews with practitioners who had conducted similar research, as described in Chapter II—in early stages of instrument development to identify methodological and structural strategies for the surveys. In addition, the researcher's twelve years of experience as Director of the non-profit organization, the Therapeutic Landscapes Network, contributed to best practice knowledge, as it entailed frequent correspondence with professionals in healthcare design, healthcare garden design, healthcare research, and related fields.

Expert opinion. During the surveys' development and refinement, draft versions were reviewed by architects, landscape architects, interior designers, occupational therapists, horticultural therapists, clinical and non-clinical healthcare practitioners, healthcare design researchers, and professors with experience in survey design, administration, and analysis. These experts read paper or digital drafts of the surveys and either wrote on the paper draft or used Microsoft Word Track Changes to suggest edits on the digital version. The researcher held cognitive interviews with two experts in which they “walked through” the survey together as the expert pointed out any problems they encountered while the researcher listened and took notes. For the near-final draft, reviewers participated in an online pre-test of the surveys. This pre-test was important for addressing technical issues, finding out how long the surveys would take (the goal was 10 minutes), and receiving any final feedback about content or format that needed refinement before finalizing the Surveys for Pilot Testing at the eight designated H-GET HCFs.

The researcher also needed a “lay person’s” perspective, since most of the survey participants would not be not experts in the field of healthcare garden design or survey development. The researcher used the same methodology that had been used for experts with non-experts, including colleagues, fellow graduate students, friends, and family members who were asked to give candid responses as well as suggestions for improvement on the survey drafts.

Face validity. Support for face validity was sought during the content validation process. Experts and lay people were asked to comment not just on the *content* but on the *look and feel* of the instrument—whether it made sense, looked professional and legitimate, and looked, at face value, like the questions would accurately capture the information the researcher sought.

4.2.2 H-GET Surveys Questions and Format

Two very similar surveys were developed: the H-GET Visitor Survey for patients and visitors (see Appendix 4.1), and the H-GET Staff Survey for staff and volunteers (see Appendix 4.2). The surveys were designed to help researchers, designers, and healthcare administration learn about (a) participants’ awareness of and attitudes toward the HCF garden and healthcare gardens in general; (b) whether the participant was aware of and had visited the garden; and (c) if they had *not* visited the garden, what were the barriers to visiting. All participants were also asked demographic and background questions including gender, race, language, role in the facility (patient, visitor, staff, volunteer), length of treatment or work at the facility, and their attitudes toward nature in their everyday lives away from the facility. For participants who *had* visited the garden, additional questions were asked about (a) specific conditions of their garden use (e.g., how often, for how long, barriers to longer or more frequent use, and activities and feelings while visiting the garden); (b) thoughts about the garden's role in their health and satisfaction with the overall facility; (c) how they would rate the garden and specific garden features; and (d) opinions about staff use of the garden.

The surveys collected both quantitative and qualitative information. To limit respondent burden and allow for quantitative statistical analysis, the majority of questions were closed-ended, using categorical (e.g., yes/no, male/female), multiple-choice (e.g., for barriers to garden use, participants could choose nine options including "my health," "too busy," and "too far away/hard to get to") or a Likert-type scale (e.g., "definitely yes" to "definitely no"). Some closed-ended questions contained an option for write-in responses so that participants could provide additional details. Three open-ended question near the end of the survey asked for comments about the garden—what participants liked most and least, and any other general comments.

To enable comparison between patients/visitors and staff/volunteers, as many questions as possible were worded exactly the same in both the H-GET Visitor Survey and the H-GET Staff Survey. As a result, 26 out of 46 total questions in the H-GET Staff Survey are the same as 26 out of 36 total questions in the H-GET Visitor Surveys. Questions differed between the two surveys only when it was necessary. For example, for the H-GET Visitor Survey, demographic questions asked participants whether they were patients, visitors, or "other." For the H-GET Staff Survey, participants were asked to choose from a list of 17 possible roles in the HCF (e.g., Registered Nurse, Physician, Chaplain, Volunteer).

In early conversations with researchers and HCF personnel, it was decided that providing both paper and online surveys would be the best option because it would enable people to participate regardless of whether they had access to a computer with internet. Thus surveys were first created in Qualtrics, an online survey platform, and then paper versions were created based on the Qualtrics version. The graphic designer who designed the Garden Assessment Tool for Evaluators (GATE) followed a similar format and style for the design of the paper H-GET Visitor and Staff Surveys. Both Surveys were divided into eight sections:

1. On the first page were instructions and general information, including IRB documentation and consent, as shown in Figures 4.1 and 4.2.
2. “Please tell us about yourself” (four questions for the Visitor Survey; eight for the Staff Survey):
1. “Garden awareness and access” (eight questions for the Visitor Survey; ten for the Staff Survey)
2. “A few more questions about you” (five questions)
3. “Garden visits” (seven questions)
4. “Garden quality”
    a. 12 Likert-type items for rating elements of the garden, modeled on the Garden Assessment Tool for Evaluators (GATE)
    b. Three additional questions
5. “Staff use of the garden” (three questions for the Visitor Survey, seven questions for the Staff Survey)
6. “Additional garden comments”

Because each facility had its own policies and protocol, the survey introduction page was designed to be flexible and customizable for distribution at different study sites, as will be described in the next section.

HEALTHCARE
GARDEN
EVALUATION
TOOKIT

HEALTHCARE GARDEN VISITOR SURVEY

GENERAL INFORMATION ABOUT THIS SURVEY

This survey is being conducted by a Ph.D. Candidate at Texas A&M University about gardens in healthcare facilities. It should take 5-15 minutes to complete. **If you work or volunteer at the healthcare facility, please fill out the green Healthcare Garden STAFF Survey instead.**

Even if you didn't know about the garden until now, your feedback is still important!

YOUR RIGHTS AS A RESEARCH PARTICIPANT

Aside from your time, there are no costs for taking this survey. You will not be paid, but your participation is valuable for the research. Your participation is completely voluntary. You may decide not to participate, or to stop at any time. The survey is completely anonymous and we will not collect any identifiable information. By completing the survey, you are giving permission for the researcher to use your responses, combined with those of other participants, for research purposes. There are no known risks for taking part in this survey. Information will be kept confidential to the extent permitted or required by law. People who have access to these records include the Principal Investigator and research study personnel. Representatives of regulatory agencies such as the Office of Human Research Protections (OHRP) and entities such as the Texas A&M University Human Research Protection Program may access these records to make sure the study is being run correctly and that information is collected properly.

QUESTIONS ABOUT THE RESEARCH

You may contact the Principal Investigator, Susan Rodiek, Ph.D., to report a concern or complaint about this research at (979) 862-2234 or rodiek@tamu.edu. You may also contact the Protocol Director, Naomi Sachs, at (845) 264-2026 or nsachs@tamu.edu. For questions about your rights as a research participant, or if you have questions, complaints, or concerns about the research and cannot reach the Principal Investigator or want to talk to someone other than the Investigator, you may call the Texas A&M Human Research Protection Program office by phone at (979) 458-4067, toll free at (855) 795-8636, or by email at irb@tamu.edu.

SECTION 01 **PLEASE TELL US ABOUT YOURSELF**

01 What healthcare facility are you visiting/ being treated at today?

- ☐ Baylor Scott & White Hospital
- ☐ Legacy Good Samaritan Medical Center
- ☐ Greenwich Hospital
- ☐ St. Joseph Hospital
- ☐ Legacy Salmon Creek
- ☐ Oakland Kaiser Broadway Medical Office Building
- ☐ Oakland Kaiser Specialty Medical Office Building
- ☐ Smilow Cancer Hospital

02 Are you a (please check one):

- ☐ Patient
- ☐ Visitor
- ☐ Other (please specify) : ____________________

Note: If you work or volunteer at this healthcare facility, please fill out the Healthcare Garden STAFF Survey instead.

03 Is this your first visit to this hospital? ☐ Yes ☐ No

If No, about how many times have you visited this hospital? ____________________

04 On a scale of 1–10, how important to you is being outside in nature when you are not at the hospital?

NOT AT ALL IMPORTANT 1 2 3 4 5 6 7 8 9 10 EXTREMELY IMPORTANT

Figure 4.1 First page of the H-GET Healthcare Garden *Visitor* Survey.

HEALTHCARE GARDEN EVALUATION TOOKIT

HEALTHCARE GARDEN STAFF SURVEY

GENERAL INFORMATION ABOUT THIS SURVEY

This Healthcare Garden STAFF Survey is being conducted by a Ph.D. Candidate at Texas A&M University about gardens in healthcare facilities. It will take approximately 5-15 minutes to complete. **If you are a patient or visitor, please complete the Healthcare Garden VISITOR Survey.**

Take this survey online if it's more convenient for you, and/or if you would like to be entered into a drawing to win one of two $25.00 Amazon gift cards: *http://tinyurl.com/gardenstaff*. For staff and volunteers only.

Even if you didn't know about the garden until now, your feedback is still important!

YOUR RIGHTS AS A RESEARCH PARTICIPANT

Aside from your time, there are no costs for taking this survey. You will not be paid, but your participation is valuable for the research. Your participation is completely voluntary. You may decide not to participate, or to stop at any time. The survey is completely anonymous and we will not collect any identifiable information. By completing the survey, you are giving permission for the researcher to use your responses, combined with those of other participants, for research purposes. There are no known risks for taking part in this survey. Information will be kept confidential to the extent permitted or required by law. People who have access to these records include the Principal Investigator and research study personnel. Representatives of regulatory agencies such as the Office of Human Research Protections (OHRP) and entities such as the Texas A&M University Human Research Protection Program may access these records to make sure the study is being run correctly and that information is collected properly.

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SECTION 01 PLEASE TELL US ABOUT YOURSELF

01 In which healthcare facility do you work?

- ☐ Baylor Scott & White Hospital
- ☐ Greenwich Hospital
- ☐ Legacy Good Samaritan Medical Center
- ☐ Legacy Salmon Creek
- ☐ Oakland Kaiser Broadway Medical Office Building
- ☐ Oakland Kaiser Specialty Medical Office Building
- ☐ Smilow Cancer Hospital
- ☐ St. Joseph Hospital

02 Where are you when you are filling out this survey? You do not need to be in the garden, but it might help.

- ☐ Outside in the garden
- ☐ In the cafeteria or cafe
- ☐ In the staff breakroom
- ☐ I am not at the healthcare facility
- ☐ Other (please specify) :____________________

Figure 4.2 First page of the H-GET Healthcare Garden *Staff* Survey.

4.3 Methodology for Instrument Testing and Analysis

4.3.1 Recruitment and Survey Distribution

Recruitment of survey participants. Although the survey instruments remained constant across study sites, the procedures for survey recruitment, distribution, and collection differed across facilities. After receiving IRB approval from Texas A&M University, the researcher gained permission and IRB approval from the facilities that required it. For the Staff Surveys, a drawing for two $25.00 Amazon gift cards per facility was offered as an incentive for participation. To be eligible, staff had to complete the online survey rather than the paper-and-pencil version. The paper survey had a note telling staff of this and provided a link to the online survey. At the end of the survey, participants were invited to enter into the drawing by providing their email addresses. These addresses were kept separate from the rest of the survey data and were removed after the drawing and before data analysis. All questions and information on both Visitor and Staff Surveys were optional and voluntary; there were no forced response questions in the surveys.

Survey distribution. Staff and Visitor distribution was different at each HCF depending on the organization's policy and physical set-up. See Table 4.1 for a breakdown of distribution at each facility and Figures 4.3–4.5 for images of the survey distribution set-up. Notification about surveys—especially the Staff Surveys—varied with each HCF. In all but two HCFs, Staff Surveys were distributed online only.

At Baylor Scott & White Hospital and Greenwich Hospital, the HCF liaisons sent out a direct email to all staff members, with a second email reminder about one week later. Wording for the email was provided by the researcher and included information on the Amazon gift card incentive. At St. Joseph Hospital, an announcement about the surveys was sent out in a general email newsletter; this announcement was not shared with the researcher and so it is unknown what the wording was or whether it included mention of the Amazon gift card drawing. At Kaiser Oakland, where two of the Pilot Test gardens were located, the announcement was included in a weekly newsletter but the Amazon incentive could not be mentioned due to the HC organization's policy. Policy at Legacy Health did not allow online announcements about surveys (at least surveys outside of the Legacy system). Therefore, at the two Legacy Pilot Test HCFs, paper Staff Surveys were distributed at the same time and in the same location as the paper Visitor Surveys, and announcements about the online Staff Survey were distributed in staff breakrooms with posters and paper tabs with the website address (url) of the Qualtrics survey. Paper tabs with the Staff Survey website url were also left out on the tables with the paper surveys. Interestingly and perhaps not coincidentally, Staff Survey participation at Baylor Scott & White and Greenwich Hospital far exceeded the other HCFs were Staff Surveys were distributed, which may have been due to how participants were informed of the Surveys (through a direct email) and/or the gift incentive. In all but one HCF, online surveys began on the second day of on-site data collection (H-GET GATE research and Behavior Mapping) and were kept open for approximately two weeks. At Legacy Health, due to logistical issues, survey distribution (both online and paper) began approximately two weeks after on-site GATE and Behavior Mapping had taken place.

For paper Visitor and Staff Surveys, the stack of surveys, the survey announcement, pencils, and a box for completed surveys were placed on a table near the facility entrance and/or the garden entrance. To help participants at Legacy Health differentiate which survey to take, the Staff and Visitor surveys were two different colors (yellow for Visitors, green for Staff) and in addition to separate titles at the top of the page ("Healthcare Garden Visitor Survey" and "Healthcare Garden Staff Survey"), wording on the first page alerted participants about whether it was a Staff or Visitor survey (see Figures 4.1 and 4.2). Completed surveys were collected by the researcher's trained research assistants (referred to as "Research Assistants" or "RAs" in this dissertation), approximately every five days for approximately two weeks. All surveys were mailed to the researcher when the survey period was complete. It should be noted that at one facility, in the second week of the survey, the box with the Visitor Surveys disappeared. Fortunately, this was a facility where very few had people participated and it is likely that not many surveys were lost. However, this event speaks to a real problem with paper survey distribution. Paper surveys should be collected from the box daily by a designated person and stored somewhere safe until they can be sent to the researcher.

Table 4.1. H-GET Surveys: Survey distribution and collection numbers and description
Note: Numbers in table are for *usable* surveys (surveys completed more than 94%).

Staff Surveys

Garden	Paper	Online	Distribution
Legacy Stenzel	14	15	Table near hospital and garden entrance; paper tabs with url
Legacy Salmon Creek	45	3	Table at top of stairs; paper tabs with url
Kaiser Courtyard Garden	ND*	8	Link in staff newsletter
Kaiser Serenity Garden	ND	8	Link in staff newsletter
Scott & White Garden	ND	247	Direct email to all staff
St. Joseph Garden	ND	46	Weekly email/newsletter to staff
Greenwich Garden	ND	343	Direct email to all staff
Smilow Rooftop Garden	ND	ND	Not distributed
Total usable surveys = 729			

Visitor Surveys

Garden	Paper	N/A**	Distribution
Legacy Stenzel	13		Table near hospital and garden entrance
Legacy Salmon Creek	2		Table at top of 3rd floor stairs
Kaiser Courtyard Garden	ND		
Kaiser Serenity Garden	ND		
Scott & White Garden	16		Hospital entrance concierge station
St. Joseph Garden	4		Hospital entrance information desk
Greenwich Garden	8		Hospital waiting room near garden
Smilow Rooftop Garden	52		Breezeway entrance to garden
Total usable surveys = 95			

*ND = Not distributed
**Visitor Surveys not distributed online

GARDEN SURVEY

Please fill out a survey to help an A&M student with research about our Healing Garden. Thank you!

Figure 4.3 Survey announcement for Baylor Scott & White Hospital, College Station, TX.

Figure 4.4 Survey distribution at Smilow Cancer Hospital, New Haven, CT. Completed surveys were placed in the box. Entrance to garden is to the left of the table. Photo by Naomi Sachs.

Figure 4.5 Survey distribution in the lobby at Greenwich Hospital, Greenwich, CT

4.3.2 Plan for Statistical Analysis

All data from the collected paper surveys were entered into Qualtrics, the web-based survey platform where the online surveys were administered, and were marked as "paper" for future analysis of possible differences between the two survey modes. After survey collection was complete, data sets from both the Visitor Survey and the Staff Survey were downloaded as csv files and were cleaned before being uploaded to SPSS 24.0 for analysis. For the 26 questions that were the same for the Visitor Survey and the Staff Survey, another data file was generated by combining Visitor Survey and Staff Survey responses. Descriptive statistics for all questions in all surveys were examined. In addition, the researcher used the third data file (combined survey responses) for statistical comparisons between survey groups, using t-tests for continuous variables and chi-square analyses for categorical variables. To examine convergent validity of the surveys and the Garden Assessment Tool for Evaluators (GATE), Pearson correlations between two different types of garden scores and between the survey garden scores and the GATE garden scores were run. Pearson correlations were also used for exploring hypotheses about relationships between survey participants' feelings toward nature in their everyday lives and garden visits and garden scoring; and for relationships between garden scoring and six measures of successful garden outcomes. For qualitative write-in questions, a preliminary exploratory analysis of the Visitor Survey data was conducted to identify themes and categories.

4.4 Survey Results

Survey questions reported here are bolded and italicized for added clarity. When both patient/visitor (Visitor Surveys) and staff/volunteer (Staff Surveys) responses are reported, results from Visitor Surveys are reported first. Table 4.1 provides a summary of how Visitor and Staff Surveys were distributed at each Pilot Test HCF and how many *usable* surveys were collected. Surveys (Visitor and Staff) that were less than 94% complete were considered invalid (unusable) and data were not entered into Qualtrics for statistical analysis. In reporting results, *M* = Mean, *Mdn* = Median, and *SD* = Standard Deviation.

4.4.1 Overview of H-GET Surveys

A total of 95 valid Visitor Surveys were collected from all but two HCFs. Surveys were not distributed at either of the Oakland Kaiser facilities because there was no good location to leave them out.

Staff Surveys. A total of 855 Staff Surveys were collected from seven of the H-GET Pilot Test sites, including 788 collected online and 59 collected on paper. Smilow Cancer Hospital policy prohibited staff participation in surveys; therefore, only Visitor Surveys were distributed at Smilow. All data from paper surveys were entered into the online Qualtrics survey by the researcher. Almost half of the Staff Survey participants were from Greenwich Hospital (343, 48.1%), followed by 247 (34.6%) at Baylor Scott & White Hospital. Other numbers are reported in the table below. Because data from both of the Kaiser Oakland facilities were so small, they were omitted from statistical analysis. As a result, 729 valid Staff Surveys were included for data analysis.

4.4.2 Demographic Results - "A few more question about you"

This section contained questions about gender, age, race, and language. Although they are being reported first here, these questions were not actually located at the beginning of either the Visitor or Staff Survey, but were instead at the end. Dillman, Smyth, and Christian (2014) recommend *not* placing basic demographic questions at the very beginning of the survey, for two reasons. First, they recommend starting with questions that will be interesting to participants, and demographic questions usually are not; second, some participants find personal questions intrusive and off-putting and would be more likely to quit the survey immediately if these questions were asked first. As an additional attempt to encourage participants to answer demographic questions, this section started with the following statement: "*A person's background can sometimes influence how he or she experiences the surrounding environment. You are NOT required to answer these demographic questions (#s 1-5), but your answers will help us understand any potential relationships we find. Thank you!*"

Of the Visitor Survey participants, 74 (77.9%) respondents were female and 19 (20%) were male. The oldest respondent was 88 and the youngest was 13. The mean age was 54. A total of 86 (90.5%) respondents identified as white, one (1.1%) as Black or African American, 1 as Native Hawaiian or Other Pacific Islander, and 1 as American Indian or Alaska Native. No respondents identified as Asian. Of the three respondents who identified racially as "Other," one identified as Haitian/Hispanic, one as North African, and one as Italian. Five respondents

(5.3%) identified as Hispanic or Latino, and 85 (89.5%) did not. The primary language for 89 (93.7%) respondents was English. Two (2.1%) respondents identified Spanish as their first language, and one reported French/Creole.

Of the Staff Survey participants, 529 (88.5%) respondents were female and 69 (11.5%) were male. The oldest respondent who reported their age was 87 and the youngest was 23. The mean age was 48. A total of 490 participants (84.8%) respondents identified as white, 24 (4.2%) as Black or African American, 31 (5.4%) as Asian, three (.5%) as American Indian, and one (.2%) as Native Hawaiian or Other Pacific Islander. Of the 29 (5%) participants who classified their race as "Other," some of the responses included Multiracial, Biracial, Mexican/American, Irish-American, Mestizo, Latino, Russian American, American, and "Why the hell does my race matter?" Sixty-nine respondents (11.8%) identified as Hispanic or Latino, and 516 (88.2%) did not. The majority of participants' first language was English (570, 97.1%). Seven (1.2%) participants identified Spanish as their first language. Other languages reported were Italian, Tagalog, German, Portuguese, Cantonese, Nepali, "both" (English and Spanish), and "Fluent in both English and Spanish."

4.4.3 "Please tell us about yourself"

For both surveys, the first section was titled ***Please tell us about yourself*** and asked participants about what HCF they were in, what their role was, and how much time they had spent at the HCF. Questions in this section were tailored for Visitor and Staff Surveys separately.

Visitor Surveys

What healthcare facility are you visiting/being treated at today? Over half (52, 54.7%) of the Visitor Survey participants were from Smilow Cancer Hospital, followed by Baylor Scott & White Hospital (16, 16.8%), Legacy Good Samaritan (13, 13.7%), Greenwich Hospital (8, 8.4%), St. Joseph Hospital (4, 4.2%), and Legacy Salmon Creek (2, 2.1%).

Are you a Patient/Visitor/Other? About two-thirds of Visitor Survey respondents were visitors (59, 62%). Patients comprised a little over one-third of respondents (36, 38%).

Is this your first visit to this healthcare facility? For 17 respondents (18%), this was their first visit to that HCF; the majority of respondents had visited the HCF at least once before **(**77, 82%). If it was *not* their first visit, participants were asked: ***If no, about how many times have you visited this hospital?*** The majority of respondents answered in numbers (e.g., 3, 5, 100), and the average number of visits was 25 ($M = 25$, $Mdn = 10$), ranging from 2 to 300 times. Some participants wrote in qualitative answers that were not possible to compute (e.g., "too many to count," "been coming throughout my pregnancy," "Since 2013 2x wk," and "2 inpatient stays").

Staff Surveys

In which facility do you work? The largest number of Staff Survey participants (343, 48.1%) worked or volunteered at Greenwich Hospital, followed by Baylor Scott & White Hospital (247, 34.6%). Other numbers, in descending order, were Legacy Salmon Creek (48, 6.7%), St. Joseph Hospital (46, 6.5%), Legacy Good Samaritan (29, 4.1 %).

Where are you when you are filling out this survey? Staff were asked this additional question in case their location might influence responses. In order to minimize respondent burden, this question was not in the Visitor Survey. Possible options were "Outside in the garden," which received 21 (3%) responses; "In the cafeteria or café" (24, or 3.4%); "In the staff breakroom" (104, or 14.7%); "I am not at the healthcare facility" (88, or 12.4%); and "Other," which had by far the highest number of responses (471, or 66.5%). Most write-in responses for the "Other" option had to do with being at work, for example "work station," "office," "my office," "my desk," and "on the unit." In the next Staff Survey iteration, a distinct option of "at my desk/work station/office" should be added.

Are you a…? This question asked Staff Survey participants to choose what role they filled in the HCF. As can be seen in Figure 4.6, of the 17 multiple choices of job titles that participants could choose from, almost a third selected "Registered Nurse" (212, or 29.9%). The second-largest category was “Administration” (52, 7.3%). All other options chosen were below 50 participants. Those who checked “Therapist,” “Volunteer,” and “Facility Maintenance Personnel” were asked to write in further details. For “Therapist,” respondents’ specific roles included Physical Therapist, Occupational Therapist, Speech and Language therapist, Dietician, Social worker, Hand therapist, Radiation worker, Respiratory worker, Recreation, Horticultural, and Diabetes educator. For “Facility Maintenance Personnel,” respondents answered Project Assistant, Chief Carpenter, Facilities, and Groundskeeper. For “Volunteer,” some of the responses included Auxiliary president, Escort, Spiritual Care, Office Assistant, Main Floor, Family Birth Center, Reception, Front Desk, and Board Member. A large number of participants (176, or 24.8%) selected “Other” and then filled in details including Secretary, IT, Practice Coordinator, Supervisor, Case Manager, Patient Finance, Media Coordinator, Pharmacist, Sonographer, and Nurse Practitioner. Some of these roles may have fit in to the available job titles, but participants chose to be more specific. For example, “IT” could be under “technician.” For future analysis, an attempt should be made to move some of the “other” entries into the designated categories. A future iteration of the survey might allow for individualized answers within more of the possible responses. This would allow people to use their actual job title while lessening the number of “other” responses.

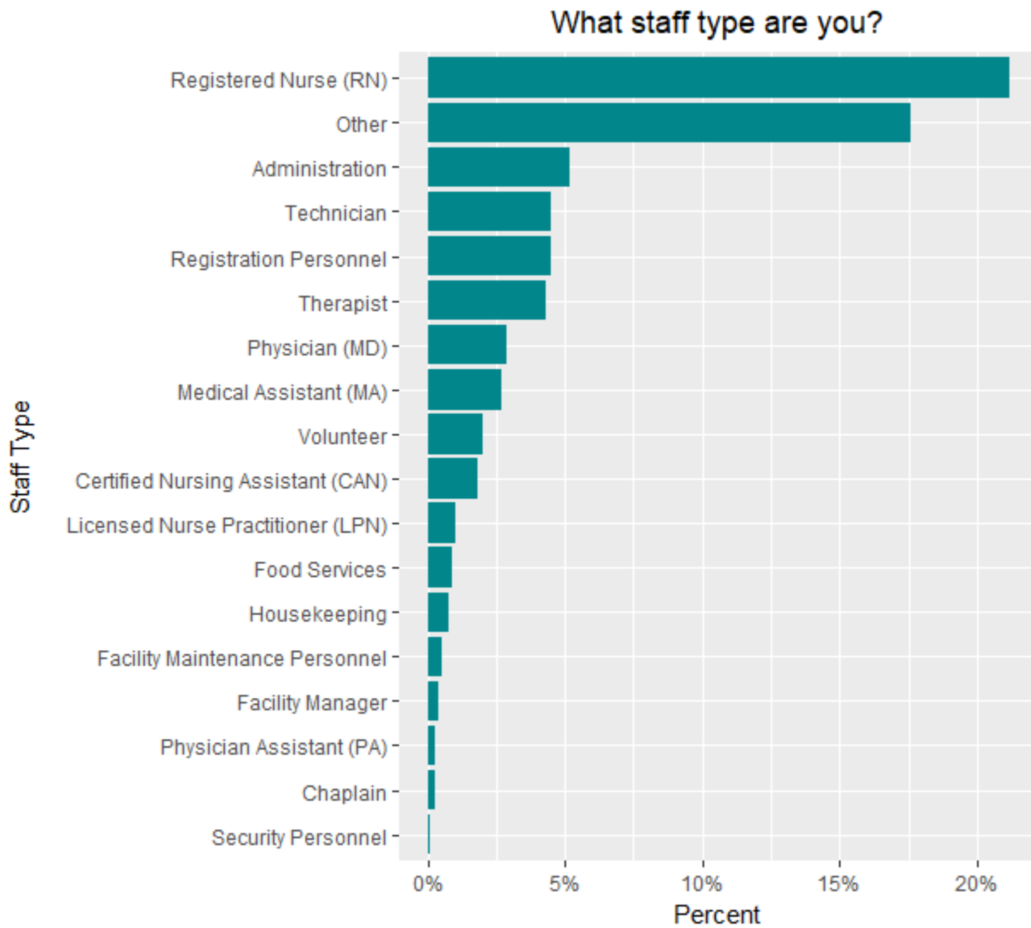


Figure 4.6 Staff Survey work roles in percentage.

How long have you worked (or volunteered) at this healthcare facility? A total of 625 Staff Survey participants (87.8%) had worked or volunteered at the facility for more than one year; the mean number of years worked was 10.99.

About how many hours per week do you usually work at this healthcare facility? The mean number of hours worked per week was 36.73.

When do you usually work at the healthcare facility? The majority of participants (593, or 83.4%) worked during the day; 56 (7.9%) participants worked at night; and 62 (8.7%) worked both.

On a scale of 1-10 (1 = Not important at all and 10 = Extremely important), how important to you is being outside in nature when you are NOT at the healthcare facility? The last question in the "Please tell us about yourself" section of both Visitor and Staff Surveys asked about the importance of nature to participants in their everyday lives. It is possible that only people for whom nature is important would visit a HCF garden, or that these people would at least be more inclined to visit; it is also possible that only people for whom nature is important would take the survey. Davis (2011) asked a similar question but did not use statistical analysis beyond descriptive statistics. The average level of importance of being in nature participants was 8.74 (M = 8.74, SD = 2.03) for the Visitor Survey, and 8.11 (M = 8.11, SD = 2.03) for Staff.

In your everyday life AWAY from the healthcare facility, about how often do you spend time outside in nature (in your garden or another garden, at a park, etc.)? Staff were asked this additional, related question. A total of 319 participants (44.9%) responded "Almost every day"; 231 (32.5%) responded "A couple of times a week"; 73 (10.3%) responded "A couple of times a month"; and 46 (6.5%) responded "I don't spend much time outdoors." Although the numbers are small, it is encouraging that not all staff members who participated in the survey spent much time in nature.

4.4.4 "Garden Awareness and Access"

This section sought to learn about participants' awareness of the HCF garden. Visitor and Staff Surveys asked whether participants knew about the garden before taking the survey and if so, how they first found out about it. Participants were also asked about whether they could see the garden from indoors (visual awareness) and if so, whether they enjoyed looking at it. They were also asked whether they had visited the garden at the HCF. Several previous HC garden evaluation studies have found that lack of awareness about a garden is a significant barrier to usage (Cooper Marcus & Barnes, 1995; Davis, 2011; Naderi & Shin, 2008; Pasha, 2011; Sherman, Varni, Ulrich, & Malcarne, 2005; Whitehouse et al., 2001).

Before taking this survey, did you know that this healthcare facility had a garden? Sixty-five (71%) of Visitor Survey participants answered "Yes" to this question, and almost one-third

(29%) were *not aware* that the HCF they were visiting had a garden. In contrast, and as might be expected, of the 713 *Staff Survey participants* who answered this question, 671 (94.4%) knew about the garden before taking the survey. Given that 18% of Visitor Survey respondents were at the HCF for the first time, and that most staff members had worked at the HCF for more than one year and probably had access to more of the building and grounds than patients and visitors, these numbers are not surprising.

***How did you FIRST find out about the garden*?** See Figure 4.7 for a comparison between Visitor and Staff Surveys. Almost half of the Visitor Survey participants (43, 46.7%) first found out about the garden through someone telling them about it. This is evidence that design solutions for increasing awareness of the garden such as placement of the garden (visibility at the entrance or from indoors), signage to the garden, and so on are not enough; a HCF's *policy* about staff helping patients and visitors be aware of the garden is also important. An early draft of the Visitor Survey asked participants to specify who told them about the garden, but this write-in option was eliminated to reduce respondent burden. However, given that so many participants found out about the garden from other people, it might be useful in the future to add a space for write-in details. Six respondents from Smilow Cancer Hospital wrote in additional information next to their answer even though write-in space was not given. For example, "Nursing staff and paperwork giver at my husband's admission"; "Nurse"; "Nurses on 14th floor"; "employee"; and "Hospital encourages patient visits to garden." A total of 28 (30.43%) Visitor Survey participants found out about the garden by walking by it; 12 (14.13%) saw it through a window; four (4.35%) saw a sign for it in the hospital; four learned about it from the survey; and three had read about it (3.26%). Twelve (13.04%) respondents checked the "Other" box for this question.

For the same question, almost one-half of Staff Survey participants (287, 42.8%) reported first becoming aware of the garden from walking by it. Ninety-seven (14.5%) reported "someone told me about it"; 83 (12.4%) saw the garden from the window; 23 (3.4%) read about it; 16 (2.4%) saw a sign in the hospital; 12 (1.8%) first learned about the garden from the survey. Almost a quarter (152, or 22.7%) of respondents checked "Other." The majority of these responses were from Baylor Scott & White Hospital, where staff participation in the garden's fundraising campaign in 2012 was over 90%. Responses from these participants such as "I donated to build it" were common. Some staff in other facilities found out about the garden from orientation, or from notices from administration.

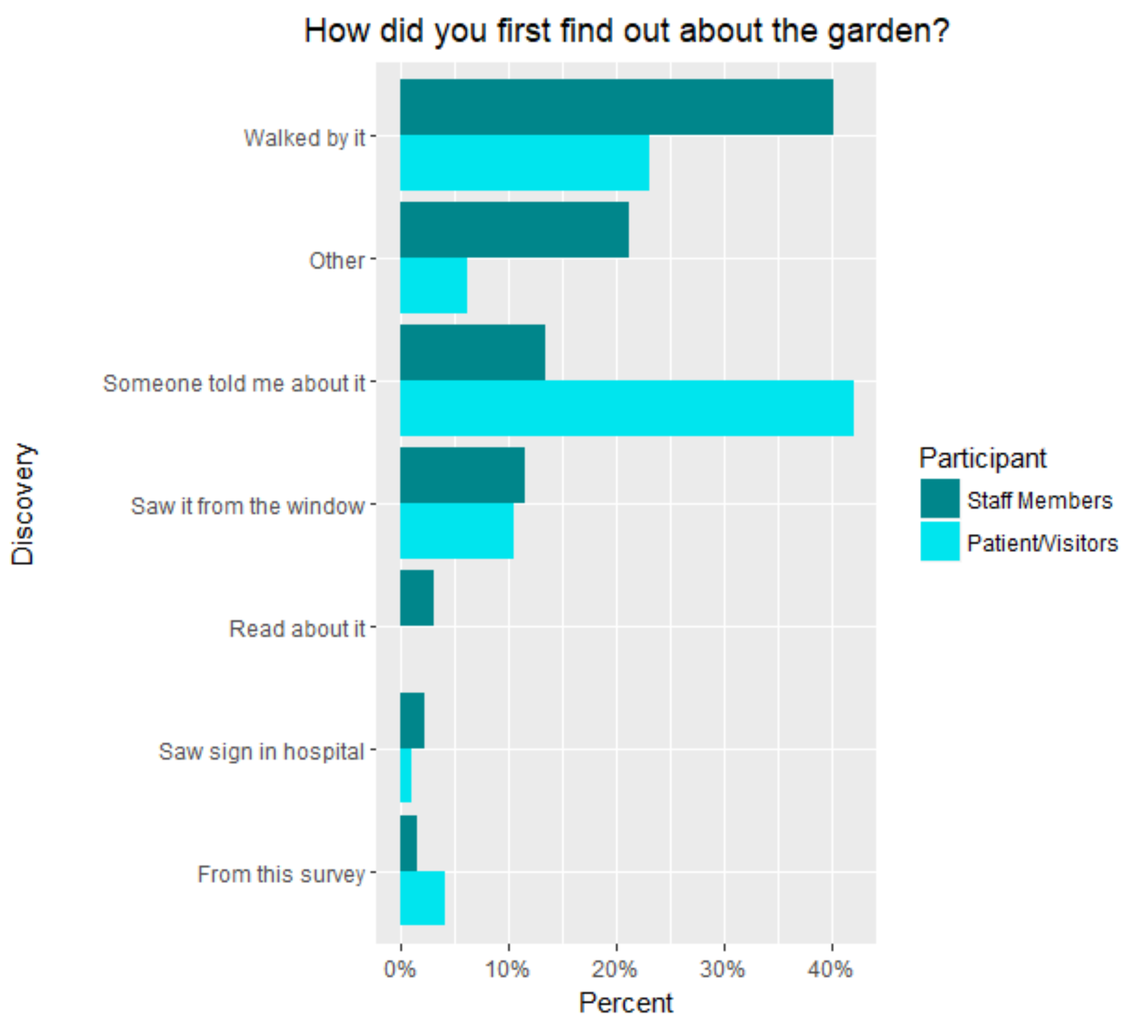


Figure 4.7 *"How did you first find out about the garden?"*

Please indicate which garden you are taking this survey about. For Staff Surveys, this additional multiple choice question was asked to ensure that participants were responding about the Pilot Test garden and not a different outdoor space at the same HCF.

Are there places inside the facility where you can look out and see the garden? This question sought to find out about participants' visual access to the garden from indoors. As discussed earlier, Cooper Marcus and Barnes (1995, 1999), Cooper Marcus and Sachs (2014), and other researchers have noted the importance of visual access to the garden in making people aware of its presence. A garden that is visible from indoors has the added benefits of enabling those who cannot go outside to still connect with nature; allowing daylight inside; and serving as a wayfinding tool. Although only ten (10%) Visitor Survey respondents said that they *first* found out about the garden from seeing it through the window, 70 (80.46%) said that there were places inside the HCF where they could look out and see the garden. A follow-up open-ended question for participants who reported seeing the garden from indoors was ***If yes, from where?*** The most common Visitor Survey responses to this follow-up question were Lobby, Cafeteria, Café, Hallway, Waiting Room, and Patient Room. In the future, adding a list of choices for people to check rather than write in would make data analysis easier.

An even higher percentage of Staff Survey participants reported being able to see the garden from inside (602, 90.3%). As with staff awareness of the garden, it makes sense that a higher percentage of staff could see the garden, because most had greater access to more of the facility.

If you can see the garden from inside the building, do you enjoy looking at it? Fifty-seven (80.28%) Visitor Survey participants responded "definitely yes" and another 10 (14.1%) answered "somewhat yes." Thus almost three quarters of Visitor Survey participants responded in the positive. Only four respondents were neutral, and no respondents answered either "Somewhat no" or "Definitely no." For the Staff Survey, 422 participants (76.7%) reported "definitely yes" to the same question and another 86 (15.6%) answered "somewhat yes," making the “yes” responses total 92.3%. Thirty-five (6.4%) respondents were “neutral;” four (.7%) reported “Somewhat no” and three (.5%) responded “Definitely no.”

Have you ever visited the garden at this HCF? Of the 90 Visitor Survey participants who responded to this question, 62 (68.9%) reported having visited the garden at least once, and 28 (31.1%) had not. Of 669 Staff Survey respondents, 590 (88.2%) had visited the garden.

What has kept you from visiting the garden? Check all that apply. See Figure 4.8 for a comparison between Visitor and Staff Surveys. For Visitor Survey participants, the primary reason for not having visited the garden was that they did not know about it (lack of awareness) (17, 62.96%). This is consistent with findings from previous research. Six respondents (22.2%) reported “too busy”; two (7.41%) said “The health of the person I’m visiting”; one (3.70%) said “Too far away/too hard to get to”; 25.93% respondents checked “Other.” The three write-in responses for “Other” were “First time here,” “just have not gone,” and “Not usually in this part of the hospital.”

Ninety (12.6%) Staff Survey participants had *not* visited the garden. The largest barrier reported was “too busy” (54 responses, 60% *of the 90 “have not visited” respondents*).Thirteen (21.7% *of the 90 “have not visited” respondents*) reported “Too far away/hard to get to”; 12 (13.3%) participants responded “I feel like the garden is only for patients”; and six (6.67%) said, “Didn’t know about it.” Only two participants (2.2%) reported “Weather” as the reason they had never visited the garden, and none reported “Staff are not supposed to use the garden.” Of the 15 (16.7%) who checked “Other,” four filled in that they did not work at that facility or were only there occasionally. Three responded that they worked at night. Even when HC gardens are open at night, staff may not be aware that they are. Three participants responded that they were too busy with work or they do not leave their unit. Two participants noted that they had not thought about visiting, or “Sometimes I forget it is there.” Only one participant stated that their reason for not visiting was due to a design issue: “No benches...a few tables to each but full a lot of times.”

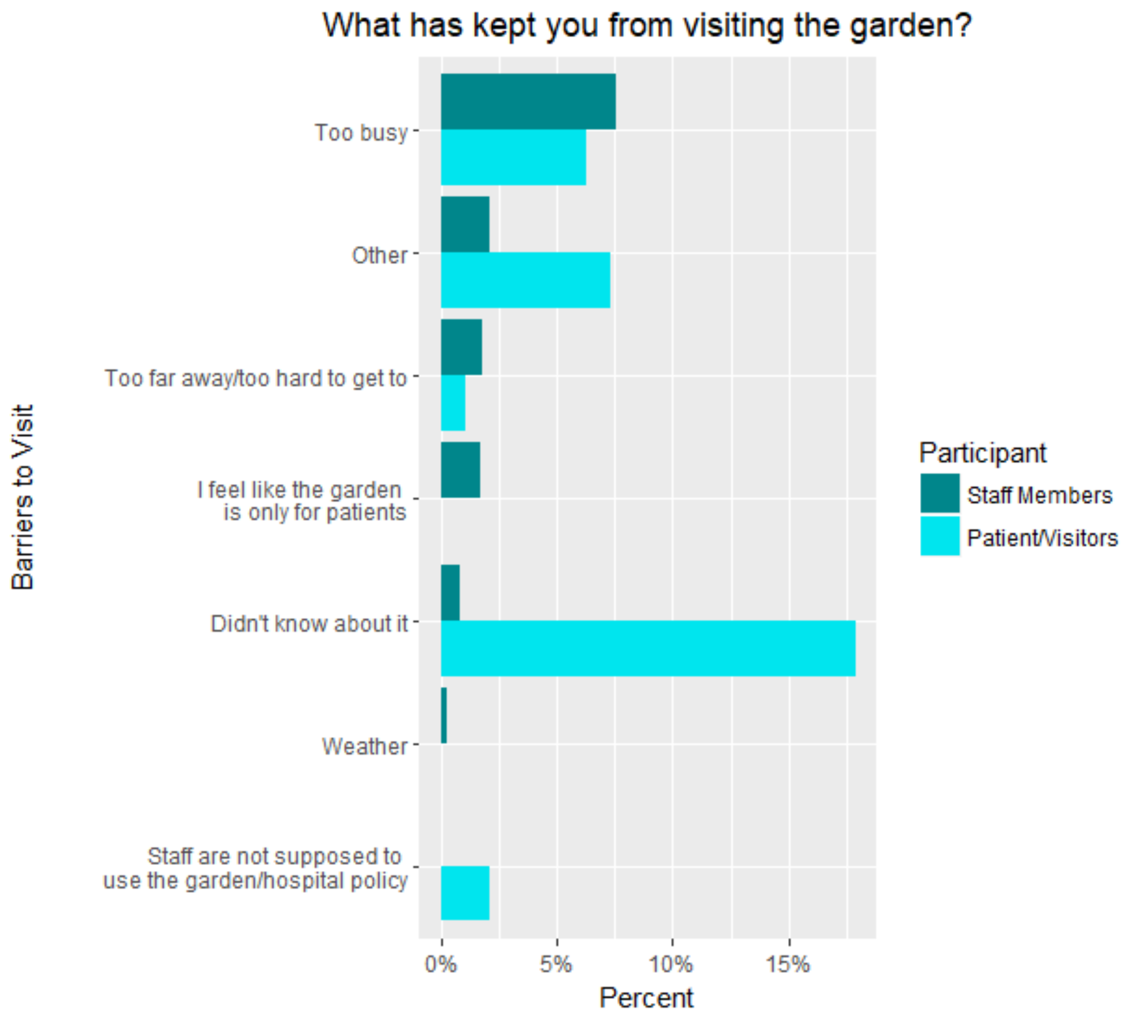


Figure 4.8 "*What has kept you from visiting the garden? Check all that apply*."

Participants who reported *not* having visited the garden were not asked to complete the entire survey, since the remainder of the survey asked specific questions about garden visits. They were only asked the demographic questions described above and four additional questions regarding their opinions about healthcare gardens in general and the garden they were completing the survey about, described below. Participants were then informed that the survey was complete—for paper surveys, with **"If you have NOT visited the garden, please stop here and return this form."** Online Staff Survey participants who had not visited the garden were automatically taken to the end where they could still sign up for the Amazon gift card incentive before the survey was officially complete.

Would you encourage other people (patients, visitors, or staff) to visit the garden? Eighty-nine (93.7%) Visitor Survey participants responded positively, with 78 (82.1%) checking "Definitely yes" and 11 (11.6%) "Probably yes." Two (2.1%) participants responded "Maybe" and zero responded with "Probably not" or "Definitely not." Staff Survey results were similar but slightly more conservative. 615 (86.2%) staff responded positively, with 480 (67.3%) checking "Definitely yes" and 135 (18.9%) "Probably yes." Thirty-eight (5.3%) Staff Survey participants responded "Maybe" and 11 (1.5%) responded "Probably not." Zero staff responded "Definitely not."

In your opinion, is it important for healthcare facilities to have gardens? Eighty-nine (93.7%) Visitor Survey participants responded positively, with 78 (82.1%) checking "Definitely yes" and 11 (11.6%) "Probably yes." Three (3.2%) responded "Maybe" and no participants checked "Probably not" or "Definitely not." Staff responses were, again, similar but slightly more conservative than Visitor. 639 (88.4%) staff responded in the positive, with 439 (61.6%) as "Definitely yes" and 191 (26.8%) "Probably yes." Sixty-three (8.8%) responded "Maybe," 9 (1.3%) responded "Probably not," and five (.7%) "Definitely not."

Does the garden improve your satisfaction with this healthcare facility? Responses to this question were slightly more conservative among both Visitor and Staff Survey participants, and as with the previous two questions, staff responses were more conservative than those of patients and visitors. Eighty-four (88.4%) Visitor Survey participants responded positively, with 67 (70.5%) "Definitely yes" and 17 (17.9%) "Probably yes." Six (6.3%) responded "Maybe" and one "Probably not." Zero Visitor Survey participants responded "Definitely not." 580 (81.4%) staff responded in the positive, with 380 (53.3%) "Definitely yes" and 200 (28.1%) "Probably yes." Fifty-three (7.4%) responded "Maybe," 31 (4.3%) responded "Probably not," and seven (1%) "Definitely not."

Does the garden increase the likelihood that you would recommend this healthcare facility to others? Responses to this question were the most conservative for both Visitor and Staff Survey participants and as with the previous questions, staff responses were more conservative than visitor. Seventy-two (80%) Visitor Survey participants responded in the affirmative, with 51 (56.7%) checking “Definitely yes” and 21 (23.3%) “Probably yes.” Thirteen (14.4%) responded “Maybe” and five (5.6%) “Probably not.” No Visitor Survey participants checked “Definitely not.” Slightly more than half (401, 57.7%) of Staff Survey participants responded in the affirmative, with 260 (36.5%) checking “Definitely yes” and 141 (21.2%) “Probably yes.” 131 (19.7%) Staff Survey participants responded with “Maybe,” 110 (15.4%) with “Probably not,” and 23 (3.2%) with “Definitely not.” Saying that a garden is good is one thing, but saying that it improves one’s satisfaction with the entire HCF requires a greater leap. Thus the more conservative responses on Visitor and Staff Surveys to this and the previous question make sense and are possibly a good indicator that participants were paying attention and were not just trying to please the survey administrators by checking “Strongly agree” on every question.

4.4.5 “Garden visits.” This section sought to find out how frequently participants visited the garden and how long they stayed; why they visited the garden and what they did when there; whether they would visit more frequently for longer periods of time if they could; and if yes, what kept them from doing so.

Visitor Surveys: ***Since you started being treated at this hospital, about how many times have you visited the garden?*** Almost the same number of Visitor Survey respondents had visited the garden 1–2 times (26, 32.91%) as had visited the garden 15 or more times (21, 26.6%). When participants were asked to estimate the number of times beyond 15, write-in responses ranged from 20 to 300. Participants also wrote in responses such as “I try to go out every time I’m here” and “Every day – 36 days in hospital.” Sixteen (20.3%) respondents had visited the garden 3-5 times; eight (10.1%) 6-9 times; and eight (10.1%) 10-15 times.

Staff Surveys: ***Over the course of the year, about how often do you visit the garden in this healthcare facility in your FREE TIME?”*** The highest number (158, 26.3%) of participants checked “A few times a year,” followed in descending order by “A few times a week” (107, 17.8%), “A couple times a month” (88, 14.6%), “About once a day” (77, 12.8%), “About once a week” (66, 11%), “About once a month” (56, 9.3%), “I never visit the garden” (36, 6%), and

"More than once a day" (13, 2.2%). It is interesting that the two lowest answers were the two on the farthest end of the visit frequency spectrum.

Visitor Surveys: ***During most of your visits to the garden, how much time do you spend there?*** The majority of Visitor Survey participants reported staying in the garden from 0–15 minutes (35, 44.30%), followed closely by 16–30 minutes (30, 37.97%). Ten (12.66%) participants reported staying 31–45 minutes; three reported staying more than an hour; two participants said that they walked through the garden; and one participant reported staying 45–60 minutes.

Staff Surveys (the same question was worded slightly differently to emphasize garden use in *free time* rather than for work)*:* ***When you visit the garden <u>in your free time</u>, approximately how much time do you usually spend there?*** With Staff Survey participants as well, the most frequently reported duration was 0–15 minutes (287, 40.3%), followed by 16–30 minutes (148, 20.8%). A much higher percentage (129, 18.1%) of Staff Survey participants checked "I walk through it on my way to somewhere," which was reflected in the Behavior Mapping data. Forty (5.60%) participants checked the 31–45 minutes duration option; 11 (1.5%) checked 46–60 minutes; and no Staff Survey participants reported spending more than an hour in the garden.

Although the following Visitor and Staff survey questions were worded slightly differently, they addressed the same question about whether people would visit more often or stay longer in the garden:

Visitor Survey: ***Would you visit the garden more often, or stay in it longer, if you could?*** More than half of Visitor Survey participants (42, 53.9%) answered "Definitely yes" and another 24 (30.8%) answered "Probably yes," adding up to almost 75% of Visitor Survey participants reporting in the affirmative. Nine participants (11.5%) responded "Maybe," three (3.9%) said "Probably not," and zero said "Definitely not."

Staff Survey: ***If you COULD spend more of your free time in the garden, would you?*** Almost half of Staff Survey respondents (245, 40.8%) answered "Definitely yes" and another 235

(39.1%) answered “Probably yes,” adding up to 80% affirmative responses—an even greater percentage than for the Visitor Surveys. Ninety-eight (16.3%) participants responded “Maybe,” 22 (3.7%) responded “Probably not,” and only one (0.2%) “Definitely not.”

What keeps you from visiting the garden as often or for as long as you would like? This question was asked, with the same wording, of Visitor and Staff Survey participants. Figure 4.9 shows responses from both surveys combined. For visitors, the top reason was “The health of the person I’m visiting” (24, 33.3%). Almost as many participants checked that they were “Too busy” (22, 30.6%). Almost a quarter of respondents (17, 23.6%) listed weather conditions as a reason. Most of the weather-related write-in responses listed cold, rain, and winter, probably due to the number of surveys being distributed in the Fall, especially in the Pacific Northwest where the rainy season had begun. It is possible that if the surveys had been distributed in high summer—especially in Texas—more respondents would have listed heat or humidity as a barrier to using the garden. Eight respondents (11.1%) listed “My health”; nine respondents (12.5%) said that the garden was “Too far away/hard to get to.” Only one respondent checked “there are things about the garden I don’t like.” Fourteen (19.4%) checked “Other.”

For Staff Surveys, over half of participants checked “Too busy” (459, 64.4%). Almost a quarter of respondents (103, 14.4%) listed weather conditions as a barrier to visiting more frequently or for longer durations. Most of the weather-related write-in responses mentioned cold, rain and winter. Again, this may have been partly due to the time of year when the surveys were distributed. Eighty-five participants (11.9%) checked “Other,” 64 respondents (9.0%) said that the garden was “Too far away/hard to get to,” 15 (2.1%) responded “There are things about the garden I don’t like,” and one (0.1%) did not know about it.

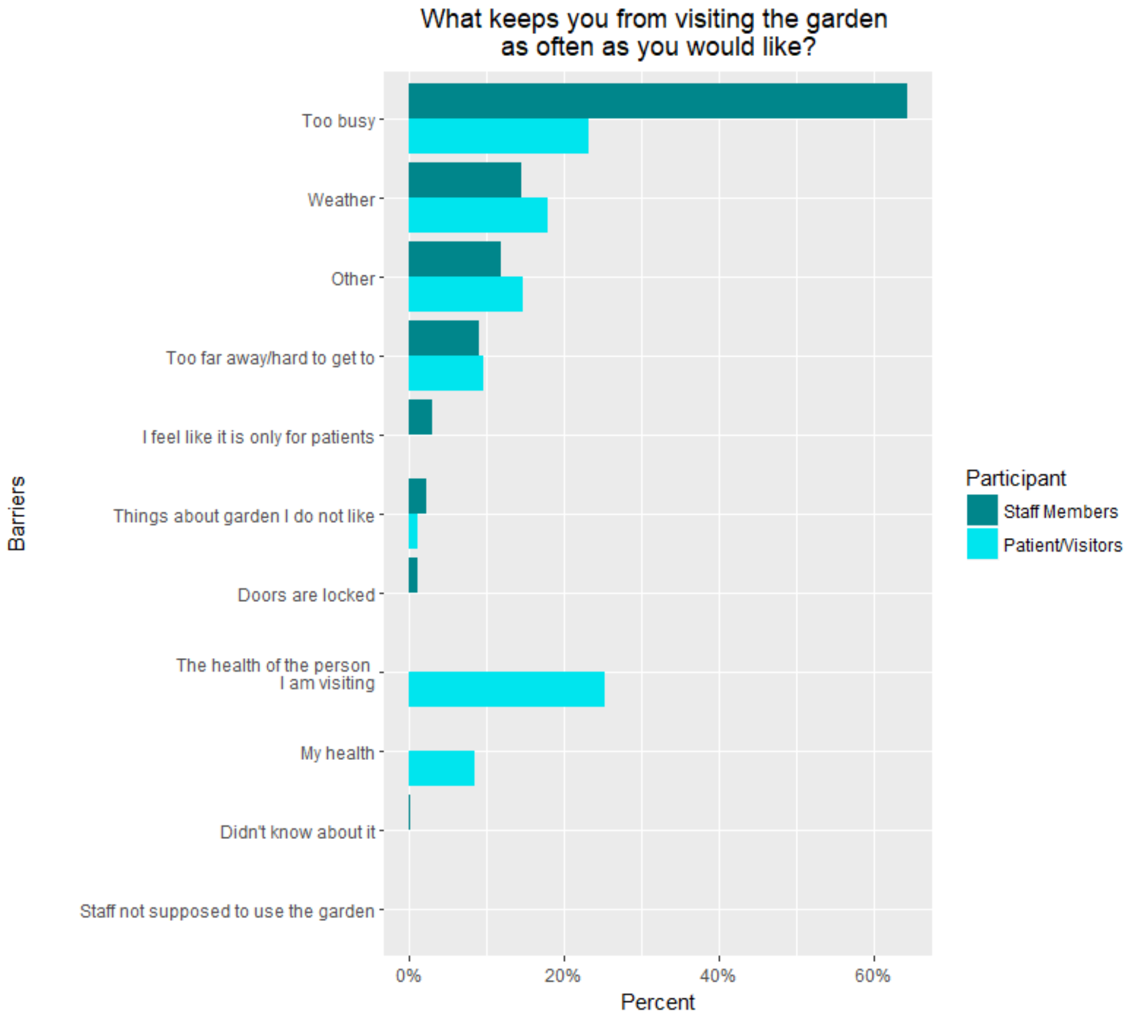


Figure 4.9 *"What keeps you from visiting the garden as often or for as long as you would like?"*

Why do you visit the garden, and what do you do when you're there? Check all that apply.

Visitor and Staff Surveys both contained this question. Visitor Surveys had 22 options, including "Other," and Staff Surveys had 24 options, including "Other." The options were as follows, in the order they appeared on the survey, which was the same order for both groups. The two additional Staff Survey options are in italics, as is the slightly different wording for the one question about therapy: Get away from the facility; Have privacy; Relax; Get fresh air; Look at plants, birds, other natural features; Walk slowly, stroll; Walk briskly for exercise; Just sit down for awhile; Have lunch or a cup of coffee / tea; Talk on the phone; Read or do work (on paper or a mobile device); Write / journal / draw; Text, watch movies on YouTube, etc. on a mobile device; Meditate or pray; Express emotions I can't express inside (cry, laugh, etc.); Be by myself; Talk/be with someone else I know; Be amongst other people; Smok*e; Talk with a patient or family member/friend of the patient (Staff Survey only)*; Do physical, occupational, horticultural, or other therapy *(For Staff Survey, wording was "Work with patient(s) doing therapy (PT, OT, HT, etc.)"; Attend a staff or work-related meeting (Staff Survey only)*; Attend specific events: __________________; Other: ____________.

The average number of items chosen was five (*M* = 4.79, *SD*, 3.66, *Mdn* = 5) with a range from 0 to 14. For both survey groups, "Get fresh air" was the highest response (70.53% for Visitor Surveys and 69.85% for Staff). This is consistent with other HCF garden evaluation surveys described earlier. It should be noted that to "get fresh air" may mean different things to different people. For some, the meaning may be literal—the air outside the building is, or at least feels, "fresher" and cleaner than the air inside. For others, fresh air may be symbolic of change, a break, or a sense of escape. For Visitor Surveys, the second-highest (67.37%) response was "Look at plants, birds, other natural features." This was the third-highest response for Staff (45.72%). Whereas "Relax" was the third-highest response for Visitor Surveys (61.05%), it was the second-highest for Staff (61.01). Thus, access to nature and relaxation were ranked second and third by both participant groups but the order of importance was flipped. Both of these responses are also consistent with other previous HCF garden evaluation studies. "Just sit down" was ranked fourth by Visitor Survey participants (48.42%) and fifth by Staff (38.01%). "Lunch" was ranked fourth by Staff (41.09%) and was far lower on the list for Visitor Survey participants (16.84%). The high ranking of "Lunch" by Staff for this question correlates with both Visitor and Staff responses to the question about what staff are usually doing in the garden, described below. With Behavior Mapping observations at almost all sites, lunch was one of the most common staff activities in the garden (see Chapter V for details). Table 4.2 and Figure 4.10 show the two groups' responses to each option, in descending order, and Figure 4.11 shows the two groups' top five responses.

Table 4.2. *"Why do you visit the garden, and what do you do when you're there? Check all that apply."*
Note: Each group's responses are listed in percentage and number descending order

Why Visit, What Do	Group	Percent	Number	Why Visit, What Do	Group	Percent	Number
Fresh air	Visitor	70.53%	67	Fresh air	Staff	69.85%	498
Look at nature	Visitor	67.37%	64	Relax	Staff	61.01%	435
Relax	Visitor	61.05%	58	Look at nature	Staff	45.72%	326
Just sit down	Visitor	48.42%	46	Lunch	Staff	41.09%	293
Walk slowly	Visitor	45.26%	43	Just sit down	Staff	38.01%	271
To 'get away'	Visitor	40.00%	38	To 'get away'	Staff	34.22%	244
Meditate/Pray	Visitor	31.58%	30	Be by myself	Staff	32.40%	231
Be with someone	Visitor	25.26%	24	Walk slowly	Staff	26.93%	192
Be by myself	Visitor	25.26%	24	Have privacy	Staff	20.06%	143
Have privacy	Visitor	18.95%	18	Meditate/Pray	Staff	18.37%	131
Lunch	Visitor	16.84%	16	Use phone	Staff	16.55%	118
Use phone	Visitor	12.63%	12	Be with someone	Staff	16.13%	115
Exercise	Visitor	11.58%	11	Read or do work	Staff	12.34%	88
Express emotion	Visitor	9.47%	9	Text, mobile device	Staff	7.85%	56
Be amongst others	Visitor	9.47%	9	Exercise	Staff	6.59%	47
Read or do work	Visitor	7.37%	7	Attend event	Staff	5.33%	38
Write/Journal/Draw	Visitor	6.32%	6	Be amongst others	Staff	4.21%	30
Work with patients	Visitor	5.26%	5	Attend meeting	Staff	3.65%	26
Other	Visitor	5.26%	5	Talk with pt/family	Staff	3.37%	24
Text, mobile device	Visitor	2.11%	2	Other	Staff	3.09%	22
Attend event	Visitor	2.11%	2	Express emotion	Staff	2.81%	20
Smoke	Visitor	0.00%	0	Write/Journal/Draw	Staff	2.24%	16
Talk with pt/family	Visitor	0.00%	0	Work with patients	Staff	1.54%	11
Attend meeting	Visitor	0.00%	0	Smoke	Staff	0.14%	1

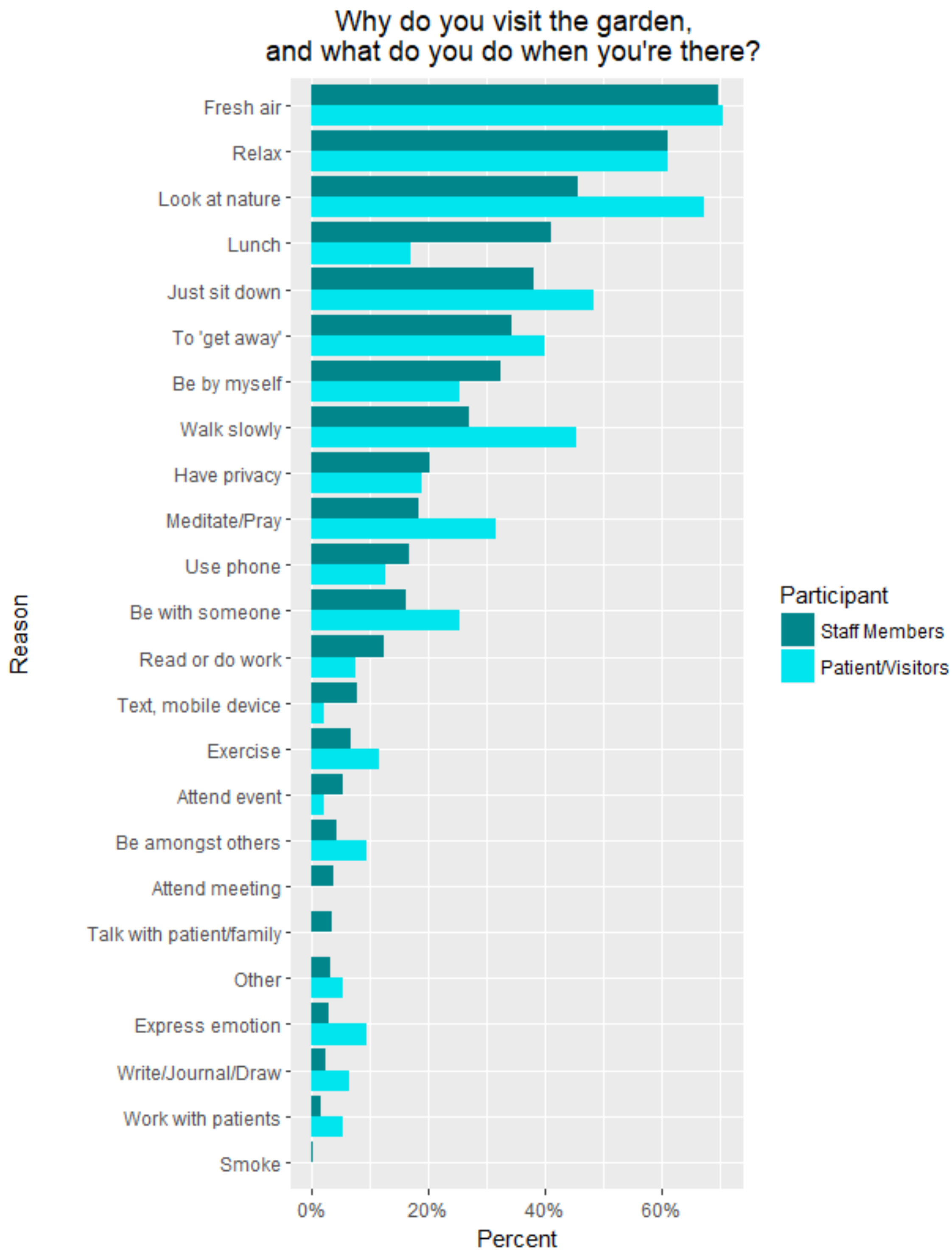


Figure 4.10 *"Why do you visit the garden, and what do you do when you're there?"*

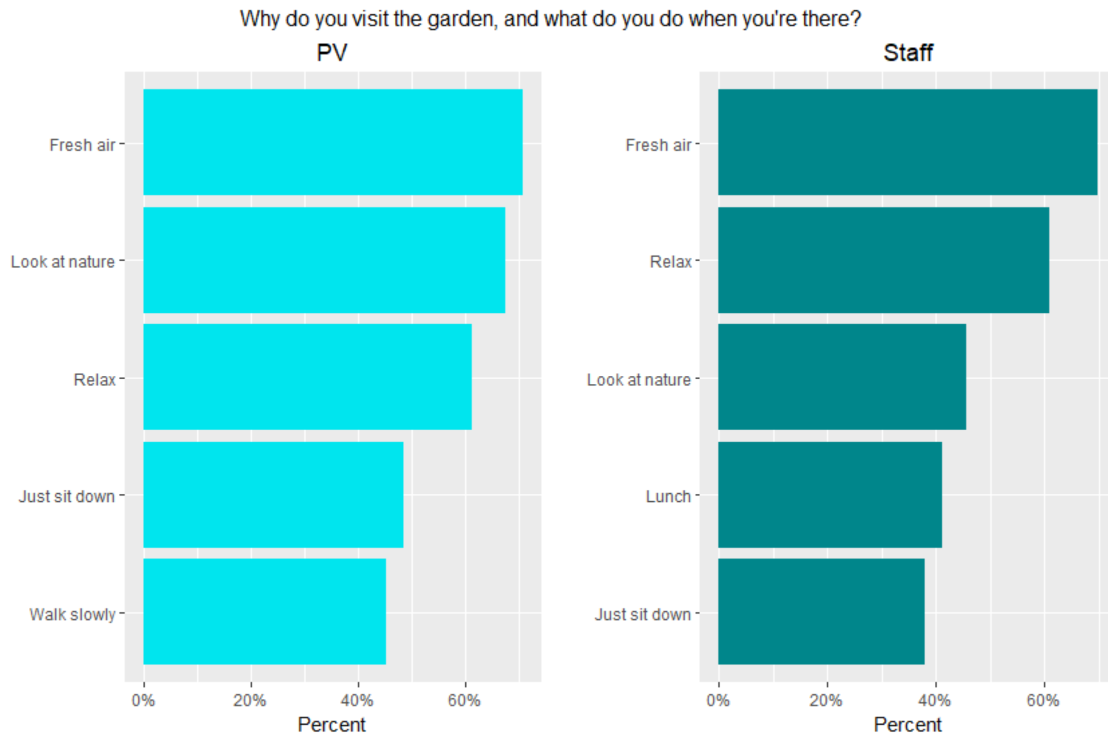


Figure 4.11 Comparison between Visitor Surveys and Staff Surveys top five responses to *"Why do you visit the garden, and what do you do when you're there?"*

Two additional questions in the "Garden Visits" section of both Visitor and Staff Surveys sought to learn how participants felt about their garden visits as well as their opinions about garden visits for other people. These questions, along with the four discussed previously, could be analyzed with the GATE scores and the "GATE-like" scores discussed below to discover any correlation between garden quality and outcomes (health, satisfaction, etc.) from garden use.

How do you usually feel after you spend time in the garden? In Visitor Surveys, 71 (97%) participants reported "I feel better" and two (.027%) reported "I don't feel any different." No participants reported "I feel worse." 541 (91.2%) Staff Survey participants reported "I feel better" and 52 (8.8%) reported "I don't feel any different." No staff reported feeling worse after they spent time in the garden.

In your opinion, is spending time in the garden good for people's health (physical and/or mental)? Sixty-seven (90.5%) of Visitor Survey participants responded “Definitely yes” and an additional six (8.1%) responded “Probably yes.” One participant responded “Maybe,” and no participants responded with “Probably not” or “Definitely not.” Of the 713 Staff Survey Participants who answered this question, 445 (73.9%) responded “Definitely yes” and an additional 128 (21.3%) responded “Probably yes.” Twenty-six (4.3%) participants responded “Maybe,” three (0.5%) responded “Probably not,” and zero responded “Definitely not.”

4.4.6 “Garden Rating”

In this section, Survey participants were asked to provide feedback about the garden. As shown in Figure 4.12, the first part of this section asked participants to rate specific qualities and elements of the garden. For survey development and research purposes, this part of the survey was called the “GATE-like scale” because it was structured and worded very much (and, with some items, exactly) like the Garden Assessment Tool for Evaluators (GATE) described in detail in Chapter III. The GATE-like scale was included in surveys to explore whether and how GATE evaluators’ and survey participants’ assessments of the garden corresponded with each other. Strong agreement and correlation between actual GATE scores and Survey GATE-like scale scores would provide support for convergent validity of both instruments (Campbell & Fiske, 1959).

SECTION 05 **GARDEN RATING**	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
Note your level of agreement with the following statements:					
The entrance to the garden is easy to find.					
The garden looks appealing and inviting from indoors.					
I feel safe in the garden.					
When I'm in the garden, I have a sense of "being away" from the healthcare facitlity.					
I can find privacy in at least part of the garden.					
Overall, the garden looks well-maintained.					
The garden feels lush and full of life.					
The main pathway/paved area is safe and comfortable to walk or use a walker/wheelchair/stroller/IV pole.					
The garden provides opportunities for walking.					
The garden offers many places to sit.					
The seating in the garden is comfortable.					
There are places in the garden where people can socialize (talk, meet, play, hang out together).					

Figure 4.12 "Garden Rating" section of Visitor and Staff Surveys. For scoring, Strongly Agree = 4, Somewhat Agree = 3, Somewhat Disagree = 2, Strongly Disagree = 1. Not Sure or N/A was not included in scoring.

For Visitor Surveys, twelve statements could be agreed or disagreed with on a 4-point Likert-type scale of "Strongly Agree," "Somewhat Agree," "Somewhat Disagree," "Strongly Disagree," or "Not sure or N/A." For scoring, these scale items were rated so that Strongly Agree = 4; Somewhat Agree = 3; Somewhat Disagree =2; and Strongly Disagree = 1. As with the GATE, "Not sure or N/A" did not receive a numeric score. Statements were worded either verbatim (in italics below) or similar to the GATE statement wording. The GATE was developed to allow evaluators be as objective as possible; thus, constructs such as safety and comfort were represented by specific indicators (for example, elements would make a garden safe rather than asking whether the garden was safe). For the GATE-like scale, these constructs were allowed to be more general, both to reduce respondent burden and to explore whether and how well the objective and the more general, subjective measures, related. The statements were, in this order:

- The *entrance to the garden is easy to find* (same wording as GATE italicized)

- The *garden looks appealing and inviting from indoors.*
- I feel safe in the garden.
- When I'm in the garden, I have a sense of "being away" from the healthcare facility.
- I *can find privacy in at least part of the garden.*
- Overall, the garden looks well-maintained.
- The garden feels lush and full of life.
- The main pathway/paved area is safe and comfortable enough to walk or use a walker/wheelchair/stroller/IV pole.
- The garden provides opportunities for walking.
- *The garden offers many places to sit.*
- The seating in the garden is comfortable.
- There are places in the garden where people can socialize (talk, meet, play, hang out together).

Staff Surveys were structured exactly the same way as the Visitor Surveys but had four additional statements, which are listed below. In an attempt to reduce respondent burden, the four statements were removed from Visitor Surveys but could not be removed from Staff Surveys because online participation had already begun. The four statements were not included in data analysis.

- The *garden has some features that provide a rich, multi-sensory experience (things to do, look at, touch, smell, hear, etc.).*
- The garden has other pleasing natural features (water, wildlife, etc.).
- The garden provides opportunities for other activities (children's play, ceremonies, programmed events, etc.).
- *There is a choice of seating in sun or shade during most of the day.*

GATE-like scale results. Means of all GATE-like items tended to be high for both groups, ranging from 3.45 to 3.93 out of 4.0 for Visitor Surveys and 3.33 to 3.85 out of 4.0 for Staff. Visitor Survey scores tended to be higher than Staff for most items, as can be seen in Table 4.3.

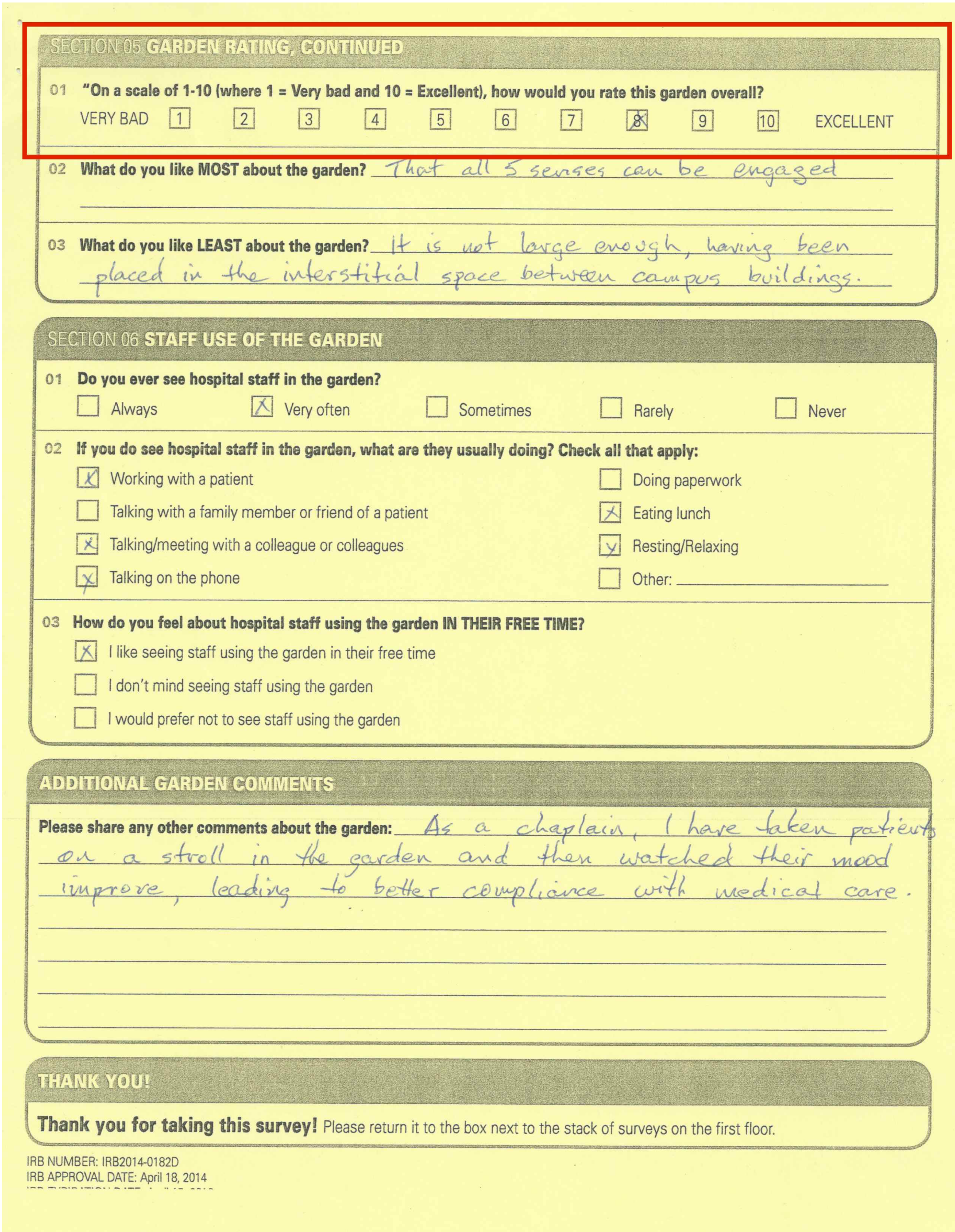
Table 4.3. Comparison of "GATE-like" scale rating between Visitor and Staff Surveys

Statement	Group					
	Patient/Visitor			Staff		
	M	*SD*	*n*	*M*	*SD*	*n*
The entrance to the garden is easy to find.	3.53	.67	72	3.56	.66	600
The garden looks appealing and inviting from indoors.	3.85	.36	74	3.68	.61	589
I feel safe in the garden.	3.93	.25	74	3.85	.38	587
When I'm in the garden, I have a sense of "being away" from the healthcare facility.	3.79	.47	74	3.49	.66	585
I can find privacy in at least part of the garden.	3.46	.76	70	3.34	.78	585
Overall, the garden looks well-maintained.	3.84	.41	74	3.78	.52	598
The garden feels lush and full of life.	3.70	.54	74	3.59	.67	594
The main pathway/paved area is safe and comfortable enough to walk or use a walker / wheelchair / stroller / IV pole.	3.88	.33	72	3.76	.47	578
The garden provides opportunities for walking.	3.78	.48	73	3.52	.75	585
The garden offers many places to sit.	3.64	.61	74	3.43	.74	592
The seating in the garden is comfortable.	3.45	.86	71	3.33	.77	578
There are places in the garden where people can socialize (talk, meet, play, hang out together).	3.77	.49	73	3.54	.69	583

Note. Participants responded on a 4-point scale (4=Strongly Agree; 3=Somewhat Agree; 2=Somewhat Disagree; 1=Strongly Disagree), where higher scores indicated greater quality of the garden.

Three additional questions were in the “Garden Rating” section. The first question asked for an “overall garden rating,” and two open-ended questions asked participants to share what they liked *most* and *least* about the garden.

Garden Rating: On a scale of 1-10 (1 = Very Bad and 10 = Excellent), how would you rate this garden, overall? In addition to the GATE-like scale, Visitor and Staff Surveys asked participants to rate the garden with an *overall score* using a scale of 1 (Very Bad) to 10 (Excellent), as shown in Figure 4.13. This question, too, was very similar to the GATE question asked of evaluators before they began item-by-item scoring (“On a scale of 1-10, how would you rate the overall restorativeness of this garden? “Restorative” = Able to restore a person’s strength, health, or well-being.”). This GATE question, which was on the first page of the instrument, enabled a more intuitive, pre-cognitive response to the garden before evaluators began to think about it objectively. Mean scores from the GATE 1–10 question were calculated to provide what is called the “Overall Impression” score, as described in detail in Chapter III. The “Overall Impression” 1–10 score, when compared and correlated with the “Cumulative Item” GATE mean score of all of the items, became an important part of GATE instrument validation. For the Surveys, comparing the totals from the Survey GATE-like scores (which we will call “GATE-like Cumulative Item” scores) with the Survey 1–10 (also “Survey Overall Impression”) scores with each other and with the GATE scores provided evidence for convergent validity (Campbell & Fiske, 1959).



SECTION 05 GARDEN RATING, CONTINUED

01 "On a scale of 1-10 (where 1 = Very bad and 10 = Excellent), how would you rate this garden overall?

VERY BAD [1] [2] [3] [4] [5] [6] [7] [X 8] [9] [10] EXCELLENT

02 What do you like MOST about the garden? That all 5 senses can be engaged

03 What do you like LEAST about the garden? It is not large enough, having been placed in the interstitial space between campus buildings.

SECTION 06 STAFF USE OF THE GARDEN

01 Do you ever see hospital staff in the garden?

- [ ] Always
- [x] Very often
- [ ] Sometimes
- [ ] Rarely
- [ ] Never

02 If you do see hospital staff in the garden, what are they usually doing? Check all that apply:

- [x] Working with a patient
- [ ] Talking with a family member or friend of a patient
- [x] Talking/meeting with a colleague or colleagues
- [x] Talking on the phone
- [ ] Doing paperwork
- [x] Eating lunch
- [x] Resting/Relaxing
- [ ] Other: ______

03 How do you feel about hospital staff using the garden IN THEIR FREE TIME?

- [x] I like seeing staff using the garden in their free time
- [ ] I don't mind seeing staff using the garden
- [ ] I would prefer not to see staff using the garden

ADDITIONAL GARDEN COMMENTS

Please share any other comments about the garden: As a chaplain, I have taken patients on a stroll in the garden and then watched their mood improve, leading to better compliance with medical care.

THANK YOU!

Thank you for taking this survey! Please return it to the box next to the stack of surveys on the first floor.

IRB NUMBER: IRB2014-0182D
IRB APPROVAL DATE: April 18, 2014

Figure 4.13 H-GET Survey 1–10 "Overall Impression" garden rating scale, highlighted in red.

1–10 rating "Overall Impression" results: For both groups of survey participants, ratings were high. The mean score for Visitor Surveys was very high (*M* = 9.16, *SD* = .98) and was slightly lower for Staff (*M* = 8.55, *SD* = 1.59). The mean score of both groups combined was 8.62 (*SD* = 1.54). This high rating is consistent with participants' ratings on the GATE-like items and with the mean scores derived from the GATE-like score aggregate. Table 4.4 summarizes these results.

Table 4.4. Comparison between Visitor and Staff Surveys of Overall Impression and Cumulative Item scores.

Mean score	Group					
	Patient/Visitor			Staff		
	M	*SD*	*n*	*M*	*SD*	*n*
Overall Impression	9.16	.98	74	8.55	1.59	529
Cumulative Item	9.30	.32	74	8.93	.45	600

Note. Overall Impression = Overall garden rating (where 1 = Very Bad and 10 = Excellent);
Cumulative Item = Mean of all GATE-like scores, with 4 = highest and 1 = lowest possible scores.
Cumulative Item scores have been translated from 4 scale to 10 scale for ease of comparison.

It is important to note that with each garden, scores given for each statement/item by Visitor and Staff were higher than most GATE item scores . GATE-like Cumulative Item scores were also higher than the GATE Cumulative Item scores for each garden. Explanations for this difference could be because the GATE-like items were fewer and, in some cases, more general than on the GATE (for example, "garden feels safe" rather than specific items that point to garden safety); because survey participants were not trained to rate the garden with a critical eye like the GATE Research Assistants and researcher; social desirability bias (wanting to please the researchers) might have influenced participants' higher ratings; and/or a sense of pride in their place of treatment/work ma have led to response bias. It may also be that because participants were happy that *something* was there, they were more likely to rate everything higher. In fact, several Staff Survey respondents, when asked in the open-ended question what they liked MOST about the garden, responded with, "That it is there."

What do you like MOST about the garden? and ***What do you like LEAST about the garden?*** Both Visitor and Staff Surveys contained the same optional, open-ended questions asking participants to describe what they liked most and least about the garden. Visitor Surveys received 72 (75.8%) responses to "like MOST" and 61 (64.2%) responses to "like LEAST." Staff Surveys received 239 (33.5%) responses to like MOST and 301 (42.2%) responses to like LEAST. It should be noted that for both Visitor and Staff Surveys, some of the "Like LEAST" answers were responses to the effect of "nothing." Some examples of these 12 (19.7%) responses from Visitor Surveys were "Nothing," "N/A," "0," "Can't think of one thing," "Nothing :-)" and "I love it all." Because these were write-in questions, data is solely qualitative and takes more time to analyze. In-depth data analysis of these qualitative answers is beyond the scope of this dissertation and will take place in the future.

4.4.7 "Staff use of the garden"

Participants in both Visitor and Staff Surveys were asked about their observations and feelings of staff use of the garden. In the Staff Survey, participants were also asked about existing policies on staff use of the garden; whether they thought staff should use the garden; and how they felt about staff having a designated garden that is separate from the garden(s) for patients and visitors.

Do you ever see other healthcare staff in the garden? This question was asked on both surveys, worded exactly the same. Almost half (30, 22.5%) of Visitor Survey participants responded with "Sometimes." Sixteen (22.5%) checked "Very often," nine (12.7%) checked "Always," and the same number of participants (8, 11.3%) checked "Rarely" and "Never." For staff, the largest number of participants (205, 34.8%) responded "Very often." The same number of participants (161, 27.3%) selected "Always" and "Sometimes." Forty-eight (8.1%) checked "Rarely" and 14 (2.0%) checked "Never." See Figure 4.14 for a comparison of the two Survey groups' responses.

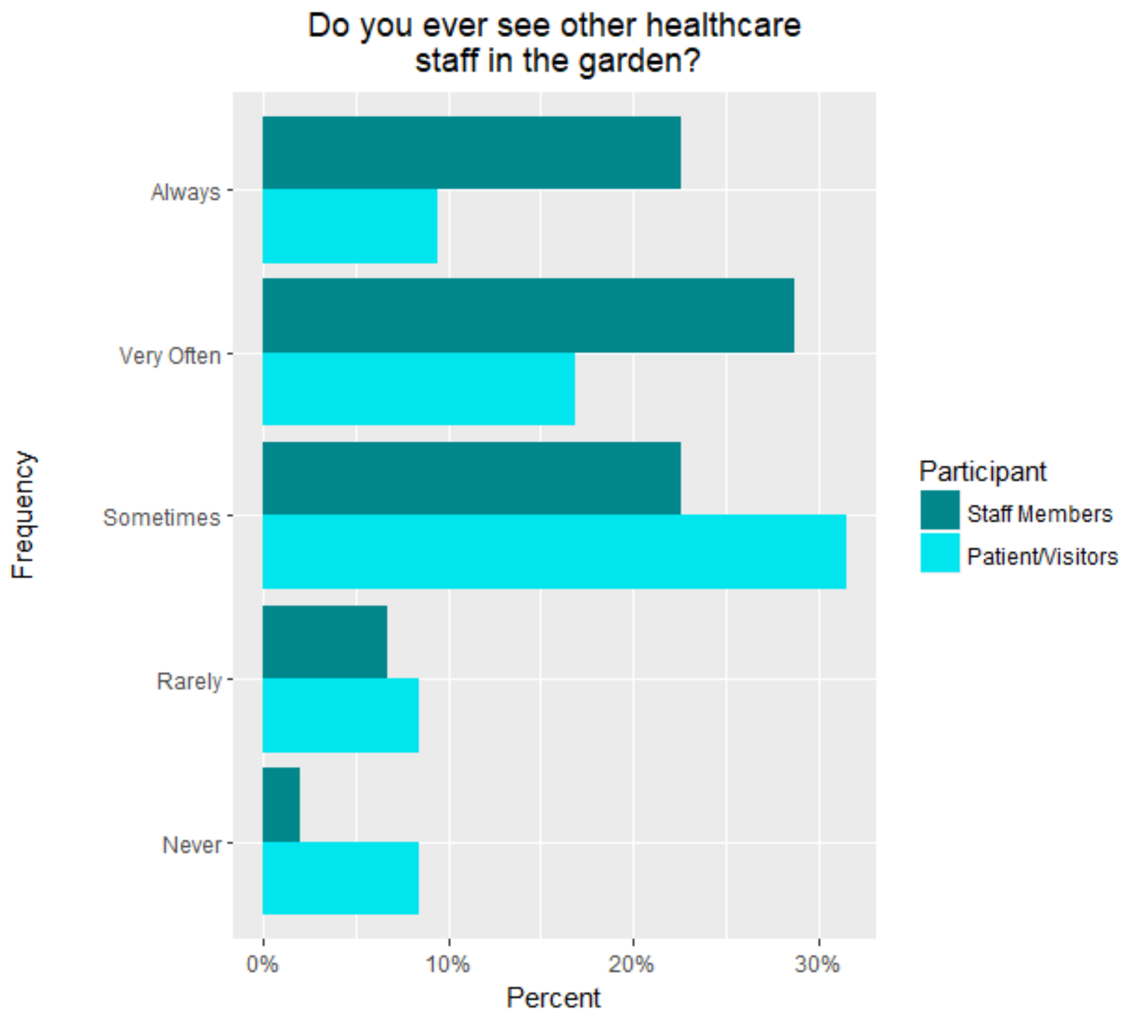


Figure 4.14 *Do you ever see other healthcare staff in the garden?*

If you do see healthcare staff in the garden, what are they usually doing? As can be seen in Figure 4.15, 37 (61%) Visitor Survey participants reported seeing staff eating lunch; 26 (42.6%) checked "Talking on the phone" and the same number checked "Resting/relaxing"; 24 (39.3%) reported "Talking/meeting with a colleague or colleagues," and the same number checked "Working with a patient." Thirteen (21.3%) checked "Talking with a family member or friend of a patient" and 12 (19.7%) "Doing paperwork." Five respondents (8.2%) checked "Other." The largest number of Staff Survey participants (448, 62.8%) also reported "Eating lunch" as an activity; 404 (56.7%) reported "Resting/Relaxing"; 286 (40.10%) reported "Talking on the phone"; 222 (31.10%) reported "Talking/meeting with a colleague(s)"; 90 (12.6%) reported

“Talking with a family member or friend of a patient”; 56 (7.9%) checked “Working with a patient”; 48 (6.7%) “Doing paperwork”; and 27 (3.8%) checked “Other.”

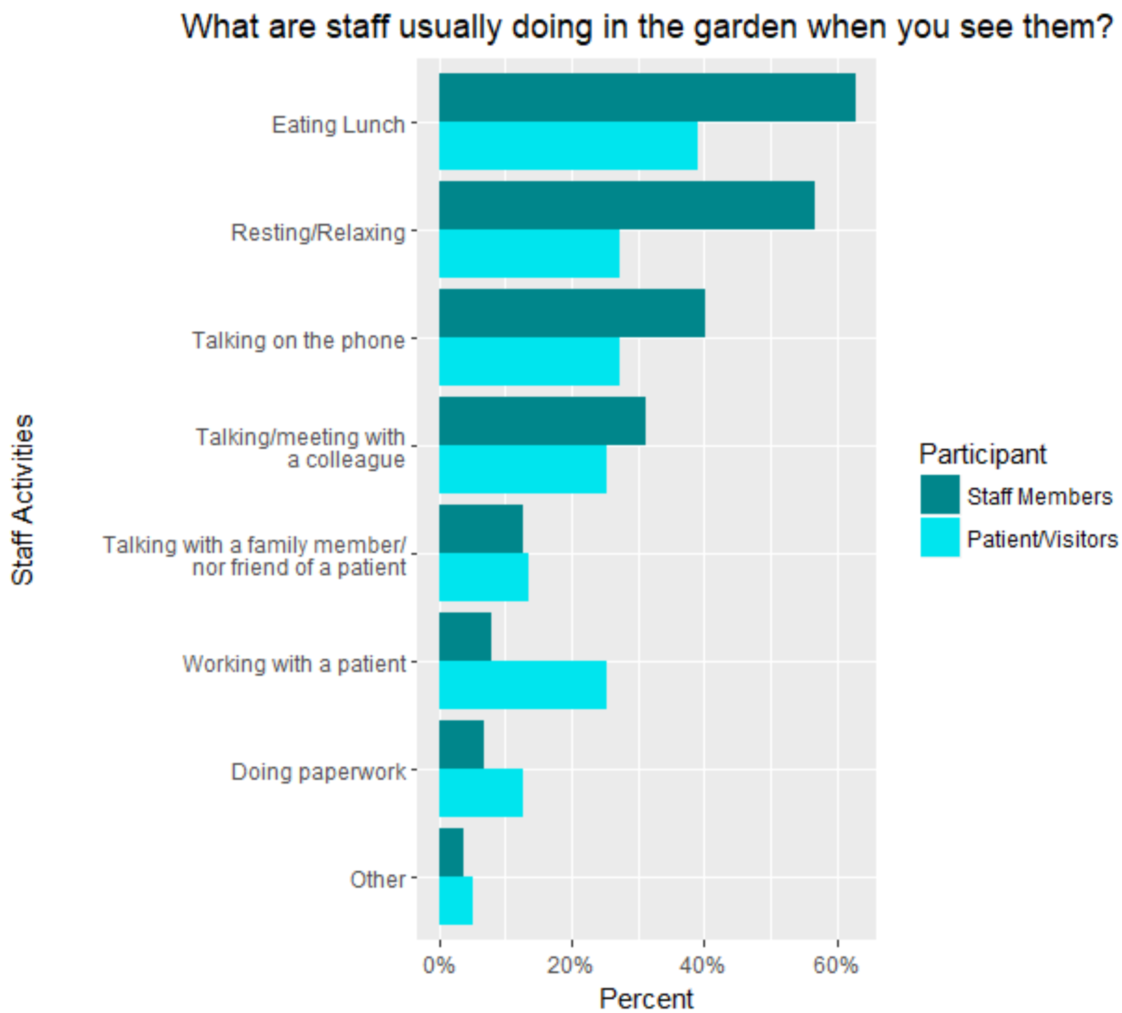


Figure 4.15 *“If you do see healthcare staff in the garden, what are they usually doing?”*

Visitor Survey: *How do you feel about the healthcare staff using the garden IN THEIR FREE TIME?* This was the last question regarding staff on the Visitor Survey. Of the 71 participants who answered the question, almost three quarters (50, 70.4%) responded “I like seeing the staff use the garden in their free time”; 20 (28.2%) responded “I don’t mind seeing staff using the garden in their free time”; and only one (1.4%) participant checked “I would prefer not to see staff using the garden." Although there was no write-in space specifically for this question, four participants left related comments in other open-ended questions. The spouse of a patient who had checked the "I like seeing the staff use the garden in their free time" wrote "Important for them to recharge. Thanks for providing this space :-)" Another visitor who checked the "I like seeing the staff use the garden" box wrote, "Great Idea helps me relieve stress and get my thoughts together and I enjoy seeing STAFF out there. Especially if they are having a stressful day they can come back focused." These two write-in comments show an appreciation of the stress that staff are under and a belief that gardens in HCFs benefit not just patients and visitors but also staff. One participant who checked the "I don't mind seeing staff using the garden in their free time" box added the comment, "If they're not having loud meetings or conversations." The one participant who responded "I would prefer not to see staff using the garden" added comments about staff both in the "What do you like LEAST about the garden" section ("Staff takes up all shaded spaces and will not move for patients. Lay on benchs [sic] taking naps like homeless people. Staff can go any where within the hospital patients cannot. I feel a Healing Garden should be for patients.") and in the "Please share any other comments about the garden" section ("If this garden is for staff and patients another garden needs to be made with a view of water and ONLY for patients"). The results that almost three quarters of participants reported *liking* seeing staff using the garden in their free time, and that only one of the 71 respondents to this question reported that they would rather not see staff using the garden, were surprising and went against the researcher's hypothesis that patients and visitors would prefer *not* to share the healing garden with staff.

Staff Surveys. Five additional questions about gardens for staff were asked in the Staff Survey, as listed in order and described below:

Does the healthcare facility have a policy about staff using the garden in their free time? Of the 713 staff members who answered this question, over half (391, 65.6%) checked "Don't know." Two hundred (28.1%) checked "No," and only five participants (0.8%) checked "Yes." Three of the participants who checked "Yes" gave more details: "Its for patients not breaks" [sic]; "Staff are strongly encouraged to use the garden"; and "We are not supposed to eat lunch there." It is interesting that so many participants were unsure about whether their HCF had a specific policy regarding staff use of the garden. Further quantitative and qualitative data analysis should examine whether there is any link between a clear policy of allowing or not allowing use and actual use by staff.

Do you think staff should be allowed to use the garden in their free time? Participant response was resoundingly positive, with 515 (86.6%) participants answering "Definitely yes" and another 64 (10.8%) answering "Probably yes," adding to a total of 97.4% affirmative answers. 2.5% participants were "Neutral" and only .2% answered "Somewhat no." Zero participants responded "Definitely not."

Does this healthcare facility have a separate garden(s) for staff? Over three-quarters (463, 77.9%) answered "No," 122 participants (20.5%) checked "Don't know," and nine (1.3%) checked "Yes."

If this facility DID have a separate garden for staff, would you use it? While the majority (366, 67.5%) of respondents answered "Yes" and only 35 (6.5%) answered "No," a surprising number (141, 26%--over one quarter) of participants answered "Not sure." The "Not sure" choice invited participants to write in more details: "Not sure: feel free to describe why you're not sure." Twenty-nine of the 76 write-in responses had to do with convenience; staff explained they would only use an additional garden if it were close and easy to get to. For example, "breaks are very limited....only 30 minutes in a 8 hour shift to eat and do whatever else is needed. Sometimes, work is too busy to take a full break"; "present garden is easily accessible-not sure whether a staff garden would be"; "Already too busy"; "I would probably use the most convienient" [sic], "Our current garden is inviting enough. I am just so busy, I don't go there." Twenty-two of the 76 "Not sure" participants who wrote in more details did not see the need for a separate garden. Write-in responses included "I don't think we need a separate garden because ours is quite large in area"; "Don't see the need for a separate area"; "Only one garden needed"; "Seems a little unnecessary for me"; "I love the garden we have-do not feel the need for a seep rate [sic] garden-not sure what it would do"; "The current healing garden is convenient for me and beautiful. Unclear why one would segregate staff/patients." One participant wrote, "This idea is going too far! ONE garden is a lot!!" A small number of staff were concerned that a separate staff garden would not be as nice as the existing garden, or as one for patients and visitors: "Not unless it was as nice as this one"; "I imagine it wouldn't be as nice if a staff only area"; "Would tend to think that a staff garden would not be as well maintained." One staff member seemed to think that a separate garden would necessitate more communication with fellow staff members, something he or she clearly did not want: "I don't want to have to talk to colleaugues!" [sic]. Of the staff who thought that they would use a separate garden, some of the write-in responses were: "Please put in a tranquility garden for staff"; "I feel that the patients, their family and friends need a pace [sic] to go and unwind, pray, meditate, discuss private situations with out having hospital personnel talking, laughing or eating around them, even though the eating tables are on the other side of he wall"; "It would be nice to get away - away from all aspects of pt. care. Staff would need to maintain the cleanliness of the garden. Perhaps start a herb/vegetable garden"; "I do think a separate space would be helpful for staff who need privacy - we are a small community hospital - hard to get privacy."

Do you think that healthcare staff should have their own garden, separate from patients and visitors? Less than one-quarter (23.6%) of the 713 Staff Survey participants who responded to this question answered in the positive (that staff should have their own garden), with 66 (11.2%) answering "Definitely yes" and 73 (12.4%) "Probably yes." 182 (31%) participants reported "Maybe" and the majority—266 (45.3%) staff—responded in the negative, with 203 (34.6%) answering "Probably no" and 63 (10.7%) "Definitely no."

Are there any other outdoor spaces at this healthcare facility where you spend time? For example, cafeteria patio, or front entrance. The last Staff Survey questions related to gardens asked about additional outdoor spaces at the HCF where participants spent time. In pre-testing of Behavior Mapping, the researcher noticed that the same number, if not more, people congregated in outdoor spaces that were not the Pilot Test healing garden, particularly outdoor areas that were near or adjacent to the cafeteria, even when the spaces did not seem as attractive or comfortable. See Chapter V for a discussion and results from Behavior Mapping. Surveys were an opportunity to triangulate these findings and to find out possible reasons for staff spending time in outdoor spaces other than the healing garden. In response to ***Are there any other outdoor spaces at this healthcare facility where you spend time? For example, cafeteria patio, or front entrance,*** 249 participants (42.1%) answered yes, and 342 (48%) answered no.

For those participants who responded yes, an open-ended question asked for more details: ***If there are any other outdoor space(s) at this healthcare facility where you spend time, please say briefly why you use them. Easier to get to? More private? More social? There is no right or wrong answer, we would just like to know how other outdoor spaces compare to the hospital's garden.*** One hundred sixty-four participants wrote in comments. Although more formal analysis of this qualitative data is needed, the most commonly recurring responses fell into four categories: (a) the other space was closer or easier to get to from respondents' work area ("Ambulance Bay - I am technically still on my unit but can get some quick fresh air"); (b) more convenient to the cafeteria for access and eating ("Caf patio - plentiful seating eating lunch w/co-workers.") [SIC]; (c) more privacy ("I enjoy quiet time in the Kern CCU garden because I am usually the only person up there. It feels very private."); (d) wanting more exercise than the garden can offer ("I try to walk the trail around the hospital daily after lunch to boost energy as I sit most of the day.").

4.4.8 Additional Comments

Please share any other comments about the garden. Both Visitor and Staff Surveys included this qualitative open-ended response question. Staff Survey responses were not analyzed for this study. Visitor Survey comments are summarized here. Seven participants commented on how the *garden helped them deal with stress and provided a means of escape* (all comments in quotes are verbatim): "Beautiful, relaxing, healing." "Great idea to have while dealing with the hospital stress." "Great Idea helps me relieve stress and get my thoughts together and I enjoy seeing STAFF out there. Especially if they are having a stressful day they can come back focused." "It's a spot that you would not expect It a nice little place out in the natural sun where you can enjoy the fresh air and beautiful fresh air." "I love the garden and wish more health centers included places like this. Its hard to stay at the hospital / be away from your familiar life but the garden is a great place to feel like you're escaping. Add more spots to have areas like this!" "I am so grateful for the garden, I live 2 blocks away in a Senior Building - I love to get away from all the old people shouting. I love to watch the plants and trees bloom in the Spring and the changes in Autumn and Winter."

> The garden is amazing since it is in the middle of the city. When you sit in a corner and look over the garden with the trees and different bushes - it almost makes you forget that in that bldg are so many sick people especially sick children. When one sees one of these kids smiling and enjoying being out in nature - it makes one feel good inside. There is hope!

Four participants shared *design ideas: "*I would like to see bright happy colors! maybe some green or purple's around. maybe fake flowers, if patients can be around real ones. The pond is too dark and gloomy. Maybe color the floor? or something awardwinning like :-)" "I hope the survey encourages Smilow to redesign comfortable seating Also need shaded areas for mid-day." *"*Winter garden would benefit and enhance experience by adding "natural" garden art, rocks, little cement bridges (Japanese or European style). Summer garden needs more flower baskets and fragrant roses (containers of) to appeal to olfactory senses as well as aesthetic appeal. Thanks for asking 4 input.*" "*I did not see a lot of plant IDs." Two participants wanted fish in the water feature. Two participants asked for a *playground for children*. Two participants mentioned *winter*: "Winter garden would benefit and enhance experience by adding "natural" garden art, rocks, little cement bridges (Japanese or European style)." "I was happy to see the [Smilow] garden walkway did not stay coated with snow and ice and people were still walking through it." Two participants specifically mentioned *maintenance*: "There are no weeds. Everything is groomed. It doesn't look pruned (sheared). It is beautiful," and "Nicely maintained grass and well groomed tress and grass." One participant, from one of the smaller healing gardens, *wished the garden were larger to better facilitate exercise*: "Would love it if area was a little bigger to allow for more walking exercise - not just a stroll. That's my only complaint - For cancer patients, its truly a "healing garden" --> improves my husband's mood, energy level to get outside!" Only one participant commented that the survey was too long. One participant simply commented, "This is one of the Most Wonderful Gardens I have been in."

4.5 Data Analysis for Convergent Validity

Convergent validity was tested by correlating Staff Survey participants' subjective 1–10 "Survey Overall Impression" scores with the "GATE-like Cumulative Item" scores. Results from the Pearson correlation indicated that there was a significant positive relationship between the two scores ($r = .73$, $p < .001$). When the GATE-like Cumulative Item scores were correlated with GATE Cumulative Item scores, results were also strong ($r = .73$, $p < .001$) and appeared similarly strong across HCFs. Legacy Good Samaritan ($r = .57$, $p < .01$), Legacy Salmon Creek ($r = .81$, $p < .01$), Baylor Scott & White Hospital ($r = .66$, $p < .01$), St. Joseph Hospital ($r = .52$, $p < .01$), Smilow Cancer Hospital ($r = .75$, $p < .01$), and Greenwich Hospital ($r = .59$, $p < .01$) all demonstrated a robust link between the GATE Cumulative Item score and the GATE-like Cumulative Item score. This correlation provides further evidence for convergent validity in the H-GET Surveys (Campbell & Fiske, 1959). This finding was also similar to the correlation within the GATE between the GATE "Cumulative Item" scores and the GATE evaluators' "Overall Impression" 1–10 scores, as described in Chapter III.

4.6 Data Analysis for Hypothesis Testing

Although the primary focus of the survey research within this dissertation study was on instrument development and testing, some data analysis was conducted to test *a priori* hypotheses that (a) patients and visitors (Visitor Surveys) would score garden items (GATE-like Cumulative Item score) and the overall garden (1–10 Overall Impression score) differently from staff and volunteers (Staff Surveys); (b) strong correlation of how important Staff Survey participants felt that nature was in their everyday lives and frequency and duration of garden visits and GATE-like scores ; (c) the more visible gardens were from indoors, the more greater people's awareness of the gardens would be; (d) there would be a significant correlation between self-reported enjoyment of view of the garden and rating of the garden (GATE-like score); and e) there would be significant positive correlation between how survey participants rated the garden and the "outcome" measures of garden success. Unless Visitor and Staff

Survey data were being compared, only Staff Survey data were used for analysis because of the much larger sample size.

4.6.1 Hypothesis Testing for Differences Between Patients/Visitors and Staff

The researcher hypothesized that patients and visitors (Visitor Surveys) would score garden items (as represented by the GATE-like score) and the overall garden (1–10 Overall Impression score) differently from staff and volunteers (Staff Surveys). This hypothesis was tested using *t*-tests of Visitor and Staff mean GATE-like scores and 1–10 Overall Impression scores, as shown in Table 4.4.

Table 4.5 *t*-test between Visitor and Staff Surveys of Overall Impression and Cumulative Item scores.

Mean score	Group								
	Patient/Visitor			Staff			Difference		
	M	*SD*	*n*	*M*	*SD*	*N*	*t*	*df*	*d*
Overall Impression	9.16	.98	74	8.55	1.59	529	4.61**	134.41	.40
Cumulative Item	9.30	.32	74	8.93	.45	600	3.74**	111.16	.36

Note. Overall Impression = Overall garden rating (where 1 = Very Bad and 10 = Excellent);
Cumulative Item = Mean of all GATE-like scores, with 4 = highest and 1 = lowest possible scores.
Cumulative Item scores have been translated from 4 scale to 10 scale for ease of comparison.
**Significant at the $p < .001$

4.6.2 Hypothesis Testing about Relationships Between Participants' Attitude Toward Nature and Survey Responses to Garden Visits and Garden Scores.

Pearson correlations were run to examine the relationship between Staff Survey participants' self-reported importance of nature ("nature importance") in their everyday lives and survey responses about frequency and duration of garden visits. Correlations were also run to examine the relationship between self-reported "nature importance" and participants' GATE-like scores.

Importance of nature and *frequency* of HC garden visits. Results from the Pearson correlation from Staff Survey data confirmed that there was a significant relationship between staff's opinion about *importance of being outside in nature* and *how often the staff visited the garden* (r = -.19, $p < .05$).

Importance of nature in participants' everyday lives and *duration* of HCF garden visits. There was *not* a significant correlation between *perceived importance of nature* and *duration of garden visits* (r = .03, p = .53). This finding may indicate that people do not necessarily stay longer in the garden because they feel strongly about nature. There are many possible reasons, including that the garden serves as a private space; feels like an escape from the facility; or is where colleagues, friends, or family want to be and so the respondent goes with them.

I**mportance of nature and garden ratings (GATE-like scores)**. There was a significant positive correlation (r = -.13, $p < .01$) between "nature importance" and GATE-like scores. The more important people felt nature was in their everyday lives, the higher likelihood of them scoring the garden items higher in the GATE-like portion of the Survey.

4.6.3. Hypothesis Testing about Relationships between Garden Visibility and Garden Awareness

A Chi-square analysis indicated that the more survey participants could see the garden from indoors (the more the garden was visible), the more likely they were to be aware of the garden, (χ^2 = 4.57, $p < .05$).

4.6.4 Hypothesis Testing about Relationships between Garden Quality (garden score) and Enjoyment of View

A Pearson correlation showed a significant relationship between self-reported enjoyment of the view of the garden from indoors and GATE-like scores of the garden, (r=.40, $p < .010$). Participants scoring their HC garden positively were also likely to enjoy the view of the garden.

4.6.5 Hypothesis Testing about Potential Measures of Success of Healthcare Gardens and Outcomes

Six questions, discussed in detail in the descriptive statistics results section above, addressed survey participants' thoughts and feelings about healthcare gardens in general (one question), and about the specific garden at their HCF (five questions). These questions were tested as indicators of outcomes—potential measures of a garden's success. The questions appeared in this order on the survey: the first four were grouped together in the "Garden Awareness and Access" section and the last two were grouped together in the "Garden Visits" section. Abbreviations for the related tables are in quotes and parentheses:

- In your opinion, is it important for healthcare facilities to have gardens? ("Garden Important")
- Would you encourage other people (patients, visitors, or staff) to visit the garden? ("Encourage Visit")
- Does the garden improve your satisfaction with this healthcare facility? ("Satisfaction")
- Does the garden increase the likelihood that you would recommend this healthcare facility to others? ("Recommend")
- How do you usually feel after you spend time in the garden? ("Feel After")
- In your opinion, is spending time in the garden good for people's health (physical and/or mental)? ("Good for Health")

All questions were worded the same and used the same scales in Visitor and Staff Surveys. All but one question used a 5-point Likert-type scale (1 = Definitely yes, 2 = Probably yes, 3 = Maybe, 4 = Probably not, and 5 = Definitely not). The question "How do you usually feel after you spend time in the garden?" was rated with 1 = I feel better, 2 = I don't feel any different, and 3 = I feel worse.

Differences between two survey groups. As before, the first hypothesis was that Visitor Survey participants' outcome answers would differ significantly from Staff Survey participants'. As shown in Table 4.6 , independent sample *t*-tests of all five responses indicated significant differences between Visitor and Staff Survey participants.

Table 4.6 *t*-test of differences in "outcomes" responses between Visitor and Staff Survey groups.

Outcome	Group								
	Patient/Visitor			Staff			Difference		
	M	*SD*	*n*	*M*	*SD*	*n*	*t*	*df*	*d*
Encourage Visit	1.16	.43	91	1.37	.67	664	-3.91**	157.67	-.31
Garden Important	1.18	.47	92	1.51	.77	707	-5.82**	163.69	-.45
Satisfaction	1.35	.66	91	1.64	.89	671	-3.70**	139.41	-.33
Recommend	1.69	.92	90	2.24	1.23	665	-5.11**	135.97	-.46
Feel After	1.03	.16	73	1.09	.28	593	-2.68**	132.04	-.22
Good for Health	1.11	.35	74	1.31	.58	602	-4.35**	126.78	-.37

Note. Encourage Visit = "Would you encourage other people to visit the garden?"
Garden Important = "In your opinion, is it important for healthcare facilities to have gardens?"
Satisfaction = "Does the garden improve your satisfaction with this healthcare facility?"
Recommend = "Does the garden increase the likelihood that you would recommend this healthcare facility to others?"
Feel After = "How do you feel after you spend time in the garden?"
Good for Health = "In your opinion, is spending time in the garden good for people's health?"
All questions except Feel After were scored with **1 = Definitely yes, 5 = Definitely not.**
Feel After scoring was 1 = I feel better, 2 = I don't feel any different, 3 = I feel worse.
Descriptive and inferential statistics were calculated to assess differences between the two survey types (patient/visitor and staff).
* $p < .05$; ** $p < .01$

Relationship between outcome questions and garden scores. The second hypothesis was that the more successful the garden as rated by the GATE-like item-by-item scores (which measured access to the garden, comfort, safety, sense of escape, nature connection, privacy, social opportunities, and opportunities for movement and exercise) as well as the 1–10 Overall Impression scores, the more likely the survey participant would be to respond in the positive to one or all of the "outcome" questions. Pearson correlations were run to identify significance of relationship between each of the six “outcome” variables and the garden scores using both the GATE-like Cumulative Item and Survey Overall Impression scores. The full-sentence questions are above in Table 4.6, as are the corresponding outcome codes. The strongest association was found with “Recommend” (r = -.39, $p < .05$), “Satisfaction” (r = -.44, $p < .05$), and “Encourage Visit” (r = -.46, $p < .05$) and garden scores as measured by the GATE-like Cumulative Item and 1–10 Survey Overall Impression scores. “Feel After” (r = -.21, $p < .05$), “Good for Health” (r = -.23, $p < .05$), and “Garden Importance” (r = -.24, $p < .05$) were moderately associated with the garden scores. As the score increased, the dependent outcome variable increased.

4.7 Conclusion

4.7.1 Discussion

The Healthcare Garden Evaluation Toolkit (H-GET) Visitor Survey, for patients and visitors, and the H-GET Staff Survey, for staff and volunteers, provided a large amount of data and information about the H-GET Pilot Test gardens and their users. Focus for this dissertation study was on development and testing of the four H-GET instruments, and this chapter has focused primarily on documenting the Surveys’ development and testing, and on reporting descriptive statistics results.

Support for content and face validity is derived from an extensive literature review, including review and use of comparable survey instruments; opinions and feedback on the surveys’ content and format from experts and non-experts; and pre-testing of the surveys prior to dissemination at the eight H-GET Pilot Test sites.

The survey instruments were designed to help researchers, designers, and healthcare organizations explore participants’ awareness and use of the HCF garden, including barriers to use; thoughts and feelings about the garden and specific design elements; and opinions about staff use of the garden. Questions also explored participants’ attitudes toward the garden in relation to their self-reported health and satisfaction with the overall facility.

Support for convergent validity comes from results of Pearson correlation tests that found a strong correlation between two different types of garden scoring methods within the Surveys—the GATE-like "Cumulative Item" score and the 1–10 "Survey Overall Impression" score. A similar strong correlation was found between GATE Cumulative Item and Overall Impression scores, as discussed in Chapter III. Convergent validity is further supported by a strong correlation between the GATE Cumulative Item and Survey GATE-like Cumulative Item scores and the GATE Overall Impression and Survey Overall Impression scores.

Hypotheses were tested using *t*-tests, chi-square analysis, and Pearson correlations for (a) differences between Visitor and Staff Survey participants; (b) the relationship between Staff Survey participants' attitudes about nature and frequency and duration of garden visits and GATE-like scores; (c) relationship between garden visibility from indoors and participants' garden awareness; (d) relationship between self-reported enjoyment of the view of the garden and GATE-like Cumulative Item and Overall Impression garden scores; and (e) relationships between six "outcome" measures of garden success and garden scores.

The H-GET Surveys can likely be used by researchers who wish to conduct surveys about gardens in HCFs. Below are some of the limitations with this study, possible solutions to the limitations, and thoughts for future work using the H-GET Survey instruments.

4.7.2 Limitations and Future Research

Surveys are time-consuming to develop, disseminate, and analyze, particularly when there is a combination of quantitative and qualitative questions. They are also rewarding in the wealth of quantitative and qualitative data that they reveal.

Survey length. Some of the expert reviewers expressed concern about the survey length, and the researcher tried to reduce the number of questions and to make the survey as straightforward as possible to minimize respondent burden. Most participants took between 10–15 minutes to complete the online survey, which, for busy people, may be perceived as a long time. Nevertheless, survey completion rate was high, and only one participant complained about the length (in the open-ended comments section). Regardless, future versions of both Visitor and Staff Surveys should consider the possibility of shortening the instrument. For example, the entire section on staff use will probably not be necessary for most healthcare garden evaluation research. It is possible that some of the GATE-like rating items could be eliminated, and Factor Analysis can be employed to help in determining what questions to eliminate. Shorter surveys would probably increase survey participation and completion.

Sample size. Although the overall sample size for the Staff Surveys was large, only two of the seven HCFs where Staff Surveys were distributed were well-represented. Future studies using the H-GET surveys should attempt to gain a more balanced sample size across facilities. Sample size of Visitor Surveys was relatively small (95) and was not evenly represented across Pilot Test HCFs. Future studies should attempt to increase sample size.

Language. The H-GET Visitor and Staff Surveys were only available in English. Depending on the population being studied, surveys should be translated into at least one other language. For example, Pasha (2011) converted her surveys into Spanish. Some parts of the country will need translation more than others. In this study, Spanish surveys in Oakland, CA and New Haven, CT might have increased the number and quality of responses. Future versions of the H-GET surveys should be translated into Spanish (and perhaps other languages, depending on the HCF population being served) using a method where two different people translate the survey into Spanish and then two *other* different people translate the Spanish survey back into English. This translation method can also help to strengthen support for content validity (Dillman, Smyth, & Christian, 2014).

Consistency of questions. If the Visitor and Staff Surveys are to be used together in the future, one or both should be changed so that even more of the questions are worded exactly the same, and the order of the questions should be as similar as possible.

Survey distribution—policy. The researcher encountered difficulties with survey distribution, as was described above. For example, HCFs not being willing or able to announce the survey online, or not being willing or able to announce the gift incentive program. In some cases, full protocol had been agreed upon by one HCF liaison who was less familiar with the details of survey policy. Such problems should be avoided whenever possible, but researchers should also be flexible so that if plans or policies change, survey distribution is not completely halted.

Data Analysis for reliability, validity, and hypothesis testing. Only a small amount of the survey data was analyzed for this dissertation. Future analysis should focus on:

- Factor and Principal Component Analysis to further establish convergent validity;
- Testing Internal Consistency to establish reliability;
- For Criterion Validity, multivariate tests can be run to examine, for example, how ratings of specific garden features help to predict overall garden satisfaction or use of the garden;
- Multivariate linear regression analyses can be run to further explore the relationships between the independent variables and dependent variables. For example, tests can be conducted to examine how specific garden qualities influence frequency or duration of garden visits, levels of satisfaction, and so on;
- Analysis of the qualitative responses can help shed light on the survey responses as well as information gathered through the other three H-GET instruments.

Site by site data analysis. Future analysis should also delve into data analysis for each individual Pilot Test HCF to identify patterns, relationships, and correlations between variables. Such analysis would also enable further triangulation of information and results from the other three H-GET instruments.

CHAPTER V

EXPLORATORY STUDIES: BEHAVIOR MAPPING AND INTERVIEWS

5.0 Introduction

In addition to the Garden Assessment Tool for Evaluators (GATE), described in Chapter III, and Visitor and Staff Surveys, described in Chapter IV, two more instruments were developed as part of the Healthcare Garden Evaluation Toolkit (H-GET): Behavior Mapping (BMap) and Stakeholder Interviews (SI). Behavior observation and interviews have been used by researchers in previous healthcare garden evaluation research, as described in Chapter II. Both methods are useful for learning about how a space is used in real time and for gathering information about a project's planning, design, construction, and operation processes. They are also both useful in mixed methods research for triangulating and contextualizing information that has been gathered through other instruments and methods.

Development and testing of the BMap and SI instruments occurred at the same time as the other two H-GET instruments. However, due to the qualitative nature of BMap and SI, time and budget limited extensive data analysis for this study. This chapter summarizes the development and testing of BMap and SI and reports on some preliminary findings from each instrument.

5.1 H-GET Instrument #3: Behavior Mapping

5.1.1 Purpose, Definition, and Benefits and Limitations of Behavior Mapping

Purpose. Behavior Mapping (BMap) for the Healthcare Garden Evaluation Toolkit was developed to facilitate systematic observation and recording of healthcare garden users (patients, visitors, and staff) and their behaviors. The protocol was developed for use not just by academic researchers but also by designers and healthcare staff and administrators. As described in Chapter II, Behavior Mapping and the three other H-GET instruments were developed and then pilot tested at eight healthcare facilities in four different regions of the U.S.

Definition of behavior mapping. Behavior mapping is a specific type of systematic behavior observation (referred to here as SO) in which the researcher observes *who* (types of users) is doing *what* (behaviors) *when* (times of the year/month/day) and *where* (specific locations in a space). This entails examining "how a physical environment supports or interferes with behaviors taking place within it, especially the side effects the setting has on relationships between individuals and groups" (Zeisel, 1981, p. 191). Sommer and Sommer (1986) describe how SO is different from merely looking: it systematically addresses specific research questions by recording and analyzing what is observed through a controlled methodology that has been subjected to rigorous checks and controls. Corcoran and Fischer (1987) state:

> Behavioral measures, based on observation of the client's actual functioning, are particularly useful because they typically are the most direct expression of the problem and therefore tend to have a great deal of validity. Also, because behavior can be counted and defined fairly specifically, this form of measurement can add a good deal to the precision and reliability of one's assessment (p. 28).

Benefits and limitations. McKenzie and van der Mars (2015) argue that SO functions better than other measures of physical activity (PA) because it addresses the physical and social contexts of the behavior being observed. Cutler (2000) states that SO, when conducted by trained researchers and using a standardized methodology, can provide detailed, accurate, and even objective data. SO tends to yield high reliability and validity because behavior can be counted and defined quite specifically, and because the observer identifies actual functioning. Cutler also notes that SO can be an excellent source of validation of other tools when researchers are using mixed methods. McKenzie and van der Mars (2015) discuss the advantages and disadvantages of SO for assessing PA. The advantages are, first, that SO is a "direct method" that collects objective information about the physical and social environment simultaneously. Because it is a direct method in which the researcher notes exactly what is observed, SO has the potential for strong internal validity, which the authors also refer to as "WYSIWYG—What You See Is What You Get" (p. 14). Second, SO is "place-dependent," occurring only in specific locations that have unique physical and social characteristics (p. 14). It is an attractive methodology for researchers who study how changes and interventions in the environment affect PA. Third, it can be used in almost any physical setting, including water, and there is little or no burden on the people being observed. Fourth, the data collected is usually in a format (e.g., frequency, minutes, walking) that is easily understood by practitioners, administrators, and policymakers without researchers having to translate their findings. Fifth, computer hardware and software has made data collection and analysis easier. SO does have disadvantages, namely that observers do not always have full access to locations of the people they want to observe; observers' bias can (intentionally or not) influence observation and analysis; "reactivity," or participants (people being observed) acting differently with observers present (e.g., the Hawthorne effect) can affect results; and data collection and training of observers are often time-consuming and labor-intensive.

5.1.2 Literature Review for Instrument Development

A literature review was conducted to identify comparable instruments that could be used as models for the H-GET BMap protocol. Particular attention was paid to other healthcare garden evaluation studies. The literature review also revealed findings about healthcare garden design and programming that were relevant to the H-GET research.

Findings from previous systematic behavior observation studies. Although not many healthcare garden evaluations have been published, and even fewer have used SO, those that *have* used behavior mapping or another form of SO have obtained significant and frequently-cited results. Cooper Marcus and Barnes (1995) found that in several gardens in their Bay Area post-occupancy evaluation of healing gardens, many people observed in the garden were "passing through," walking from one building to another. Sherman, Varni, Ulrich, and Malcarne (2005) and Naderi and Shin (2008) had similar findings. In the same 1995 study, Cooper Marcus and Barnes found that most gardens were used primarily by staff. This finding, supported by subsequent research, surprised many people who assumed that healing gardens were used only by patients and family members. Although the authors observed more patients in some gardens than others, those users still comprised a smaller percentage than healthcare visitors, staff, and in some cases, members of the general community. At several gardens, Cooper Marcus and Barnes observed people eating lunch from the nearby cafeteria, highlighting that increased use, at least during lunch-time, was correlated with proximity to the hospital cafeteria or restaurant (1995).

Sandra Whitehouse (1999) performed a multi-method evaluation of gardens at San Diego Children's Hospital. Whitehouse's garden observations also informed other methods of the study, particularly her approach to interviews and her research questions. Thus behavior mapping served not just as a data collection tool but also as a *process* for informing the rest of her research. Whitehouse's behavior mapping methods were based on those documented by Cooper Marcus and Francis (1990). Whitehouse, too, found that patient use of the healing garden was less frequent than visitors or staff, and that visit durations for patients and others were usually very short: "Typical garden visitors (about 50%) stayed less than 5 minutes, with many of these spending only a minute or two in the garden" (p. 120). Whitehouse found through behavior mapping and hospital user interviews that children and their parents wanted "more things to do" in the garden (Whitehouse et al., 2001, p. 311). The administration at San Diego Children's took note of these findings and, with subsequent gardens, provided more features that engaged children. Whitehouse and the HCF have been commended for sound research that effected real change.

Sherman conducted a post-occupancy evaluation of three gardens surrounding a pediatric cancer care facility, also in San Diego (Sherman, Varni, Ulrich, & Malcarne, 2005). For the behavior mapping portion of her research, Sherman modified Whitehouse's behavioral coding system. She found significant differences in garden use by patients, visitors, and staff. Not surprisingly, the garden that was surrounded by staff offices was used more heavily by staff, and those that were closer to patient rooms were more heavily used by visitors and patients. Sherman also found that patients comprised only 4% of the total garden users, echoing Cooper Marcus & Barnes' 1995 and Whitehouse's 1999 findings.

Comparable instruments. In healthcare research, most SO, including mapping, has taken place inside of buildings (e.g., Alalouch & Aspinall, 2007; Rippin, Zimring, Samuels, & Denham 2015). In outdoor research, most SO has focused on physical activity (PA), usually children's, in schools, parks, museums, and zoos (Cosco, Moore, & Islam, 2010). Some of the more frequently used tools are SOFIT (System for Observing Fitness Instruction Time, McKenzie, 2015), SOPLAY

(System for Observing Play and Leisure in Youth, McKenzie, 2006), SOPARC (System for Observing Play and Recreation in Communities, McKenzie and Cohen, 2006; McKenzie, Cohen, Sehgal, Williamson, & Golinelli, 2006), and EAPRS (Environmental Assessment of Public Recreation Spaces, Saelens et al., 2006). However, most of these instruments focus primarily on levels of PA that are rarely seen in general acute care hospital gardens where the most vigorous PA is usually walking. None of these instruments were directly applicable to healthcare spaces.

Most healthcare garden evaluations have utilized some form of SO along with other instruments, as outlined in Table 2.2 (Cooper Marcus & Barnes, 1995; Davis, 2011; Naderi & Shin, 2008; Pasha, 2011; Shepley & Wilson, 1999; Sherman, Varni, Ulrich, & Malcarne, 2005; Whitehouse et al., 2001). Many researchers used instruments previously developed by other researchers. Pasha (2011), Sherman, Varni, Ulrich, and Malcarne (2005), and Whitehouse (1999) used Cooper Marcus and Francis' behavior observation and mapping techniques (1990). Cooper Marcus actually trained Whitehouse for her on-site behavior mapping. The H-GET BMap protocol used these studies as a starting point, as well as methodology documented by Cooper Marcus and Barnes (2008), Preiser, Rabinowitz, and White (1998), and Zeisel (1981). Cooper Marcus and Barnes' combination of "behavior mapping" and "behavior tracking" (2008), which will be described in greater detail in the next section, was the most appropriate model for the H-GET BMap tool because it was designed specifically for observation of patients, visitors, and staff in healthcare gardens.

Models for the H-GET BMap instrument. Two related approaches used by Cooper Marcus and Barnes served as the primary models for the H-GET Behavior Mapping protocol. For their 1995 study of hospital gardens in the California Bay Area, Cooper Marcus and Barnes analyzed garden user traffic flow, activities, gender and age distribution, and user type (patient, visitor, or staff). Each site was observed for a total of eight hours, with observations from 11 am–1 pm and 1 pm–3 pm taking place on a combination of weekdays and weekend days. Observation sessions were divided into six 20-minute periods. Behavior was recorded onto 8.5 x 11" paper plans and the data were tabulated for each site and aggregated for total counts. For a 2008 post-occupancy evaluation of six healthcare gardens in the Chicago area, Cooper Marcus and

Barnes built upon their previous methodology and combined three approaches: *Behavior mapping*, *behavior tracking*, and *entry-exit tallies*.

For *behavior mapping*, the researchers used a “snapshot” approach, where observers walked through the garden at regular intervals of fifteen to thirty minutes for four hours, recording with predetermined symbols on a paper plan who was in the garden (gender, age, patient, resident, visitor, or staff), what they were doing, and whether they were alone or in a group. The researchers then aggregated the snapshot data into a plan that showed garden use throughout the day. The two main drawbacks of the snapshot approach are that it does not accurately represent how long individuals stay in the garden, nor what they do during that time.

Behavior tracking addresses this gap by identifying specific users to gather more detailed information over a sustained period of time. For a random sample of users, the researchers determined a specific time to start observing the first person to enter the garden. The researchers then followed that person by eye and recorded their (and their companions’) movement and activities, including what time behaviors occurred, on the plan until the person left the garden. After the first person had left the garden, the next person to enter the garden was tracked, using the same method, until they exited the garden, and so on. This behavior tracking procedure was repeated for thirty minutes at a time for a total of three hours at each site, providing greater detail about typical garden users.

Entry-exit tallies involved counting the number of people entering and leaving the garden through its main entry during two half-hour tally periods. Particularly in healthcare settings, people often step out into the garden for very brief time periods, which would not be captured with the other behavior observation methods. The researchers found this third method to be less informative to the overall picture of garden usage (personal correspondence with Cooper Marcus, 2014).

Hardware and software – Electronic or analog? The BMap Protocol was developed to be used not just by academic researchers but also by designers and healthcare staff and administrators. Thus, the protocol, hardware, and software for data collection and analysis had to be kept simple and economically feasible. While electronic software and hardware (e.g., Noldus, UMT Plus Software, SOPARC) is available for SO and is now used by many researchers, it is less useful for behavior mapping because it does not easily enable the observer to identify behaviors in space on a map. Furthermore, because the H-GET is intended for use by a broad group of people, electronic equipment is cost prohibitive and the learning curve would greatly increase the risk of measurement errors. Therefore, it was determined early in the BMap development process to keep data collection to paper and pen or pencil.

5.1.3 Instrument Development: Description and Protocol

The H-GET BMap instrument was developed alongside the other three H-GET instruments (Garden Assessment Tool for Evaluators, Surveys, and Stakeholder Interviews). In addition to the literature review, informal behavior observation at two of the Texas pilot test sites helped to inform data collection protocol and the specific variables that should be recorded.

Description of the instrument. For H-GET BMap, a minimum of two trained observers make place-based, time-stamped notes about garden users and usage on a pre-printed 8.5 x 11” plan of the space.

The map**:** The BMap involves a simple 8.5 x 11” plan of the garden that can be traced from drawings supplied by the designers, as shown in Figures 5.1 and 5.2, or from other sources such as aerial photos if plans are not available. The map should include: edges of buildings; windows and doorways—if there is more than one doorway or other entryway, it is helpful to label each on the plan (e.g., “A” for primary door/entry, then “B,” “C,” etc.); planting beds; pathways; shade structures; water features; all seating; and any other noteworthy garden elements that people might walk or sit on, go through, or gather under or around. For movable seating, which can be challenging to depict, it is important to at least show the accurate number and approximate location of tables and/or chairs. It is helpful to visit the site, or at least have someone take photographs of the site before data collection, to make sure all garden features are depicted as drawn on the original plan and to draw in tables, chairs, and other moveable furnishings. There should be enough room on the map along at least one margin for observers to make notes (see Figure 5.3). A separate color pen or pencil is useful for differentiating marks on the photocopied plan from observers' notations. In addition to the garden plan drawing, the following should be added before maps are photocopied for BMap: name of garden; name of evaluator; date; time-frame (start and stop); and weather (see Figures 5.2 and 5.3).

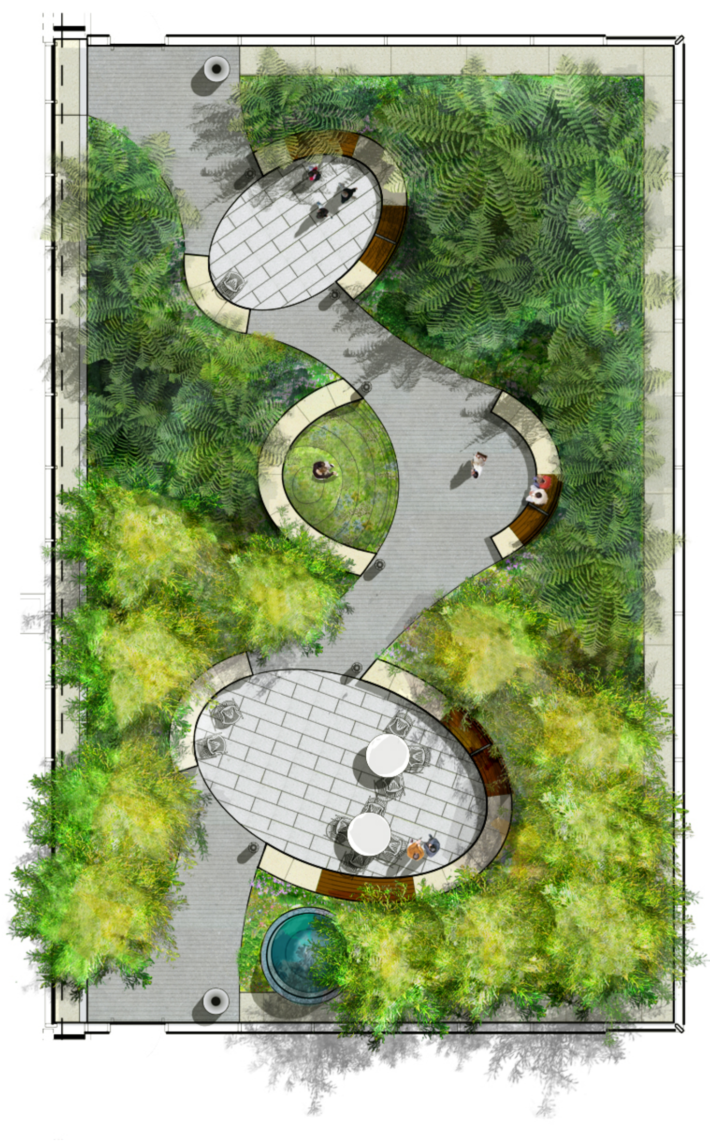


Figure 5.1 INTERSTICE Architects rendering of Kaiser Oakland Medical Center Courtyard Garden. Rendering was used to trace BMap plan shown in Figure 5.2.

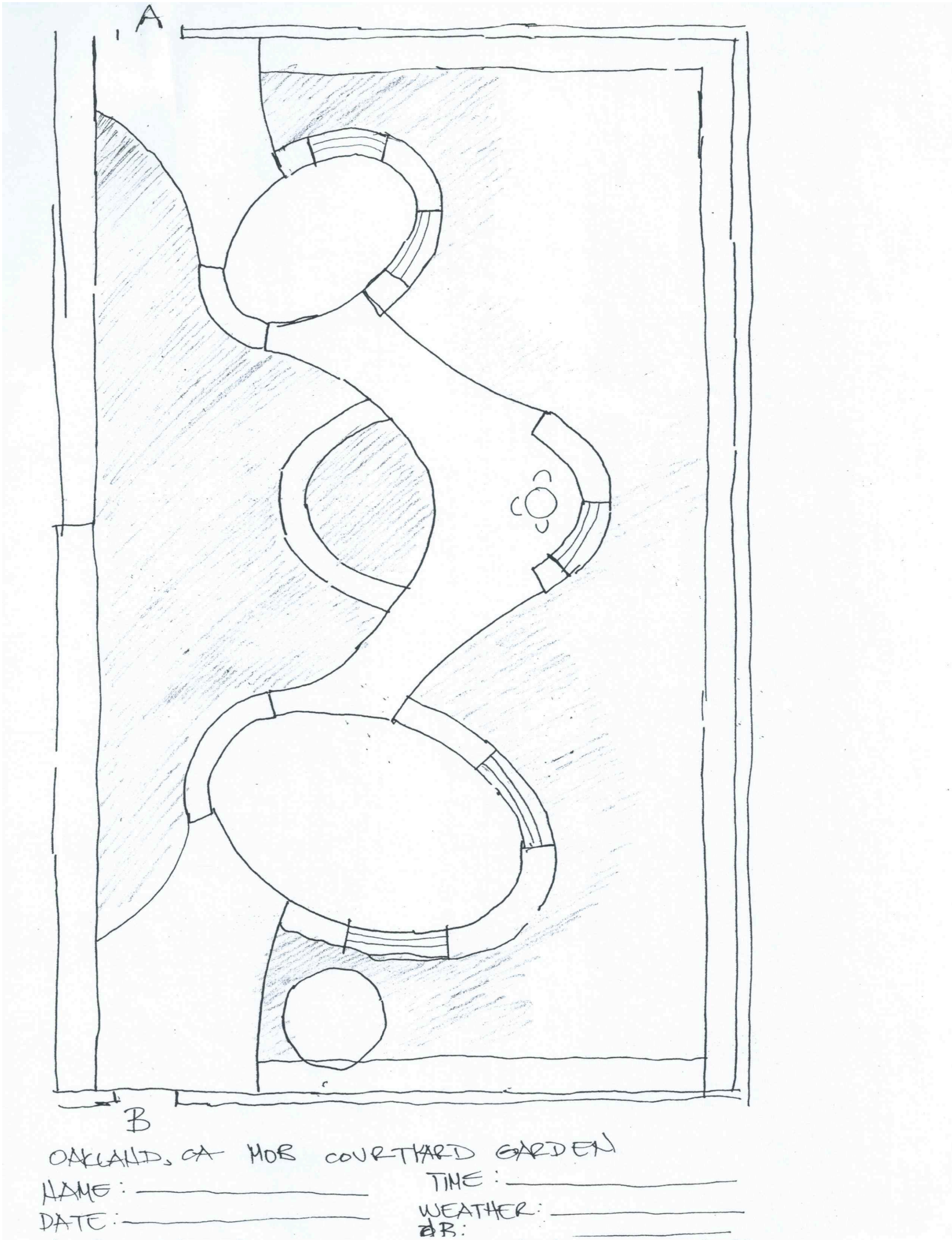


Figure 5.2 Blank plan for Behavior Mapping at Kaiser Oakland Medical Center Courtyard Garden.

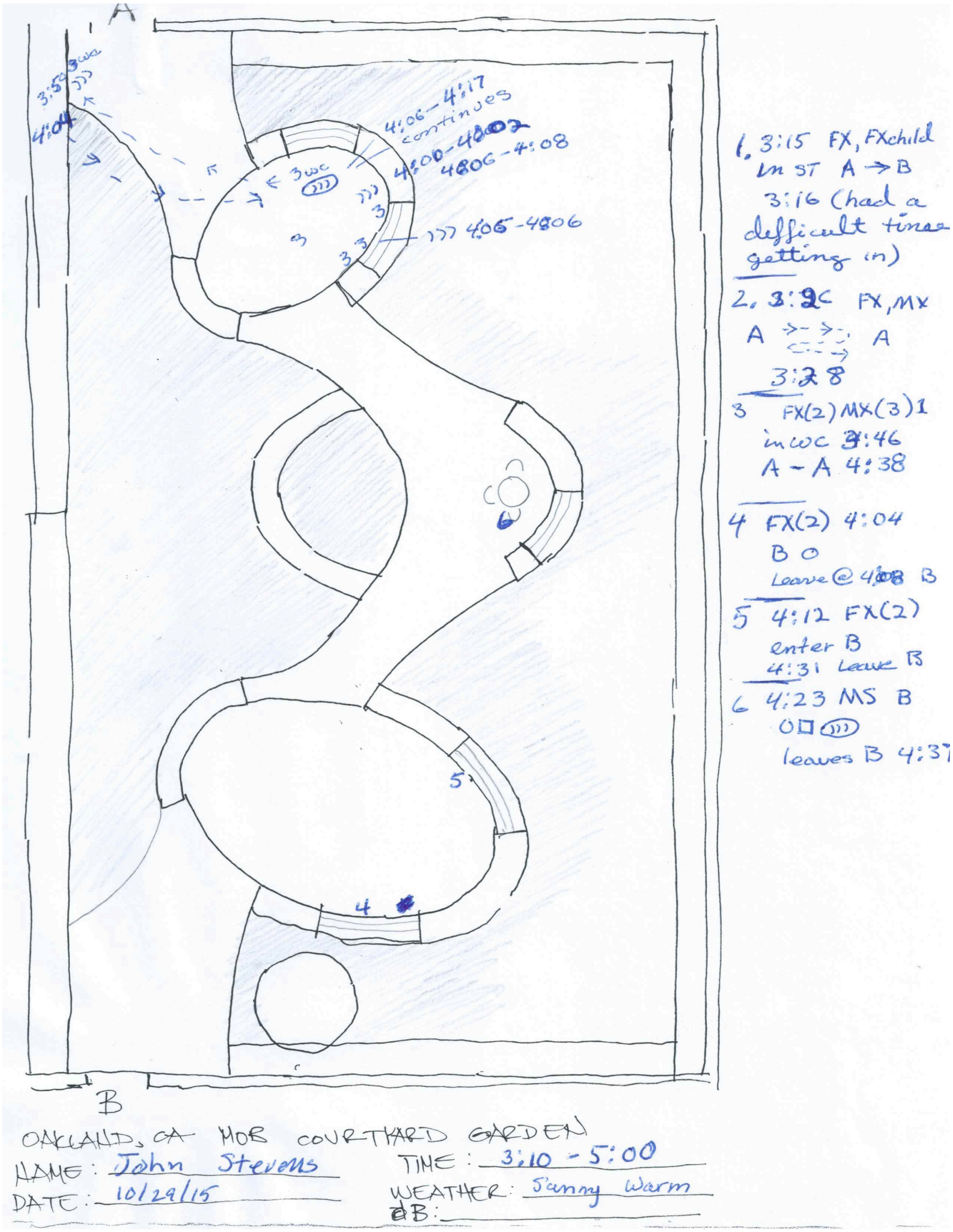


Figure 5.3 Completed Behavior Map of Kaiser Oakland Medical Center Courtyard Garden. See Figure 5.4 for key to symbols used.

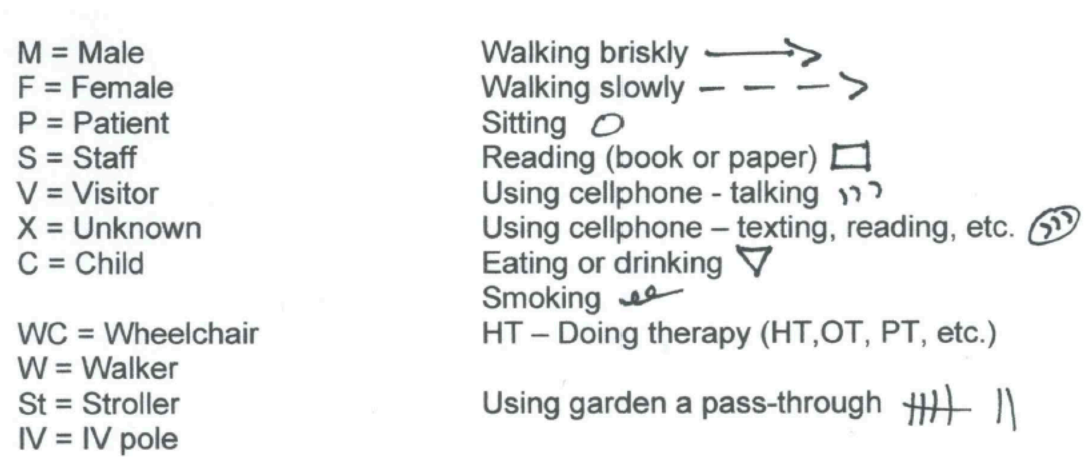


Figure 5.4 Behavior Mapping Key with variables and symbols. Each observer kept a key with them on their clipboard as a reference throughout the BMap data collection.

Variables recorded: The following garden user demographic information is recorded (each variable's symbol is in parentheses): Gender - Male (M) or Female (F); Type of user - Patient (P), Visitor (V), Staff (S), Unknown (X), or Child (C); and whether the user is using a Wheelchair (WC), Walker (W), Stroller (St), and/or IV pole (IV). Regarding use of "X" for unknown, it is often difficult to discern whether a garden user is a patient, visitor, or staff member. For H-GET BMap, Research Assistants observers were trained to identify patients by cues such as hospital gowns, IV poles, and ID wrist bands. Staff could be identified with cues such as scrubs or other healthcare uniforms and identification tags. Garden users who did not have any identifiable markers were usually marked as "X" rather than "V" for visitor on the plan since they could have also been outpatients or hospital staff who could not be identified as such.

Activities recorded: The following activities are recorded using the symbols shown in Figure 5.4): walking briskly; walking slowly, strolling; sitting (this was usually not necessary because if a garden user's location is marked on a chair or bench, it can be assumed that they are sitting down); reading (book or something else on paper); using cellphone – talking; using cellphone – texting, reading, watching videos, etc.; eating or drinking; smoking; doing physical, occupational, horticultural, or other therapy; using garden as a pass-through; and chatting (a symbol was not used for this behavior, but should be added in future).

Each observation is a unit: Each observation is numbered as a "unit" in the margin. If that observation takes place in a specific location, the corresponding number is marked on the map (see Figure 5.3). If two or more users are together, they are recorded as one observed unit but each person is still noted. For example, "1) 11:10 a.m. - FS, MS, FPWC" denotes that the first observation unit of that period was at 11:10 a.m.; a male staff member (MS) and female staff member (FS) accompanying a female patient in a wheelchair (FPWC). Their location is noted with a "1" on the garden plan. As another example, "FPIV, MX, FC, FCSt" denotes a female patient with an IV pole (FPIV), male unknown (MX—probably a visitor but since we do not know for sure, "X" is used), female child (FC), and female child in a stroller (FCSt). Most travel (people moving through the space and not stopping in the garden) should not be recorded on the plan since too many lines can quickly muddy the map. Direction of flow of traffic should be notated in the margin (e.g., "FS A → B" when a female staff member travels through the garden from Door A to Door B). Only if (a) the user(s) is meandering and the direction and destinations of the meandering are significant and (b) if there is space on the plan, should lines (dashed lines with arrows to indicate direction) be drawn directly on the plan. Other activities are written out long-hand, depending on what the observer can see and how much time is available for detailed recording. For example, if a child runs to a water feature and an adult runs after her to keep her from jumping in, or to help her throw a penny in; if a garden user picks up trash; or if a staff member is comforting a patient or family member.

Observation periods: Each observation period is approximately 20 minutes, followed by a 10-minute break. Frequent breaks prevent attention fatigue and reduce the risk of measurement error. If more than one person is observing the space, observation periods can be handled in one of two ways. The first option, if test-retest reliability is being established, is for all researchers to observe and take breaks at the same time. However, this means that for 20 minutes out of every hour, the garden goes unobserved. The second option is to have observations overlap so that there is no time when the garden is not observed by at least one person. H-GET BMap employed the latter method.

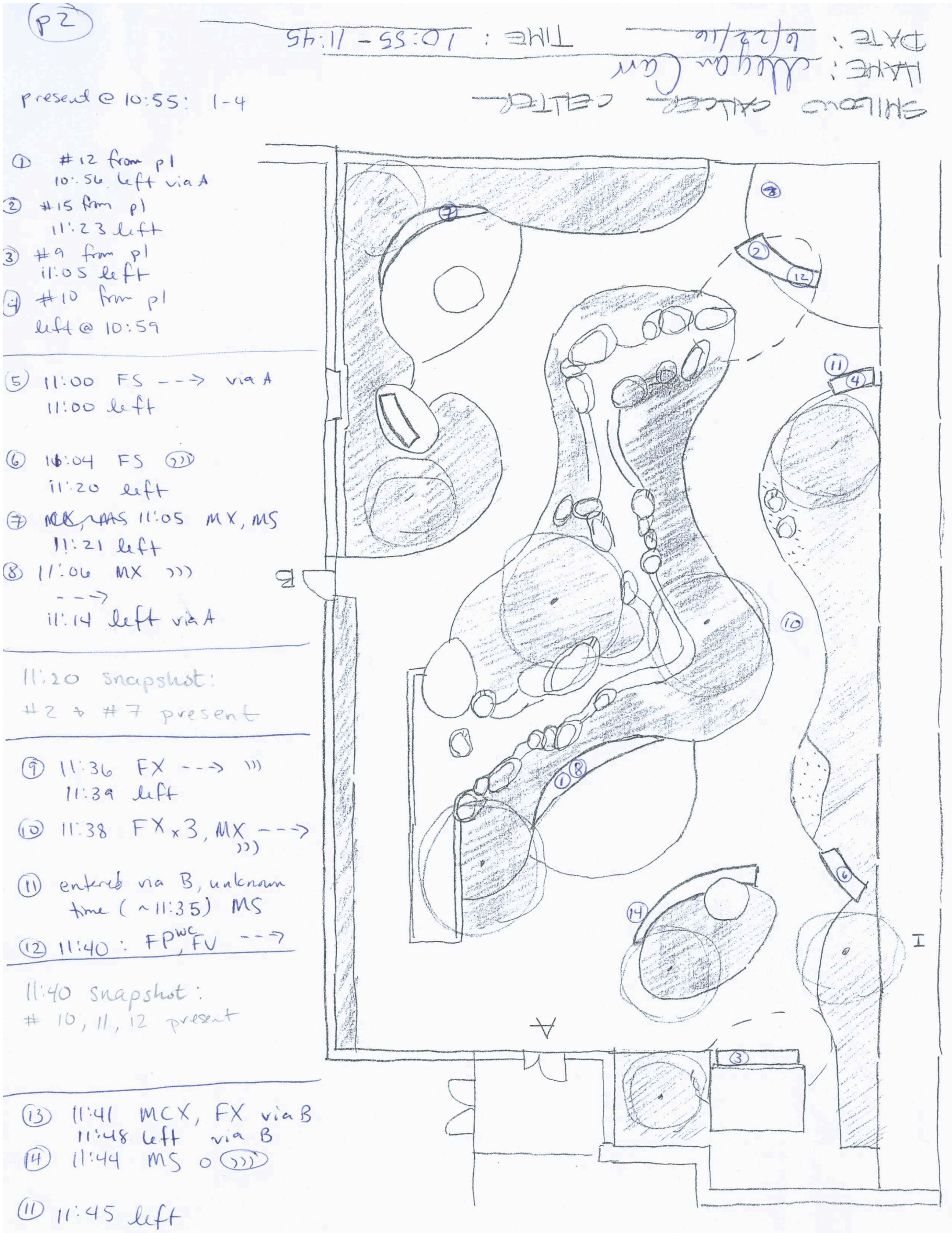


Figure 5.5 Behavior Mapping at Smilow Cancer Hospital. “Snapshot” recordings from 11:20 and 11:10 are in pencil.

Snapshots: Snapshots, as described above and called “Behavior Mapping” by Cooper Marcus and Barnes (2008), are data collected at a specific time about whatever is happening in the garden at that moment. Observers record everyone and everything they can count in one minute. Snapshots are a break in the continuous observation that records garden usage over a longer span of time. It is most effective when observers use a different color pen or pencil and when they clearly delineate the snapshot moment, as shown in Figure 5.5. Snapshots can be taken at regular intervals, for example at the beginning of each observation and then every five or ten minutes. It is helpful if all observers use the same times to take snapshots, especially if one is trying to establish test-retest reliability.

Behavior Mapping protocol

Types of observers and locations for observers: In his chapter “Observing Environmental Behavior,” Zeisel outlines several different types of observers. The “Secret Outsider” is the ‘unobserved observer’; the subjects of observation are not aware of the Secret Outsider’s presence. The “Recognized Outsider” makes no attempt to hide his presence, but does not directly interact with the subjects he is observing. The “Marginal Participant” adopts the same vantage point of others being observed—another person on the bus, a restaurant patron, a hospital visitor. The “Full Participant” is either already fully embedded in the environment, or fully embeds herself in the environment for the research. For example, a student studying other students in the same class, or a waiter studying behavior at a restaurant, or a healthcare staff member observing staff use of a garden or break area (1981, pp. 196-198).

For the H-GET Behavior Mapping, the “secret outsider” is ideal for three reasons. First, the researcher/observer should not make users uncomfortable—people go to the garden as an escape from the indoors, and often for much-needed privacy. Especially in stressful situations, people’s awareness may be heightened to notice anything out of the ordinary. Staff are even more aware because of potential threats to their patients/clients—whether that threat is from violence, infection, or infringement of privacy. If garden users feel watched or monitored, their enjoyment of the garden as a place to get away—literally and figuratively—and decompress is undermined. Second, if garden users are aware of the observers in the garden, their behavior may change. In social science research, this is known as the Hawthorne effect (also referred to as the observer effect) (McCarney et al., 2007). Finally, if the garden space is small and the observer is present, he or she is likely to occupy prime real estate of seats or benches. With the H-GET BMap testing, on several occasions at different sites, garden users were observed entering the garden, looked for available seats, and leaving when they could not find any. It would not be right for one of the observers to occupy valuable seating and prevent people from using or enjoying the garden. "Secret Outsider" behavior mapping can take place from inside the building through a window or door, as depicted in Figure 5.6, from a rooftop, or from another distant vantage point outside of the garden.

Figure 5.6 The waiting room at Smilow Cancer Hospital looks out onto the Healing Garden. One can see most of the garden from indoors which makes the waiting room an ideal location for Behavior Mapping. Photo by Naomi Sachs.

However, unobtrusive observation is not always possible; for example, when there is no vantage point from above or from within the building where an observer can see all or most of the garden. The next best approach is for researchers to be "Marginal Participants," to look and behave as much as possible like other visitors enjoying the garden. In fact, researchers probably appear more as "Recognized Outsiders"; they do not look like inpatients; they do not look like staff (no scrubs or other recognizable staff uniform) except perhaps plainclothes administrative staff. This is another reason to use Cooper Marcus and Barnes' "Behavior Tracking" method in situations where the "Secret Outsider" method is not possible (2008).

Site visit prior to data collection: Whenever it is possible, the lead researcher should visit the site before data collection to determine the best observation strategy and to identify any other issues that might arise. It may be that administration can grant access to a normally unused area of the facility, or even access from a neighboring building. Site visits can also reveal issues that could not be gotten from photographs. For example, from plans and satellite images of Scott & White Hospital, the garden looked visually and physically accessible from both the building entrance (indoor access) and the two sidewalk entrances (large metal gates to the garden). But on site, one sees that the gates *look* locked, even though they are not, because they used to have key code locks on them, which were removed in 2016. The researcher also noticed, on an hour-long pre-test visit to the same hospital during the lunch peak, that as many or more staff members ate their meals in the small, stark outdoor space directly adjacent to the cafeteria than in the hospital's healing garden. This observation resulted in two additional questions on the H-GET Staff Surveys about other outdoor areas where staff spend their time, and also prompted behavior mapping of additional outdoor spaces at Legacy Salmon Creek and Smilow Cancer Hospital. At Smilow, a Garden Assessment Tool for Evaluators (GATE) was conducted in the additional outdoor space as well as in the Healing Garden. Findings will be discussed in the Results section. Visits before data collection are also important to ensure that the BMap maps are accurate. Designers' plans, and even satellite imagery, can be incorrect or misleading. At one of the Oakland Kaiser gardens, locations of the pathways, as well as some benches, were substantially different from the landscape architect's rendering. Correct hardscape, softscape, and furnishings had to be sketched before the final Behavior Map plan was drawn and photocopied for data collection. At one of the audit test sites in Houston, TX, the satellite imagery showed a labyrinth adjacent to the University of Texas Austin School of Nursing. The entire labyrinth had been removed since the photo was taken.

Number of observers: The number of observers needed for BMap will vary depending on how large the garden is, whether there is more than one garden (or any other observation-worthy outdoor space) at the healthcare facility, and what type of observation will take place (e.g., secret outsider vs. marginal participant). To ensure reliability, there should be at least two researchers present for each observation session. It is best to have three observers, or at least one in reserve, in case something happens to one of the two scheduled researchers.

Observer health: It is particularly important in a healthcare setting for all researchers to not have any contagious illness such as cold or flu. It is unacceptable for a researcher to be in a healthcare environment where people have compromised immune systems. Staff, patients, and visitors' awareness of sick people is heightened in healthcare settings and they will be uncomfortable, if not outright hostile, to someone who is potentially jeopardizing their and others' health. In addition, researchers' performance will be compromised if they are not in good health.

When to conduct the research—days of the week: Whenever possible, BMap should be conducted for two consecutive weekdays and again approximately one week later, weather permitting, by the same two (or more) observers, using the same protocol. The original proposed H-GET BMap schedule was for two consecutive days of one weekday and one weekend day (Friday-Saturday or Sunday-Monday). Several healthcare professionals suggested that two consecutive weekdays would give a more representative example of garden usage because even with inpatient hospitals, patient, visitor, and staff traffic is greater during the Monday-Friday work week. The weekday data collection schedule has the advantage of being more flexible: if an arranged Monday-Tuesday session is not possible due to weather, researchers, or an unforeseen event at the healthcare facility that makes activity not normal, re-arranging to Tues-Wed, Wed-Thurs, or Thurs-Friday is much easier than having to wait until the next weekday-weekend time slot.

When to conduct the research—times of the year: People use outdoor space more when the weather is good. Therefore, it is critical to schedule observation days—especially if observation only happens once or twice rather than throughout the year—at a time of year when the weather is most conducive to outdoor use. For most parts of the U.S., this will be at some point between May and September, but each site can vary tremendously. Local climate data can be used to determine the optimal time. Consulting with a contact at the local healthcare facility can also help guide decisions about when in the year to conduct the data collection.

When to conduct the research—when the garden is at its best: It is also important to know ahead of time when the garden is at its peak and to visit during that time. For example, in high summer at Legacy Salmon Creek in Vancouver, WA, tables and chairs are put out on the 3rd Floor Terrace garden as well as the outdoor space just off the cafeteria. In October, when the H-GET Pilot Testing took place, only the tables and chairs adjacent to the cafeteria remained. At Smilow Cancer Hospital in New Haven, CT, the water feature—a constructed stream that flows into a reflecting pool—was not working properly and was only about half full. The usual burble of the stream could not be heard, and the water looked slightly dirty. This may have affected whether or not people were drawn out into the garden; how long they stayed; and whether or not they mentioned the water feature—often a favorite garden element—in the surveys.

When to conduct the research—on "typical" days: It is important to confirm, before the research days are scheduled, that the days will be relatively uneventful at the facility. For example, at Legacy Good Samaritan, activities are often scheduled adjacent to the garden to take advantage of walk-through traffic from the two streets that border the garden. On one of the Pilot Test days, the City of Portland was giving away free fluorescent light bulbs to promote energy savings. Traffic from healthcare staff and community members was higher on this day, which was clearly because of the City of Portland booth. At Legacy Salmon Creek, a security drill took place for two hours during the afternoon of one of the observation days. This prevented traffic to the garden.

These events, as well as the weather, are not always possible to predict before-hand, so it is best to schedule at least three, or even four, days of observation (e.g., Monday-Tues-Wed-Thurs) in case one of the days is not representative of routine weekday activity. If a second round of observation is planned, the days should be the same the following week as the first week.

The healthcare facility (HCF) liaison: With so many variables, the HCF liaison is invaluable for providing information and access before data collection and for trouble-shooting when unforeseen issues arise. The sooner that a relationship with the liaison is established, the better.

5.1.4 Methodology: H-GET Behavior Mapping Testing at Pilot Test Sites

Testing of the H-GET BMap instrument took place at all eight Pilot Test sites, as shown in Table 5.1. Three additional spaces, which are italicized in the same table, were used for comparison with the Pilot Test gardens.

Research Assistant Observer Training. Training of observers is an essential component of BMap to ensure validity and interrater and test-retest reliability. In each state with each group of Research Assistants (RAs), training took place at designated, pre-arranged training sites one or two days before data collection at the Pilot Test sites. Training began with the Garden Assessment Tool for Evaluators (GATE) in the morning, as described in Chapters II and III. BMap training occurred in the afternoon. First, the researcher/trainer explained the reason for BMap and how it fits in with the overall H-GET research. RAs were instructed to be as unobtrusive as possible and not to interact with garden users. They were told that if someone did ask them what they were doing, to say "I'm doing research about gardens in healthcare facilities for a student's dissertation." RAs were then given clipboards, the pre-printed garden map(s), and the Behavior Mapping Key (Figure 5.4). RAs had been instructed through email the day before to bring a clipboard, pencils and/or pens, and a time-keeping device (as well as water, sunscreen, and snacks). Each element of the key was explained, and examples of possible scenarios and combinations were given. The researcher conducted a ten-minute demonstration using the pre-printed garden map. RAs could ask questions during this time or after. If no one was using the garden, the demonstration was hypothetical (e.g., "If a male patient in a wheelchair and a female staff member came out together now through door 'A,' I would mark a number on the plan, then write the number in the notes section, with the time and abbreviations—in this case, "9:45 a.m., FPWC, MS – A"). After the demonstration and question and answer period, RAs conducted a series of ten-minute practice observations. After the first two observations, all researchers re-convened to compare and 'calibrate' their data. The goal was to make each observation by each RA as consistent as possible for optimal inter-rater reliability.

Pilot Testing protocol. Cutler (2000) notes that with behavior observation and mapping, reliability and validity are greatly increased when strict standardization procedures are used, such as item definitions, rater training, data collection times, and collection techniques. McKenzie and van der Mars (2015) state the need for observers to be "maintained and recalibrated throughout a study" (p. 14). On each day of data collection, the researcher went over the protocol once before BMap began and checked in on each RA/observer to ensure that methodology and protocol was being followed. At the end of each day, RAs were asked to review their notes to make sure that each observation was accounted for, that their handwriting was legible, and that any other notations were clear enough for someone else to decipher for data analysis. When time allowed, the researcher reviewed the RAs' work to ensure that inconsistencies or errors could be corrected while the BMap session memory was still fresh in people's minds.

Table 5.1 H-GET Behavior Mapping Sites and Sessions.
Note: * and italics indicate that this space was not one of the official H-GET Pilot Test gardens.

Healthcare Facility	**Garden**	**Geographic Region**	**First Session**	**Second Session**	**Third Session**
Legacy Good Samaritan Medical Center	Stenzel Healing Garden	Pacific Northwest	10/6/15	10/14/15	---
Legacy Salmon Creek Medical Center	3rd Floor Terrace Garden	Pacific Northwest	10/8/15	10/15/15	---
Legacy Salmon Creek Medical Center	*Front Entry**	*Pacific Northwest*	*10/8/15*	---	---
Legacy Salmon Creek Medical Center	*Cafeteria Terrace**	*Pacific Northwest*	*10/8/15*	*10/15/15*	---
Baylor Scott & White Hospital	Healing Garden	Central Texas	10/19/15	10/20/15	10/28/15
St. Joseph Hospital	Marshal Verne Ross Memorial Healing Garden	Central Texas	10/19/15	10/20/15	10/28/15
Kaiser Oakland Broadway Medical Office Building	Serenity Garden	Northern California	10/29/15	10/30/15	11/5/15
Kaiser Oakland Medical Center and Specialty Medical Office Building	Courtyard Garden	Northern California	10/29/15	10/30/15	11/5/15
Smilow Cancer Hospital	Betty Ruth & Milton B. Hollander Healing Garden	New England	6/14/16	6/15/16	6/22/16
Smilow Cancer Hospital	*Cafeteria Garden**	*New England*	*6/14/16*	*6/15/16*	*6/22/16*
Greenwich Hospital	Community Garden	New England	6/16/16	6/17/17	6/24/16

5.1.5 Results from BMap Pilot Testing

Due to the large amount of data gathered, full analysis was not within the scope of this study. Below are examples of some of the analysis performed and comments about issues that were raised with the BMap methodology and protocol.

BMap example site #1: Legacy Salmon Creek, Vancouver, WA. An overview of Legacy Salmon Creek is shown in Figure 5.7. At Legacy Salmon Creek, BMap was originally only planned for the 3rd Floor Terrace. Upon closer examination of satellite drawings and the building plan supplied by the landscape architect, it became clear that two other outdoor spaces were intended for use by patients, visitors, and/or staff: the “Front Entry” garden and the “Cafeteria Terrace.” All three spaces are described briefly below.

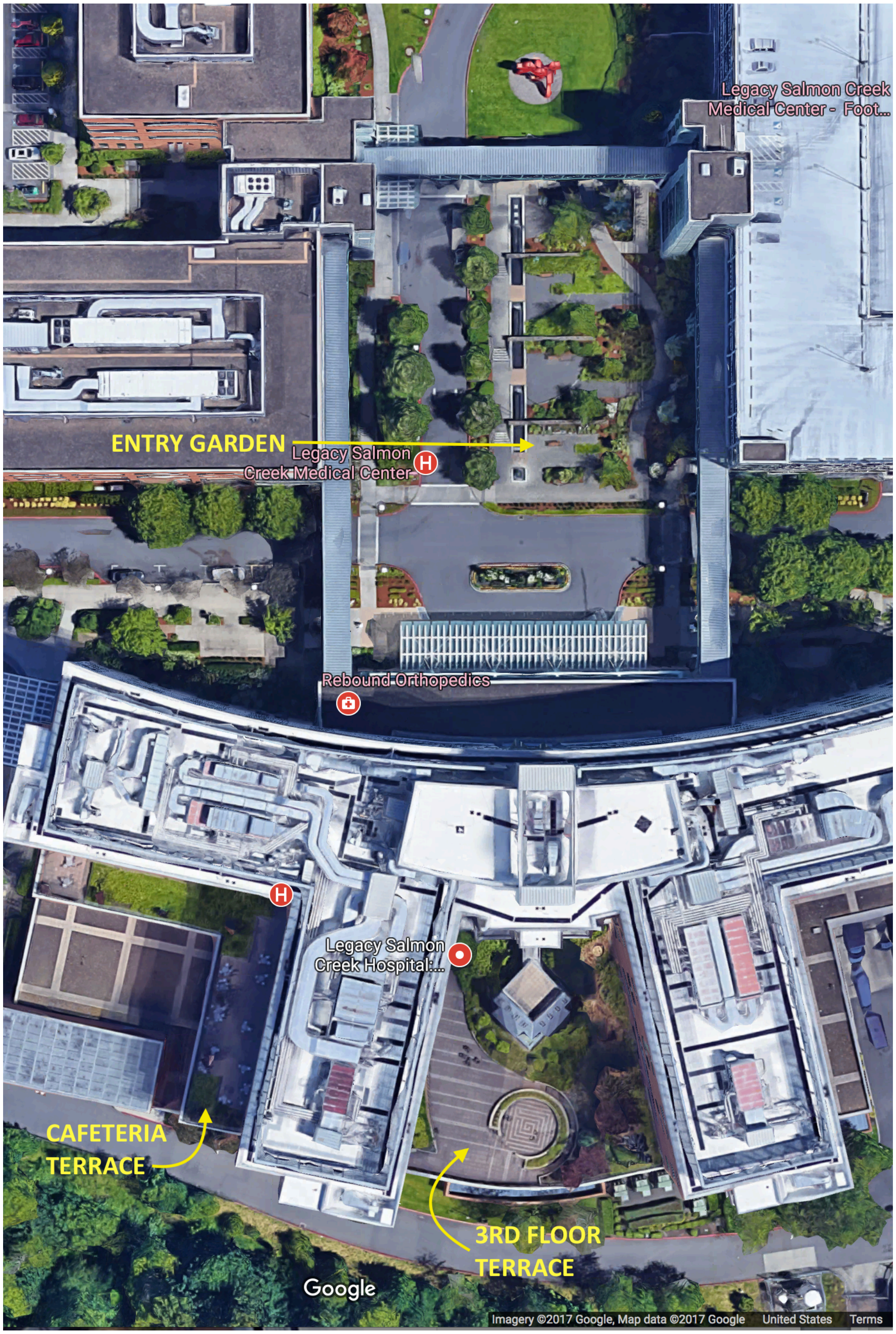


Figure 5.7 Aerial view of Legacy Salmon Creek. The three BMap test sites labeled in yellow text and arrows. From https://www.google.com/maps/@45.7204435,-122.648.

3rd Floor Terrace: This space is visible, but not physically accessible, through a floor-to-ceiling curtain wall as soon as one reaches the top of the stairs to the 3rd floor (see Figure 5.8). One turns right at the top of the stairs to get to the hospital's cafeteria. If one walks straight ahead, they enter the small chapel. Although the chapel is adjacent to the garden, it offers no entry to the garden and there are no views to the garden through the heavy stained-glass windows. To get to the garden, one can either walk down a long corridor with glass windows that face out to the garden, or through a short hallway from the dining room that connects with the longer hallway; this short hallway offers a small glimpse of the garden through the dining room. Other than through this hallway, the view of the garden is separated from the large cafeteria dining room by conference rooms, bathrooms, kitchen space, and storage space. Thus, although the garden is *close* to the cafeteria, it is not easily *visible* from the cafeteria.

The garden itself is relatively large (approximately 12,000 square feet), paved with tan and off-white colored square rooftop pavers. Concrete planting beds along the perimeter are a good height and width for casual seating. A backless wooden bench integrated with the concrete wall along the hallway curtain wall offers additional permanent seating. Ten moveable wicker chairs provide more places for people to sit. Two small, low coffee tables are also provided. Plantings consist of a combination of ornamental grasses, perennials—including lavender—a few large shrubs, and a few small trees, mostly around the edges of the garden.

Figure 5.8 Legacy Salmon Creek 3rd Floor Terrace, circular seating area. Photo by Naomi Sachs.

It is noteworthy that the Legacy Salmon Creek administration recently commissioned Brian Bainnson, principal at Quatrefoil and the landscape architect who designed most of Legacy Health's healing gardens, to re-design the 3rd Floor Terrace in an effort to increase usage and therapeutic benefits to patients, visitors, and staff. Plans were already drawn up and fundraising underway when Pilot Testing began at this site (see Figure 5.9). Thus, the H-GET research will serve as a pre-occupancy evaluation for the new healing garden. It was evident from comments on the H-GET Staff Surveys that staff were already looking forward to the new garden.

Figure 5.9 Signage for new healing garden. Fundraising was underway for the new Legacy Salmon Creek healing garden, to be constructed on the 3rd Floor Terrace. Rendered plans by Brian Bainnson, Principal at Quatrefoil. Photo by Naomi Sachs.

Cafeteria Terrace: Much more visible from the dining room is the paved terrace directly adjacent to the cafeteria and dining area, which can be seen through the floor-to-ceiling, room-length curtain wall (see Figure 5.10). The terrace can be accessed through two glass doors in the center of the curtain wall. The terrace ground plane is square, buff-colored pavers. The space has twelve round, shiny metal tables and 46 matching metal chairs, all of which are easily moved from one location to another. Two large gray concrete planters, each one with a small serviceberry tree, stand amongst the tables and chairs. Two or three different species of ornamental grasses and approximately three smoke bushes fill the low planters at both long ends of the terrace. On the sides that are not bordered by the building, the terrace is surrounded by high glass walls that provide a view out beyond the hospital, and perhaps shield some of the wind as well.

Figure 5.10 View of Legacy Salmon Creek Cafeteria Terrace, looking North. Entrance to terrace from the cafeteria is through glass doors on the right. Photo by Naomi Sachs.

Front Entry: Of the three usable outdoor areas, the front entry to Legacy Salmon Creek is the most heavily landscaped, as can be seen in Figure 5.11. Terraces, held up by linear stone walls, are planted with a verdant and varied mix of trees, shrubs, and perennial plants. A large water feature spans the length of the area, dropping from one terrace to the next. The fountain had no water in it during H-GET Pilot Testing. A large red metal sculpture stands at the bottom of the garden, serving as a focal point beneath the glass sky-walk tunnel from the parking structure to the Medical Office Building (MOB). One can also access the MOB by walking across the garden. The primary access to the hospital from the parking structure is through the Front Entry, which has a more linear, direct sidewalk with steps as well as a winding pathway at a gentle slope. Most people observed in the garden were walking through on their way to or from the parking structure. The Front Entry can be viewed through large windows from many of the hospital's waiting rooms, among other spaces which the researcher and RAs did not visit.

Figure 5.11 View of Legacy Salmon Creek Front Entry from hospital 7th floor waiting room. Photo by Naomi Sachs.

Results from first BMap session

Number of observers*:* Two RAs and the researcher conducted Behavior Mapping on October 8, 2015. A third RA was scheduled to take part in the BMap because the researcher knew that there were three spaces to be observed and wanted to have at least two people observing at least one space over the course of the day. However, the third RA did not show up, serving as a good example of how important it is to have more researchers than one thinks one needs. In order to have one observer at each space, it was not possible to have two people observing the same space at the same time.

3rd Floor Terrace: Two RAs, one at a time, observed the 3rd Floor Terrace garden from 10:00 a.m.–4:10 p.m. (see Figure 5.12). Activity was observed in the garden from 12:10–2:15 p.m. Observers sat inside the curtain wall on a ledge in the hallway where they had a full view of the garden (see Figure 5.12). From 10:00–10:20, the weather was foggy and cool, and all possible seating was wet. No garden users were observed. Between 12:10–2:15 p.m., five garden users, all staff, were observed. The temperature during this time period was 69 degrees and sunny. One female staff member stepped outside for a couple of minutes at 12:10 p.m. to make a cellphone call. Two staff members, one male and one female, were observed having lunch by themselves. The male staff member spent 19 minutes in the garden from 1:54–2:13 p.m.: "Came out with tray [from cafeteria] went right to chair and plopped down! 2:13 left…smelling lavender on way." The female staff member arrived at 1:25 but her departure time was not noted; the RA did observe that the staff member had her "face turned up to sun." Two female staff members were observed walking ("toodling, chatting") together in the garden at 1:30. Again, a departure time was not noted. Salmon Creek was one of the first Pilot Test gardens, and BMap protocol and training were still being fine-tuned. Instructions to RAs to record arrival and departure times were added after the Portland research; the "snapshot" method was not added until the last Pilot Test region, in Southern Connecticut.

Figure 5.12 The curtain wall ledge enabled observers to sit and view the 3rd Floor Terrace. Photo by Naomi Sachs.

Cafeteria Terrace: On the same day, one RA at a time observed the Cafeteria Terrace (CT) between the hours of 10:30 a.m.–4:10 p.m. The observers sat in the cafeteria dining room which afforded a full and unobstructed view of the CT through the floor-to-ceiling and room-length glass curtain wall. Activity was observed between 12:00 p.m.–4:10 p.m., with the highest degree of activity taking place between 12:00–12:50 p.m. Outdoor weather during this time period was approximately 63 degrees and overcast. A total of 40 people used the space. Of the 40 users, 15 were staff (13 female, 2 male); two were patients (2 female, 0 male; 1 with a wheelchair), 20 were unspecified ("X") (10 female, 10 male); and 3 were children (3 female, 0 male). 19 of the 40 users (48%) were alone, the rest were in groups of two or more. Twenty-five users (63%) were eating and/or drinking. The RA recorded two different groups struggling with the doors: the female patient's wheelchair would not easily roll over the threshold; and the manually operated door, which opened in to the cafeteria dining room, had to be pulled—a challenge for people with a lunch tray ("FS (trouble with door—you have to pull with hands full of lunch)").

Three users entered the CT and then left immediately because they could not find dry chairs ("FX + MX entered couldn't find dry seat, left"; "FS (came out saw wet chairs went back inside)"). This observation brings up an interesting point. Vancouver, WA has an average of 182 days of precipitation annually, resulting in an average of 42 inches of rain (https://en.wikipedia.org/wiki/Vancouver). Vancouver's climate is similar to Portland, OR, which has 164 rainy days and receives approximately 43 inches of rain a year (https://www.movingtoportland.net/portland-information/portland-weather). Even when it is not raining, fog or condensation can dampen outdoor materials. At the beginning of her observation day (10:30 a.m.), the RA noted that all seating was wet. She also noted six different groups using paper napkins from the cafeteria and dining room to dry the wet furniture, sometimes making more than one trip for more napkins. Such fine-grained behavior observations can be useful for researchers, and the healthcare facility, to understand patterns of behavior and, if necessary, to understand what changes might be made. From a design perspective, metal or plastic chairs may be preferable in this climate since wood or fabric cannot be dried easily. Solutions for enabling people to use the chairs and tables, even if they had been wet, might also come from policy—for example sending a staff member out in the mornings to dry furniture off; or from design solutions, for example installing a solid roof or awning as shelter.

Front Entry: The researcher conducted BMap of the Front Entry space from 11:30 a.m.–1:00 p.m. from the waiting room on the hospital's 7th floor, where the entire Front Entry space could be seen. During this 1 ½ hour time period, 27 people were observed in the space. Twenty-three people passed through the garden, either to and from the hospital and parking structure or to and from the parking structure and MOB. Of the 23 "pass-throughs," 4 walked slowly from one end of the space to the other, seeming to enjoy the garden: "FX, MX looking at garden, she is pointing at things in garden." "FX at bottom of garden taking pictures with her phone, looking at plants, close-ups of the Hydrangea, getting *really* close. Also pics of trees, leaves, close-ups and long views." Of the 4 people who used the garden as more than a pass-through, one was a female staff member who sat for 20 minutes on the wooden bench closest to the hospital, eating lunch and reading. Two users were together, a male and female "X" looking at the garden. One was a male X, talking on his cellphone for five minutes while standing and pacing near the flagpole at the hospital's front entry. From the observer's vantage point, two female staff members could also be seen on the top of the parking structure walking laps and talking together.

Results from second BMap session. A week later on October 15, 2015, one of the RAs who had conducted BMap the week before returned to Legacy Salmon Creek for the second session. The second RA was unable to attend due to a sudden schedule conflict. Because the two outdoor spaces were close to each other, the one RA conducted BMap for both spaces. Thus, even though only 15 people were observed using the 3rd Floor Terrace over the course of the day, some observations of either that space or the Cafeteria Terrace may have been missed. Observation of the Front Entry garden area was not conducted.

3rd Floor Terrace: Although the temperature was similar on this day, the weather was sunnier, even at 8:30 a.m. when the RA started observation. During the observation period of 8:30 a.m.–3:50 p.m., a total of 15 staff members (10 female, 5 male) used the garden. Activity started at 11:40 a.m. and lasted until the end of the observation session (3:50 p.m.). Nine users were in the garden by themselves (6 female, 3 male) and six users were in groups of two (2 female, 2 female, 1 female + 1 male). Four (27%) of the users were eating or drinking. The most-used seating area was the chairs inside of the semi-circle (10 users, 67%). The long bench, with moveable chairs pulled up to it, was used by five people (33%). One staff member sat on one of the chairs and put her feet up on the bench for ten minutes while reading a book.

Cafeteria Terrace: During the same observation session (8:30 a.m.–3:20 p.m.), users were on the Cafeteria Terrace between 11:45 a.m.–3:20 p.m. A total of 46 people were recorded during this time period. Twenty-two were staff (15 female, 7 male); 0 were patients; 11 were unspecified ("X") (5 female, 6 male), and 0 were children; the RA also recorded a group of 13 teenagers having lunch together (the RA did not identify them by gender or specify activities other than eating, talking, and watching the helicopter). Forty-five (98%) of all users were eating or drinking; eight of the non-teenagers (24%) used their cellphones for non-talking for at least part of their time outside; three (9%) talked on their cellphones; and three (9%) read a book or magazine. Twenty-three (50%) users were by themselves, the rest, except for the group of 13 teenagers, were in groups of two.

Summary from Legacy Salmon Creek BMap. The Cafeteria Terrace had significantly more users (40 users on 10/8/2015 and 46 users on 10/15/2015) than the 3rd Floor Terrace (5 users on 10/8/15 and 15 users on 10/15/15). Users of the 3rd Floor Terrace were almost all healthcare staff, many of whom used the space for lunch. The mean GATE score for the 3rd Floor Terrace was 2.61 out of 4.00, lower than the total mean score (2.99) for all Pilot Test gardens by .38. The GATE was not conducted for the Cafeteria Terrace, so we do not know if there was any correlation between scores and usage. It is likely, however, that greater use of the Cafeteria Terrace is due to its greater visibility, easier access, and closer proximity to the dining area. A similar situation was researched at Smilow Cancer Hospital in New Haven, CT, described below. At Smilow, BMap and GATEs were conducted in both spaces—the Rooftop Garden and the Cafeteria Courtyard—for a better picture of how usage might corresponded with scores and other potential variables.

BMap Example Site #2: Smilow Cancer Hospital, New Haven, CT. BMap was conducted by three RAs and the researcher on June 14 and 15, 2015 and by the three RAs on June 22, 2015. The primary H-GET Pilot Test garden was the Betty Ruth & Milton B. Hollander Healing Garden (which will be referred to here as the “Rooftop Healing Garden”). All four H-GET instruments were tested (GATE, Surveys, Behavior Mapping, and Stakeholder Interviews) with this space. An additional outdoor space, the courtyard adjacent to the cafeteria (which will be referred to here as the “Smilow Cafeteria Courtyard”), was tested for GATE and Behavior Mapping.

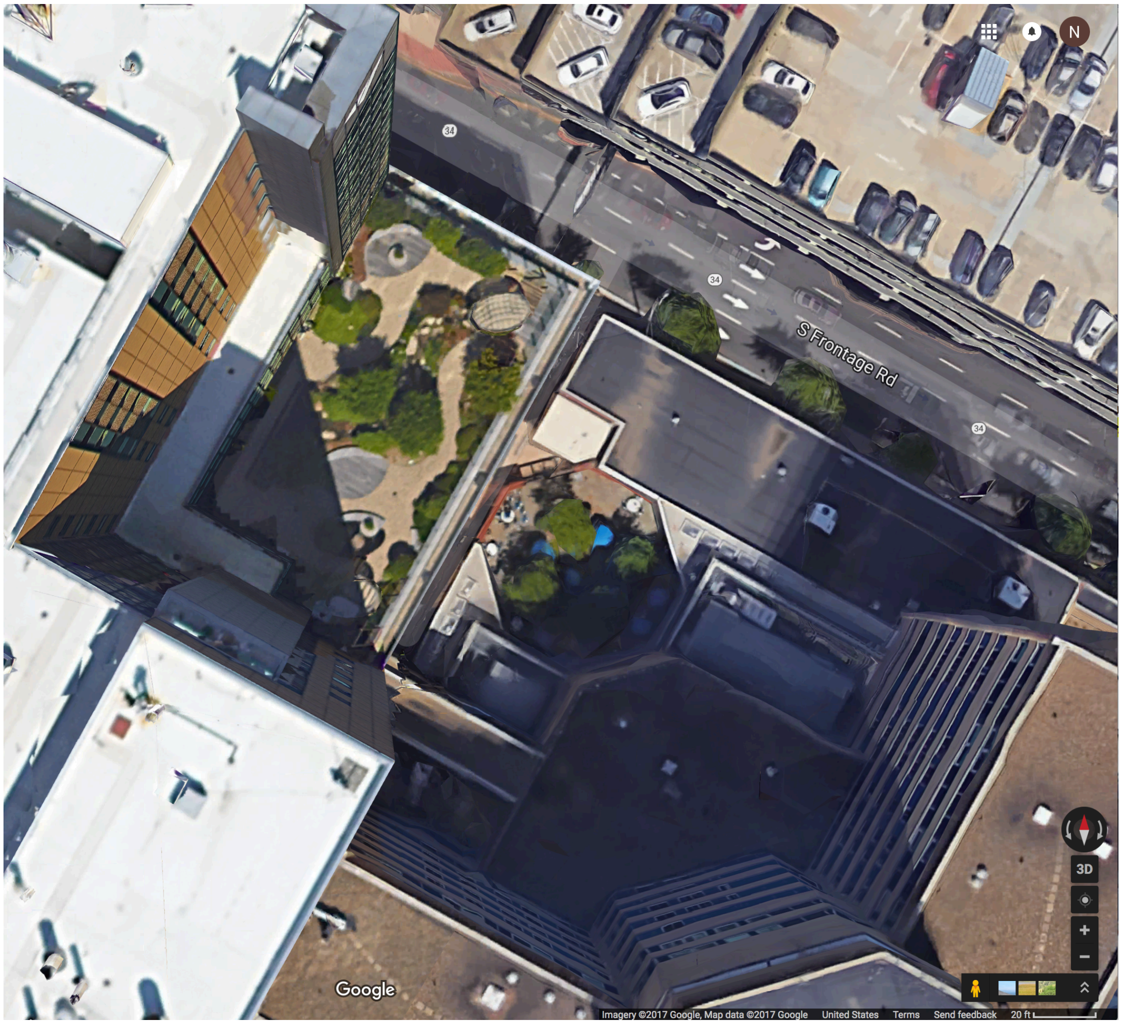


Figure 5.13 Aerial view of Smilow Cancer Hospital. Betty Ruth & Milton B. Hollander Healing Garden (Rooftop Garden) is the garden on left, Cafeteria Courtyard is to the right, on the ground floor. From https://www.google.com/maps/@41.3050701,-72.9356031,100m/data=!3m1!1e3

Description of the outdoor spaces

***The Betty Ruth & Milton B. Hollander Healing Garden (Rooftop Healing Garden)*:** This garden is open to patients, visitors, and staff. The 6,000 square foot garden is located on the seventh floor of the hospital and is visible from the hallway on that floor and from the adjacent waiting room. The garden is also visible from the seven more floors that overlook it. The garden was designed to be naturalistic in feel, with lush plantings, natural materials, and a "stream" that flows from the top of the garden into a rectangular pool at the garden entrance. A paved pathway winds through the garden so that users can make an easy loop. There is a variety of seating along the pathway.

Figure 5.14 Rendered plan of Betty Ruth & Milton B. Hollander Healing Garden, Smilow Cancer Hospital. Courtesy of Robert Golde, Towers Golde.

Figure 5.15 A shade structure in the Betty Ruth & Milton B. Hollander Healing Garden. The garden's 7th floor location and glass walls afford a view of New Haven. Photo by Naomi Sachs.

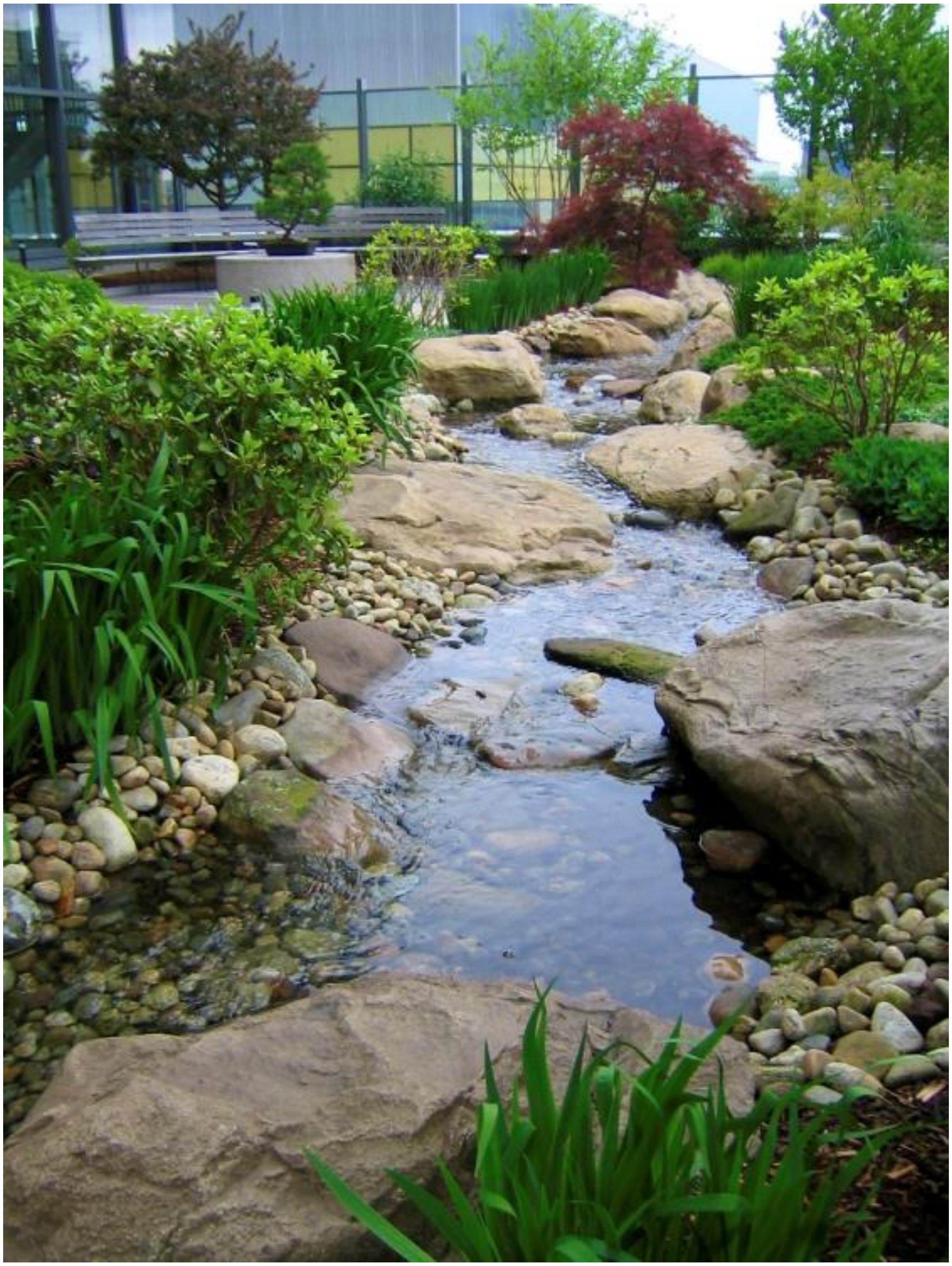


Figure 5.16 The constructed stream at the Betty Ruth & Milton B. Hollander Healing Garden. Photo by Naomi Sachs.

***The Smilow Cafeteria Courtyard*:** This courtyard is about one-third of the size of the Rooftop Healing Garden. Raised beds made of brick are planted sparsely with honey locust trees, evergreen shrubs, and some annuals. The most notable features are the many moveable tables and chairs that fill the space.

Figure 5.17 Cafeteria Courtyard at Smilow Cancer Hospital. Photo by Naomi Sachs.

Results from first Smilow Cancer Hospital BMap session

Rooftop Healing Garden (RHG)*:* On June 15, 2015 between 9:20–5:00 p.m., the RHG received a total of 208 visitors (43 female staff, 13 male staff, 70 female “X,” 34 male X, 12 female X children, 3 male X children, 14 female patients, 14 male patients, and 5 child patients). Although few people were observed eating or drinking in the garden, the “lunch-time” period between 12:00–1:47 still had the most users (68). Breaking the user groups into percentages, 24% of the users were staff; 41% were X (adult and children); and 12% were patients (adult and children).

Cafeteria Courtyard (CC)**:** On the same day (6/15/2015) and during the same time period (9:20–5:00 p.m.), the CC received a total of 241 visitors (116 female staff, 46 male staff, 52 female "X", 24 male "X", 2 female patients (1 who was in a wheelchair), and 1 male patient). The busiest time was, as might be expected for a lunch rush from the cafeteria, between 11:40am–1:20pm (144 people). Breaking the user groups into percentages, 67% of the users were staff; 32% were "X"; and 1% were patients. Over 90% of people in the space were eating and/or drinking. The primary activities were eating, drinking, and chatting, followed by people using their cellphones (non-talking) and reading a book or magazine. Most people were in groups or at least sat in a group at the same table while they had lunch. Table 5.2 shows the difference between Rooftop Healing Garden and Cafeteria Courtyard usage on the same observation day.

Table 5.2. Comparison of Smilow Cancer Hospital BMap on Rooftop Garden and Cafeteria Courtyard.

Smilow Cancer Hospital

June 15, 2016, 9:20 a.m.–5:00 p.m.

Rooftop Healing Garden

User	9:20–11:20	11:20–12:00	12:00–1:47	2:00–2:50	3:00-4:00	4:15–5:00	Total Users
Female Staff	3	6	22	7	2	3	**43**
Male Staff	2	4	5	1	0	1	**13**
Female X*	11	3	21	13	13	9	**70**
Male X	8	2	8	8	3	5	**34**
Female P*	4	1	5	4	0	0	**14**
Male P	0	2	4	0	3	5	**14**
Female Child	5	2	1	1	1	2	**12**
Male Child	1	0	1	1	0	0	**3**
Child P	0	1	1	2	0	1	**5**
Total Users	**34**	**21**	**68**	**37**	**22**	**26**	**208**

Note:
*P = Patient
X = Unknown

Cafeteria Courtyard

User	9:20–11:40	11:40–1:20	1:40-2:40	3:00–5:00	Total Users
Female Staff	10	76	26	4	**116**
Male Staff	2	31	10	3	**46**
Female X	6	23	22	1	**52**
Male X	1	12	11	24	**48**
Female P	1	1			**2**
Male P		1			**1**
Female Child					**0**
Male Child					**0**
Child P					**0**
Total Users	**20**	**144**	**69**	**8**	**241**

The difference in total number of users is not much (33 more people were observed in the Cafeteria Courtyard). However, this observation is consistent with other BMap days and facilities, and with previous researchers' findings. The most obvious explanation for more users in the CC is *proximity to the cafeteria*. For lunch, the CC is a much more convenient place to eat. For staff who have short lunch breaks, time spent getting food from the cafeteria, taking the elevator to the 7th floor to have lunch, then going back to work may be too time-consuming. The CC also has *tables and chairs that are more conducive to dining*, especially if someone wants to eat with other people. The CC also has *more seating*. Even with so many more tables and chairs, potential outdoor diners were observed entering the space, looking for a place to sit, and retreating back inside when they could not find any. It may be that people feel more *socially comfortable (appropriate)* eating lunch in a designated cafeteria courtyard rather than in a "healing garden." Especially in a cancer care facility, if staff or visitors know that chemotherapy patients are sensitive to smells, they may feel that eating in the healing garden would be counterproductive to patients' comfort and well-being. It may also be that staff, who were the majority of users in the CC, feel that they can *more openly chat and laugh together* than in the healing garden. Although the administration at Smilow did not allow Staff Surveys to be distributed (see Chapter IV), the researchers did receive informal feedback from staff that they felt like the RHG was *primarily for patients and their families*. Although this policy has changed, Smilow used to strongly discourage staff from using the RHG for anything recreational. Staff were encouraged to bring patients and family members, but were strongly discouraged from "hanging out," particularly in groups of two or more (Stakeholder Interview, July 15, 2016; personal correspondence with administrator, June 14, 2016). Staff are now more welcome in the garden, but they are still not allowed to hold meetings there due to spatial limitations and privacy (HIPAA) concerns. Although the courtyard is still somewhat tucked away—it is far less visible than, for example, the cafeteria terrace at Legacy Salmon Creek—it is still *more visible* than the RHG.

Usage is not the only indicator of success: At least from this one day, we can see that the Cafeteria Courtyard, which received a mean GATE score of 2.49 out of 4.00, had more visitors than the Rooftop Healing Garden, which received a much higher mean GATE score of 3.36 out of 4.00. If the goal of a healthcare outdoor space is *simply to get people outside*, then the

Cafeteria Courtyard was more successful than the Rooftop Healing Garden, at least for staff. However, the discrepancy between the GATE scores and BMap data raises a red flag. Why did the gardens score “better” with one measure and “worse” in the other? Ghose (1999) also found that “… visitors and staff usually tend to use any available outdoor space, even if they are badly designed” (p. 52). Convenience and appropriateness are clearly importance in garden usage. Are there other measures, such as surveys and interviews, that can help to triangulate findings to provide a more holistic picture of a garden’s success? The Staff Surveys, which have questions specifically about other outdoor spaces, might have helped with this site. Interviews with the designer and staff member did provide a possible explanation about why staff might be more inclined to use the cafeteria space, if they did not feel as welcome to eat and socialize in the Rooftop Healing Garden.

***The “snapshot” method*.** The snapshot method was not adopted as part of the H-GET BMap protocol until data collection in Connecticut, at Smilow Cancer Hospital and Greenwich Hospital. With the first two days’ worth of Behavior Mapping data from Smilow Cancer Hospital, the researcher had difficulty teasing apart time-stamped data to get a tally of garden users during specific time periods. This was especially problematic when RAs’ behavior mapping periods lasted longer than the specified 20 minutes, or when they used the same sheet of paper for more than one observation period. The researcher requested that when the RAs returned for data collection at Smilow the following week, they take “snapshots” of the Rooftop Garden at the beginning and end of their 20-minute BMap periods. Instructions were to count users in the garden at the beginning and end of the 20-minute shift and, if the shift lasted longer, to count in between as well. Snapshot recordings were to be noted with a different color pen or pencil and to be clearly labeled as “snapshot” with the time. Although more data need to be analyzed to confirm that *snapshots* combined with *continuous observation* is the most effective method for H-GET Behavior Mapping, the following results from BMap at Smilow Cancer Hospital on June 22nd indicate the strength of combining the two methods.

Results from third BMap session at Smilow Cancer Hospital

Rooftop Healing Garden: During *continuous observation* from 10:10–10:55 a.m. on June 22, 2016, the garden had 31 users (3 female staff, 0 male staff, 8 female X, 8 male X, 8 child X, 1 female patient with IV, 1 male patient, 1 child patient with IV, and 3 users who were noted on the plan but whose demographic information was not recorded). 26 of the users were in groups (7 groups of 2 or more people). Activities that took place were chatting, strolling, looking at the water feature and the view, eating/drinking, cellphone talking, and cellphone non-talking. Time spent in the garden ranged from 1 minute to 30 minutes, with an average duration of 9.17 minutes. See Figures 5.18, 5.19, and 5.20 for the original BMap, the "translated" BMap, and the simplified BMap of continuous observation.

The 10:10 *snapshot* recorded two people (1 male staff and 1 female X), both cellphone talking. The 10:53 *snapshot* recorded eight people (2 female staff, 3 female X, 1 male X, and 1 male child X). Behaviors recorded were strolling and cellphone non-talking (see Figure 5.21 for a combined BMap).

If we were to *only* use the snapshots, we would have a count of ten people in the garden during the 45 minute observation period, significantly fewer than the 31 people who were mapped during continuous observation. We would have missed both patients and several behaviors, and we would not have any information on duration of stay. Snapshots are an excellent method for getting an accurate count of garden users at one specific time and, if enough are recorded throughout the day, can be combined for a rough aggregate summary of garden use. Snapshots are useful for testing inter-rater and test-retest reliability as long as the observers are taking the snapshots at the exact same time. Continuous observation provides richer data but is more difficult to analyze, especially when one is trying to compare results of two or more observers of one garden. This is why a combination of the two methods is ideal.

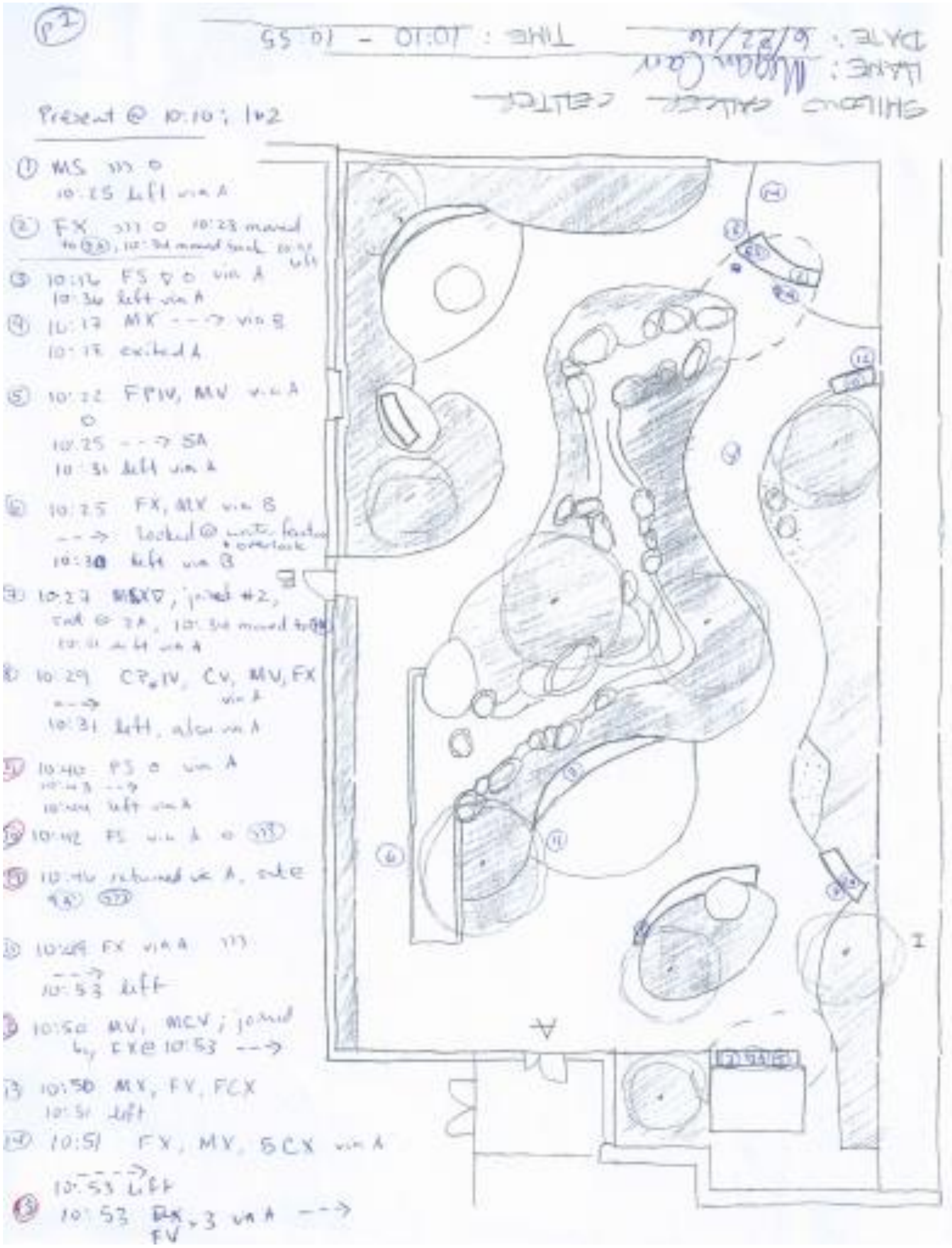


Figure 5.18 Observer's original Behavior Map of Smilow Rooftop Garden. 6/22/17, 10:10–10:55 a.m.

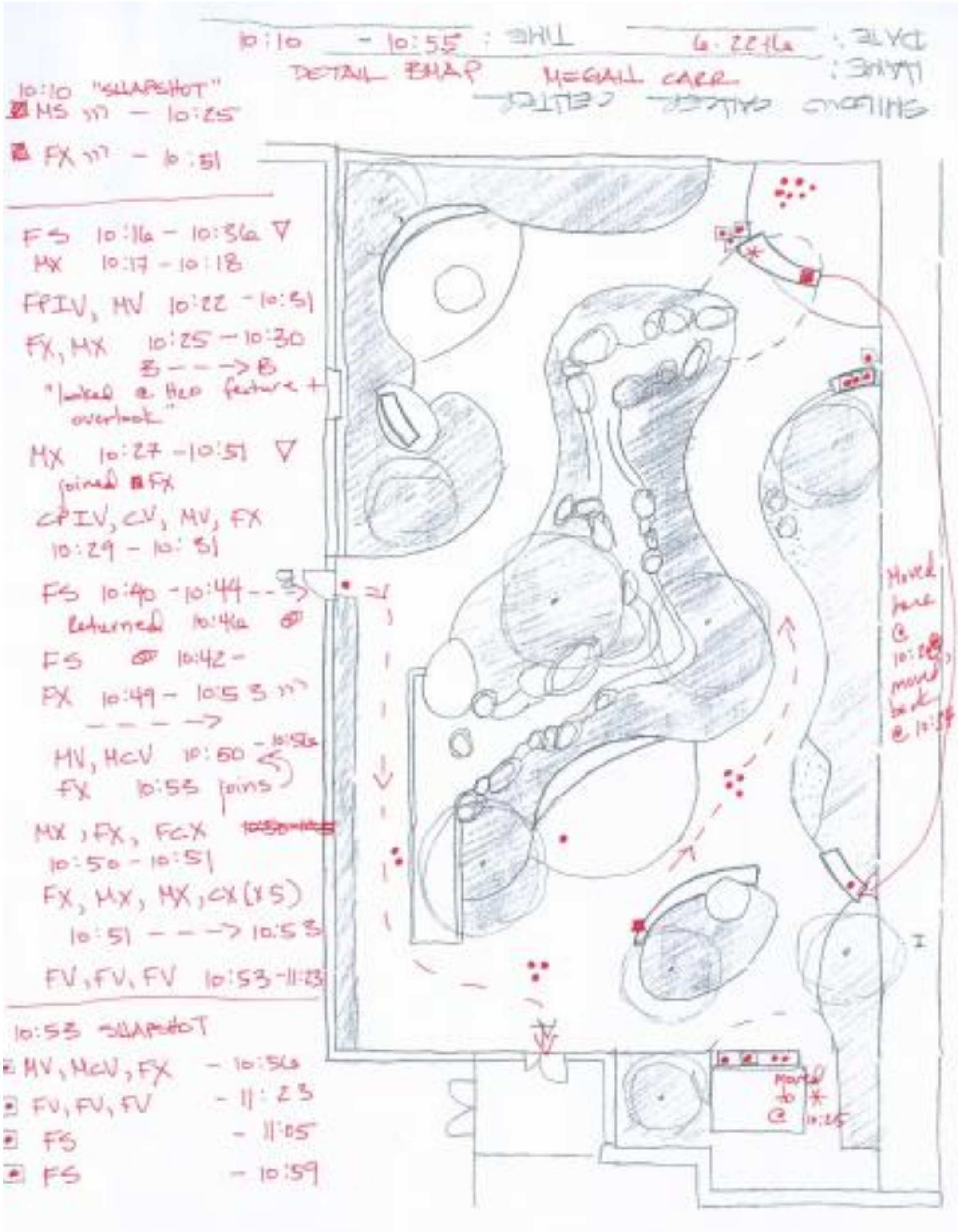


Figure 5.19 Detailed Behavior Map of Smilow Rooftop Garden. 10:10–10:55 a.m., 31 users recorded, with notes about users and behaviors on left-hand margin. Snapshots are also documented.

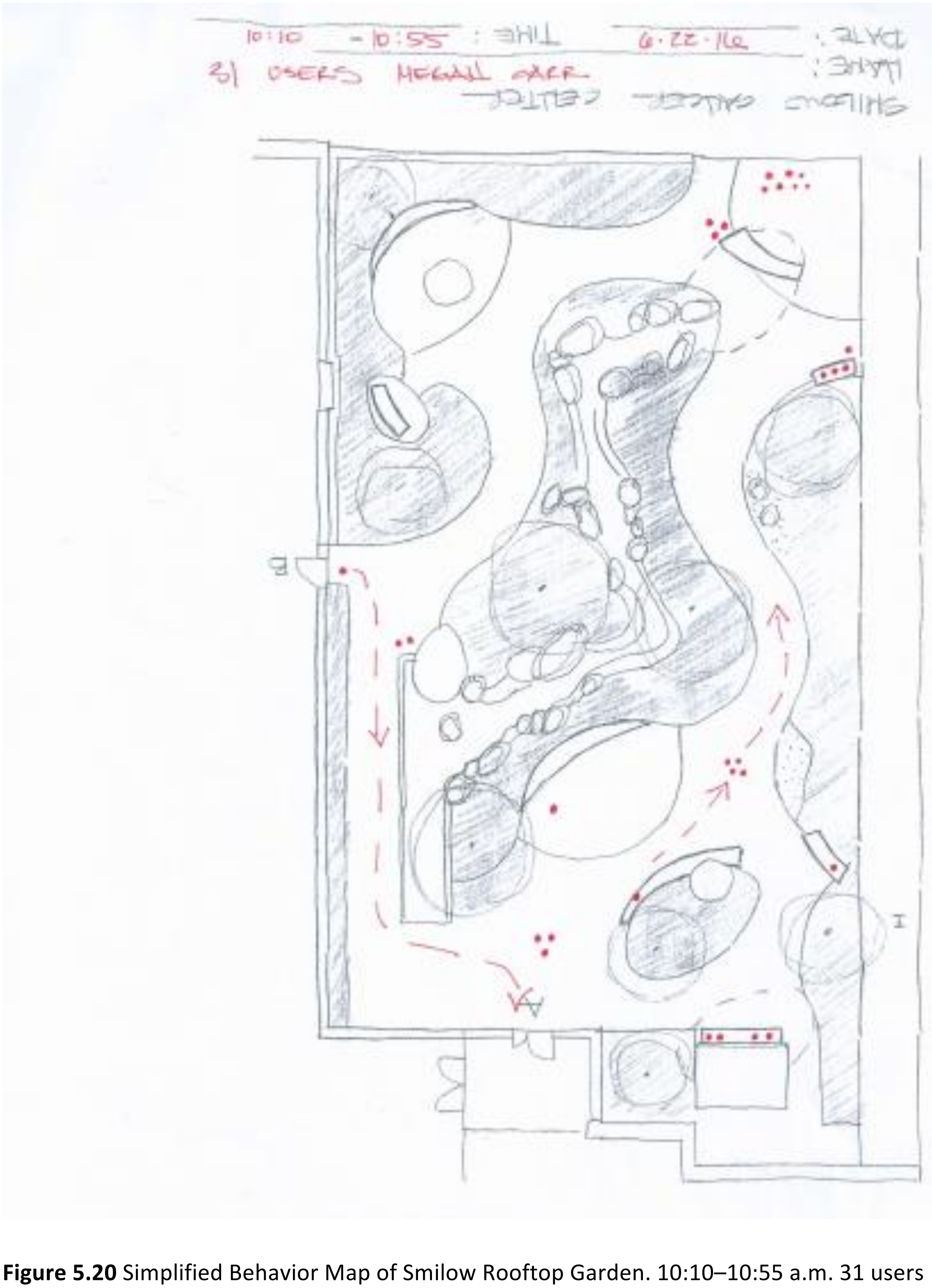


Figure 5.20 Simplified Behavior Map of Smilow Rooftop Garden. 10:10–10:55 a.m. 31 users recorded.

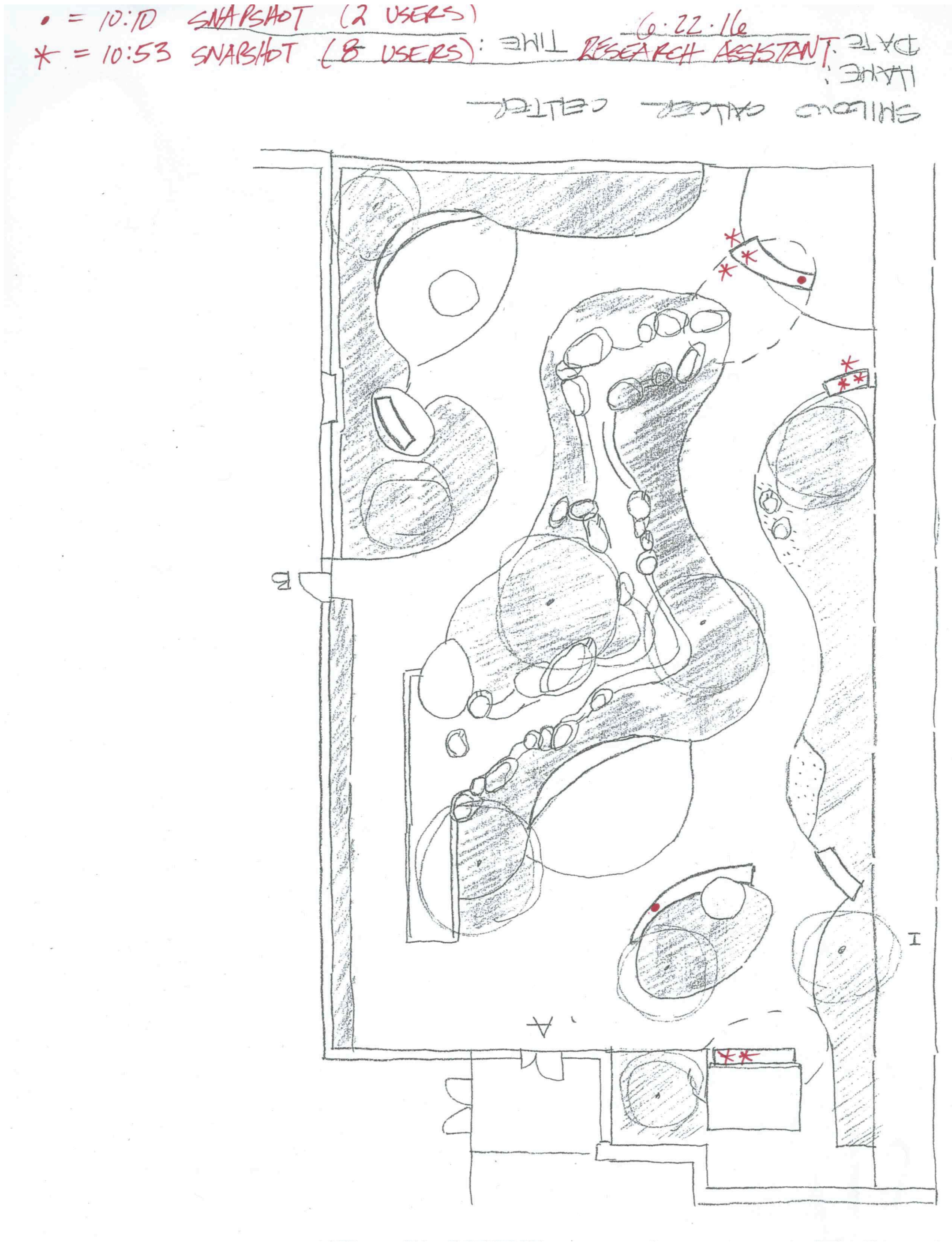


Figure 5.21 Combined “snapshots” from Smilow Rooftop Garden Behavior Mapping. 10:10 (2 users) and 10:53 (8 users) a.m. 10 users recorded.

5.1.6 Conclusion

Discussion. Behavior Mapping, a type of systematic behavior observation (SO), is an excellent method for capturing information in real time about how people use a particular space. It is also a useful tool for triangulating information from other instruments such as audits, surveys, and interviews. Although behavior observation and mapping protocols have been used by researchers in other fields, including interior healthcare design and exterior outdoor learning and play spaces, a standardized protocol for behavior mapping in outdoor healthcare settings has heretofore not been tested and published.

The H-GET Behavior Mapping (BMap) instrument was developed based on several healthcare garden evaluation studies that used SO. Cooper Marcus and Barnes' method that combined continuous observation with "snapshots" was integrated into the H-GET BMap protocol late in the instrument testing and data collection phase, but preliminary data analysis shows that it is more effective than only continuous or only momentary observation. The combination allows for the detailed, fine-grained, qualitative data that comes with continuous observation and also enables researchers to capture time-specific data in a more empirical, quantitative, and easily analyzable format.

Instrument development, including Research Assistant training, took place prior to Pilot Testing and was refined as Pilot Testing progressed. Testing of the BMap instrument took place at all eight H-GET Pilot Test sites alongside the other three H-GET instruments. At two Pilot Test sites, the BMap was also tested in additional outdoor spaces (one front entry and two cafeteria patios/courtyards) in order to compare different spaces at one facility.

Although this study focused primarily on development and testing of the H-GET instruments, some preliminary findings from data collection and analysis were:

- Staff use garden spaces as much as, and often more than, patients and visitors;
- Staff tend to use garden spaces in their free time for having lunch, either by themselves or with colleagues;
- Because their break time is so limited, staff tend to use the outdoor space that is most convenient for them, and convenience (particularly ease of access from the cafeteria or

from one's work station, and availability of tables and chairs) may drive use more than other garden design features. More staff were observed using the spaces adjacent to the cafeteria at all of the healthcare facilities that offered outdoor dining opportunities in addition to and separate from the healing garden;

- At two of the facilities that offered outdoor dining and a separate healing garden, more visitors and patients were also observed using the dining spaces, probably a matter of convenience and, possibly, visibility and ease of access. These findings may support Hypothesis #1, that "Gardens are used more when people are (a) aware of them; (b) have easy visual access to them; and (c) have easy physical access to them. However, these findings may contradict Hypothesis #5, that "garden *use* is a good indicator of garden *success*." As was found when the two outdoor spaces at Smilow Cancer Hospital—the Cafeteria Courtyard and the Rooftop Healing Garden—were compared, the Cafeteria Courtyard was more heavily used despite a significantly lower Garden Assessment Tool for Evaluators (GATE) score. Further analysis of the H-GET Surveys may shed light on why people choose one space over the other;
- Patients were observed in the garden more, and for longer periods of time, at Smilow Cancer Hospital on the Rooftop Garden and Legacy Good Samaritan in the Stenzel Healing Garden. From surveys and interviews, we know that these two hospitals also have programs that support staff engagement with patients in the garden (doing therapy in the garden, taking patients to the garden to sit or walk, and so on). More detailed data analysis needs to be conducted to establish a clear correlation, but this potentially supports Hypothesis #3: "Although the physical design of the garden, and its relationship to the building, is important, other factors such as policies, programming, and organizational culture also affect garden usage."
- Gardens that can be walked through (used as a "pass-through") on the way from one location to another tend to have more activity. Further analysis may reveal whether these gardens only *seem* busier because of the pass-through activity or whether they are actually used more. This may be further support for Hypothesis #1, that people have to know about and have physical access to the garden in order to use it.

Limitations and future research. Although behavior mapping can yield valuable information, it is labor-intensive in all phases, from preparation to data collection to data analysis. IRB approval will almost always be necessary. The researcher must coordinate with the HCF to ensure that observation can take place at the proper time, using the proper protocol. Some sites are more conducive to behavior mapping than others, especially those that allow unobtrusive observation by researchers. It is important that behavior mapping be conducted when people are most likely to be using the garden: in good weather, at a time of year when the garden is at its peak, and on "typical" days when no events alter the usual patterns of use.

To ensure reliability, it is critical that all observers receive proper training prior to data collection and that their work be checked and calibrated—ideally, every day) by the Principal Investigator. Consistency of data collection protocol is critical: the notation system, orientation of the Behavior Map, times of observation sessions and breaks, and anything else that will enable apples to apples comparisons between observers' data must be rigorously maintained.

Even in an ideal situation, BMap is a research approach that is subject to significant bias based on who the observers are, times of day and year, type of space and people being observed, and other uncontrollable and unforeseeable variables. Observers should be aware of their own personal biases and limitations in capturing all of the essential data. Researchers who analyze the data must be cautious about inferring meaning and extrapolating explanations from what has been recorded. For example, if a patient moves from one bench to another, it may seem like she moved to seek shade, but she may have moved because the other bench was more comfortable, or had a better view, or many other possibilities. With BMap, triangulation with other methods is important in cross-checking and corroborating data and providing context and explanations for what has been observed.

Data analysis from behavior mapping is also a challenge. Limitations of time and funding in this study did not allow for development of a standardized data analysis method. Creation of such a method, along with creation of a User Manual and BMap Observer Training, will be essential in ensuring that the H-GET BMap instrument maintain reliability and validity in the future.

5.2 H-GET Instrument #4: Stakeholder Interviews

5.2.1 Purpose and Definition

Purpose. For the Healthcare Garden Evaluation Toolkit, Stakeholder Interviews—structured interviews with key people involved with the HCF's garden in the past or present—are (a) a tool to gain information about each specific Pilot Test garden; (b) a method of triangulating and corroborating the other three H-GET tools; and (c) a method of gaining information about common issues and themes around healthcare gardens in general. Immediate goals for the H-GET Stakeholder Interviews (SI) were to learn about:

- Initial programming goals for the garden, and whether or how they were met;
- Whether any type of research was conducted to inform the design;
- The design process;
- Challenges in design and construction;
- Current challenges regarding the garden;
- Greatest successes of the design and garden;
- How people use and feel about the garden;
- What might have been done differently, and what might be changed in the future.

Definition. As Lincoln and Guba state, "An interview…is a conversation with a purpose" (1985, p. 268). Interviews can provide detailed information about facts, behaviors, motives, feelings, reasons for decisions and actions, and people's opinions and beliefs about all of the above (Leedy & Ormrod, 2013, p. 153). With mixed methods research, interviews in combination with other instruments can help to fill in details and provide explanations about findings that would otherwise be lacking (Cutler, 2000). Interviews can be structured, semi-structured, or unstructured. Each interview style has benefits and drawbacks; most important is that the method fit the overall research methodology and goal (Jupp, 2006). With structured interviews, the researcher defines the script (questions) before-hand to best address the study's questions or hypotheses. The interviewee is expected to answer questions within the interviewer's research framework (Guba & Lincoln, 1981). For facility evaluation, most researchers use structured interviews when they want to address specific hypotheses. Structured interviews, also called focused interviews, have the additional benefit of being less time-consuming for data collection and analysis (Shepley, 2011; Zeisel, 2006). Due to tight Institutional Review Board regulations at universities and healthcare facilities, access to patients, visitors, and staff for one-on-one interviews has become very restricted. Spontaneous, unscheduled interviews and casual conversations with garden users are not usually possible. Researchers have begun to rely on anonymous paper or online surveys, or focus groups or interviews with key personnel, to provide information and insights.

5.2.2 Instrument Development

Comparable instruments to be used as models. Almost all of the healthcare garden evaluations reviewed for this project used some form of interview (Cooper Marcus & Barnes, 1995; Davis, 2011; Naderi & Shin, 2008; Pasha, 2011; Whitehouse et al., 2001). Cooper Marcus and Barnes (1995) conducted semi-structured, spontaneous interviews with people (visitors, staff, patients, and community members) in four healthcare facility gardens to learn about "what people liked about the space, what effects they felt it had on their psychological well-being, which qualities and characteristics of the garden they identified as contributing to their well-being, impediments to use of the garden, and recommended improvements to the garden" (p. 4). Davis used structured interviews with the lead rehabilitation therapist and the garden's designer as part of a POE at the Patricia Neal Rehabilitation Center rooftop garden to learn about the "original intent of the garden and the design and decision-making process that led to the built garden" (2011, p. 18). Davis also conducted 13 patient interview questionnaires, in which he "sat with patients and asked them each of the questions and then recorded the verbal answers of the patients" (p. 20). Questions and methodologies from the Cooper Marcus and Barnes and Davis interviews informed the H-GET SI questions and protocol. Some questions from previous research were used verbatim while others were changed to reflect the group being interviewed or the information being sought.

Instrument validation. After the three SI questions and scripts, described below, were developed, professionals in the design and healthcare industries read each of the scripts and provided comments and suggestions for changes. These changes were incorporated before the first SI was conducted. The researcher conducted a mock phone interview before the first SI, using the same recording software and the actual interview script, to ensure that technology functioned and that the interview was kept to the 45-60-minute time limit.

Identification of stakeholders to be interviewed. Based on literature review and discussions with colleagues, the researcher decided to interview, by phone or in person, the following stakeholders from each site: (a) the healing garden's lead landscape architect/designer; (b) the current Facility Manager (FM); (c) a staff member or administrator from the original garden design team. The lead designer was likely to give the best overview of the design program, including how garden usage and user health outcomes were to be fulfilled by the design. The FM was the most likely to have day-to-day knowledge of the garden—who were the users, what were the technical issues with planting, hardscape, and other garden elements, what policies were helping or hindering use of the garden, and so on. The staff member from the original design team would serve as a "bridge" between the designer and the FM, providing an insider's insight into original intentions for the garden and how those had, or had not, been fulfilled over time.

5.2.3 Description of the Stakeholder Interview Instrument

The following general information was collected for each SI: (a) date and time of interview; (b) where and how the interview was being conducted (on site, phone, Skype, etc.); (c) name of interviewee; (d) name of firm for designers or HCF for FM and staff; (e) role in HCF (for FM and staff); and (f) date of beginning of design and date of garden ribbon-cutting.

The following questions were asked of *all* interviewees (for the full three SI scripts, see Appendices 5.1, 5.2, and 5.3):

1. Tell me about the design process for this garden.
    - Who brought you in and why?
    - Who were the major stakeholders (designer/s, CEO, President, staff, etc.)?
    - Who was on the design team (list everyone, not names but roles, including therapy staff, patients, community members, chaplain, etc.)?
    - Who was the primary "driver" of the design – the landscape architect/designer, the architect, the client…?

2. What was the program / goal(s) for the garden?

3. Do you think those were met? How so, or how not?

4. Did the designer use any research to inform the design?

1. Journals, books, etc.
2. Interviews or surveys with staff, patients, etc.
3. Behavior mapping, site observation, etc.

5. What were the biggest challenges during design and construction? (For designers, a second part of the question was added to this sentence, making the full sentence, "What were the biggest challenges during design and construction, and how did you deal with those?")

6. What are the biggest challenges now? Who deals with them, and how?

7. What did NOT happen according to the initial design plan, and why?

8. Have you gotten feedback about the garden since it opened, either formally or informally? If so, discuss who, how, and what.

9. What do you feel the (design / construction) team got really RIGHT with the garden?

10. What do you wish could have been done differently? Or, if you had to do it all over again, what would you have someone do differently?

11. Anything else to share?

FMs were also asked the following question at the beginning of the interview: "Were you involved in the design of this garden? If so, let's discuss the following. Even if you weren't involved on the team, you may know about the design process, goals for the garden, etc." FMs and staff were also asked, "How do people (patients, visitors, staff) use the garden?" An additional question was asked of designers if they were interviewed before data collection: "Would you be willing to share materials such as plans, drawings, sketches, etc. for use with the on-site research?"

5.2.4 Stakeholder Interview Methodology and Protocol

To keep the SI instrument as standardized as possible, the same structured interview script for each specific interviewee type and the same data collection protocol were used for each interview.

Interviewee recruitment. Stakeholder Interviewees were recruited as follows:

Designers: In most cases, the researcher contacted designers directly, either through email or by phone, and asked them to be interviewed about the healthcare garden project.

Facility Managers (FMs): The researcher's primary liaison or another HCF administrator or staff member made the introduction, either in person or by email, between the researcher and FM.

Staff: The researcher's primary liaison or another HCF administrator or staff member made the introduction, either in person or by email, between the researcher and staff interviewee.

Consent. Following initial contact, interviewees were sent the IRB-stamped H-GET Stakeholder Interview Recruitment Letter (see Appendix 5.4). Interviewees signed the IRB-stamped Letter of Consent (see Appendix 5.5) before phone and Skype interviews or at the start of in-person interviews.

Interview method. Stakeholder interviews took place for approximately 45–60 minutes, which was considered acceptable by the interviewees. The following three methods were used, as determined by the schedules and available technology of the researcher and interviewees:

1. Phone: The majority of interviews were conducted via telephone. They were recorded on the researcher's cellphone using the app, TapeACall. The researcher also took paper and pen notes during each interview, regardless of whether it was recorded.

2. Skype: One interview, with two designers, took place via Skype. This was the least successful method for interviewing; a poor internet connection negatively affected the audio, which caused more than normal flaws in transcription.

3. In person: Two interviews were conducted in person, in two of the Pilot Test gardens. The first interview was only recorded with pen and paper because it occurred early in the research before audio-recording protocol was in place. The second interview was audio-recorded.

When to conduct the interview. The original study protocol had been to conduct the majority of Designer Interviews before on-site research in the Pilot Test gardens. The thinking was that interviews would make the researcher aware of specific design elements and features that might not have been in the plans or site descriptions. Due to timing, however, most interviews were conducted after on-site data collection. This approach turned out well because the researcher, having spent at least a day on site, had become familiar with it and had some data and stories to relay to the interviewee(s), which they were always curious about. There are, most likely, benefits both to interviewing before or after data collection, but the researcher's finding regarding protocol of when, exactly, to conduct the interview is that either before or after can be effective. Whenever possible, it is beneficial for the interviewer to at least visit and spend an hour or two at the site to be familiar with the garden from more than just the plan view or photographs.

Transcription. For the recorded interviews, electronic audio files were emailed to a transcription service, which returned the transcribed file approximately one week later. For interviews that were not recorded, where only paper and pen was used for note-taking, the researcher transcribed the hand-written notes into a Word document immediately after the interview.

Data collected. A total of ten Stakeholder Interviews were conducted:

- Smilow Cancer Center: 1 Designer Interview
- Greenwich Hospital: 1 Designer Interview (same designer as at Smilow but separate interview)
- Kaiser Oakland Medical Office Building (MOB): 1 Designer Interview with two designers
- Kaiser Oakland Special Medical Office Building (SMOB): 1 Designer Interview with two designers. Same designers as MOB
- Legacy Salmon Creek: 1 Designer Interview
- Legacy Good Samaritan: 1 Designer Interview
- Scott & White Hospital: 2 Interviews: 1 Designer, 1 Staff member
- St. Joseph Hospital: 2 Designer Interviews: One with the initial designer who had conducted a pre-occupancy evaluation (Naderi & Shin, 2008) and one with the designer who drew up construction documents and saw the project completed.

All but three interviews were recorded and transcribed. The two designer interviews at St. Joseph Hospital were held early in the research process and were not recorded, but pen and paper notes were taken. Technical issues with the Skype interview with designers of the Kaiser Oakland SMOB Courtyard Garden did not allow for a transcript, but written notes were still taken.

Plan for preliminary data analysis. For this study, the focus of the SI was to help establish reliability and validity in the two main H-GET instruments, the GATE and Surveys. Therefore, SI data analysis consisted of close reading of the interview transcripts to identify facts, themes, and commonalities between the Pilot Test gardens, and also "outliers"—facts, ideas, or experiences that are different from what the majority of interviewees' reports—within each interview and across all interviews. Results from the preliminary data analysis, grouped in themes that roughly follow the interview questions, are reported below.

5.2.5 Preliminary Results

Several themes emerged from the H-GET Stakeholder Interviews. In this document, when conversations between the interviewer and interviewee are reported, the interviewer is "R" for researcher and the interviewee is "S" for stakeholder.

Program goals. With most of the Pilot Test gardens, the primary design and program goal was to provide a place for patients, visitors, and staff to get outside and relax. One designer stated, the goal was not "therapeutic," per se: "This was really just about a contemplative garden for people to get away from the…normal activities of an urban medical center, just to be able to sort of collect their thoughts and calm down and get away from that" (Designer Interview, 7/15/16). In two of the eight facilities, the designers and/or the client (the HC organization) also wanted active therapies such as physical, occupational, and horticultural therapy to take place in the garden:

> So in that early garden, the…big focus…pragmatically was raised after bringing the plant material up to the level of the…users…Primarily a space where you could get out and have the whole garden…raised beds of different levels, where you could have a four

season garden, to just get people out there connected with plants (Designer Interview, 12/11/15).

At St. Joseph Hospital, the garden was designed primarily for nurses and other staff members. The administration wanted to increase staff satisfaction and retention rates. The nurses wanted "a place to grieve" and "a place to take grieving patients." Therefore, "an intense level of privacy" and ease of access to and through the garden were both important components: "Can we get them to that space that allowed a break for a very short time…Can the nurses get out there and cry for ten minutes and get back to work?" (Designer Interviews, 2/12/15, 4/7/15).

In most interviews, staff use of the garden did not come up in the conversation—this was not a specific question in the interview script—or if staff use of the garden did come up, it was in passing, talking about who used the garden for recreation, lunch, or working with patients. One designer, however, talked specifically about the healthcare facility's policy, at least early in the design process, to *not* allow staff to use the garden recreationally:

> I will say that programmatically…the hospital was initially and well not initially, but pretty steadfast as a project insistent that this garden was for the patients and to the point where they were resistant to designing it just to help staff. But I believe that after it has been built, I believe that has slowly changed. There was a lot of policy talk, but we asked questions like…would it be helpful to have spaces for groups of nurses to have sort of conferences or you know do you see, I don't know, areas for group lunch type activities. And the answer was clearly no. Consistently no and, and I think what their concern was, if I remember correctly, is that they didn't want the patients to feel uncomfortable. With medical people around and they didn't and…really I think it goes to the issue of privacy, patient privacy. They didn't want the patients to come across their doctors, I guess or their staff or their nursing staff. So, you know the overriding concern about the patient's welfare and privacy I think when it comes to any kind of staff benefits (Designer Interview, 7/15/16).

Designer research. Some designers said that they read journal articles, books, and other materials to conduct research about designing healing gardens. Two designers pointed out that when they first started designing healthcare gardens in the mid-1990s, there was very little published research for a designer to access:

> We read some journals, but we didn't sort of delve tremendously deeply into the…research data before…and frankly at that point when we did this garden there wasn't a tremendous amount of it... Which is why we're all waiting for you to finish. So…certainly about what my own experience was with the ADA [Americans with Disabilities Act] and…how ineffective the current ADA criteria are. So, for instance, the slopes of walks, we definitely did not want to have anything resembling an "accessible" ramp in this garden. Obviously we didn't want stairs... (Designer Interview, 7/15/16).

One designer had completed the 10-day Chicago Botanic Garden Healthcare Garden Design Certificate Program shortly before starting the project and felt that the program had equipped him well (Designer Interview, 4/7/15). The garden design for St. Joseph Hospital was the most thoroughly researched because it was part of a landscape architecture studio at Texas A&M University (TAMU), intended as a pre-occupancy evaluation. Students and the professor conducted site inventory and analysis, behavior observation, and two surveys, one about staff opinions and use of the existing (pre-design) space and one about the two proposed designs (Naderi & Shin, 2008; Designer Interview, 2/12/15). The garden at Scott & White Hospital was also the result of a TAMU landscape architecture design studio in which the class entered a competition to design the new facility's healing garden. As part of the studio, students read relevant books and articles and heard from guest speakers (Designer Interview, 3/3/16).

With the exception of one garden, all of the designers interviewed had had previous experience from at least one prior healthcare project. One designer became defensive with the question about research. Their design firm had previous experience with healthcare gardens, which was seen as positive and, perhaps, "enough":

> It basically is based on experience 'cause this is not the first property that we've done. So…you've already done a lot of that, you know, you read all kinds of things and you're

> constantly reading things and you're looking…things up online and…so there's some general research that's behind your ideas, but you know, the whole idea of creating, you know, and there, some people, it just takes it to an extreme, but…the idea of creating a really you know, very soft and sensuous kind of lines and design and…. So there's all those things you do that, you know, you're just trying…to create…a setting that, so you do all kinds of things to…create the effects you want to create to make the place special...And they can make it soothing for people, but it doesn't have to be… you don't have to be relentless about making sure that everything's rounded and curved, and there are a bunch...of people in…the garden design business, who pride themselves as being healing garden designers and then they just, you know, they take that to an extreme (Designer Interview, 12/16/15).

One designer described using a combination of site analysis, literature review, and intuition for the garden's circular design theme:

> So based on the analysis and conditions, I decide [sic] to use a geometric form to apply to this design. 'Cause I believe geometric form can be more beautiful and can impress people more easily. And I chose the circle form, because the circle form means inclusive. So patients who staying or in, you know, inclusive space, they'll feel more comfortable and welcoming (Designer Interview, 3/3/16).

This designer also decided to use water in the garden, based on research:

> I think the water feature, based on my research and my literature review…I found out that water feature is a main factor to…accelerate the healing process of a patient, 'cause it can make people calm down and...feel more comfortable and where they interact with the water, they may feel better (Designer Interview, 3/3/16).

End-user input as an important form of research. With two of the Pilot Test gardens, the preference for a "back yard" style was clearly driven by the end users—not just the hospital as the client, but the hospital's staff and patients. At St. Joseph Hospital, users (staff) were shown two potential designs. One was more rectilinear and formal, the other more home-like.

Preference for the less formal design was "clear as a bell" (Designer Interview, 2/12/15). The designer of another Pilot Test garden talked about a group of patients and former patients that were brought in as advisors on the project. Their input marked a turning point in the design:

> Although we didn't interact with them on a tremendously, you know, frequent schedule…they frankly had more to do with the eventual manifestation of…the design than really anybody…from my standpoint anyway. [For example] when we were first working with the architect in schematic design, we started down a path of a sort of a stylized garden and by stylized I mean you know almost architectural really influenced by the principal in charge…from the architect's office….And so we had quite a…stylized almost contemporary looking plan. That was presented to the [patient/former patient group] probably midway through schematics and that was where…I strongly got the message this is not what we [the patient/former patient group] want. What will be most helpful would be, or what would be most comforting for them as patients would be something that basically looked like their back yard and so this…impression of not wanting to be anywhere but sort of in…very familiar, comforting surroundings is what…turned the whole design around... And that's where we started bringing the more naturalistic elements into the…design. I mean you know…you think the customer is the hospital, but it's not. It's the patient, right? So, yes I would strongly suggest that any, any of these gardens have some kind of representation from the…patient's standpoint (Designer Interview, 7/15/16).

Challenges. Several challenges about the gardens, primarily about safety and maintenance, emerged during the interviews.

Safety concerns*:* The challenge of addressing safety concerns, raised either by the client, staff, or designer, came up in almost every interview. Two designers mentioned the healthcare facility's concerns about infection control:

> Well, challenge one, the docs ask grow a garden without any soil because they were afraid of the whole you know... The microbes, and, yeah infection control issue. And so that, the answer to that was well do we want a garden or do we not want a garden,

> because we could not in fact grow a garden without soil, at least not a live one. And I think we did have pretty strong back up from everybody, including the senior administration on that, and frankly that's where a little research would have been helpful to us...To be able to say you know yes, there are microbes in soil, but if you don't dig your hands in it it's not as much of an issue as you might think it would be.

The designer was surprised that water was less of a concern for the same client and garden:

> Water often is a concern and…frankly that was not as much of a problem as I expected it to be, but I do know that they still, they continue to have concerns, Infection Control continue to have concerns about water anywhere in the hospital, but again, I think the fact that it's outside and there's no splash, I think that sort of minimizes… (Designer Interview, 7/15/16)

In the case of one garden, it was actually the landscape architect who was concerned about mildew from a water feature because of the lack of air circulation in the existing space, but staff and administrators at the HCF were adamant about having a water feature (Designer Interview, 2/12/15).

Conflict of safety vs. garden access*:* A staff member at one facility felt that the garden, which had one small sign near one of the three entrances, should be more obviously accessible. The garden can be accessed from two different doors inside the hospital, and also from two metal gates that lead to the parking lot. However, the gates had keypad locks on them until shortly before H-GET research, and they still *looked* locked. During behavior mapping, several garden users were observed testing the gates to see if they were locked; some garden users asked the researchers whether or not someone could get through. The staff member interviewee said that recently, the keypad locks had been removed, but there was no signage to invite people into the garden, to let them know that it was available for their use: "Aside from that [maintenance workers in the garden every day] a couple of patients come here. It seems they are lacking of information about this garden. It seems there is no sign there like come on here I'm here. I'm your healing garden come on, you know." The staff member conceded that safety concerns—particularly in this garden that had two water features—may have been the primary reason for not advertising the garden on the now-unlocked gates (Staff Interview, 10/21/15). Interestingly, the *designer* of this same garden also noted the potential conflict between allowing greater access to the garden, such as open gates, and the presence of an unattended water feature (Designer Interview, 3/3/16).

Figure 5.21 The gate to the Healing Garden from the parking lot looks locked. In fact, the key pad was disabled last year. One staff member thought a sign welcoming people to the garden would help, but was also concerned about the safety of unattended children.

Figure 5.22 Safety is always a consideration. Administrators and staff are concerned that if the garden gate is left open, the water feature might be a hazard.

Barriers to usage: One staff member, when asked about what he thought were the major reasons that more people did not use the garden, thought that first, most patients and visitors simply were not aware that the garden was there, or that it was for them to use. Additionally, in the interviewee's opinion, the garden did not look like a "healing garden"; it was "not inviting":

> S: To me, it's like a jungle right there… If I had my children, I wouldn't let them go there. Maybe there will be a snake right there…because they don't cut it properly and they don't. I mean that's me. You know if it is a healing garden, it needs to be attractive. And I love flowers, that's me….I would like to see more flowers than this, more flowers. Yeah, especially yellow flowers.
>
> R: Okay. Why yellow? Just that, is that just your favorite color or does that symbolize

> something?
>
> S: It symbolizes life to me, yeah.
>
> R: Sunshine?
>
> S: Mm-hmm, yup, like the sun. There is hope in yellow color…" (FM Interview, 10/21/15)

At one Pilot Test facility where the garden is not easily visible from main pubic indoor areas, the designer noticed early in the planning process how difficult the garden was to find. The firm proposed signage and wayfinding for the entire campus, "and the administration was totally on board" but that aspect of the project was delayed. When the administrator who had been in charge left, the signage plan was not implemented (Designer Interview, 4/7/15).

Inadequate maintenance: Issues with maintenance came up in almost every interview. At one garden, the flowering shrubs that the designer had originally specified had been replaced by roses with thorns (Designer Interview, 4/17/15).) Some designers were unhappy with the plant selections they had made from the beginning, and then also with the way plants and plantings were maintained. One designer mentioned that the plants were too often overpruned, ruining the garden's "wild and otherworldly" effect:

> So that's…often a problem on our projects. I've had projects completely transformed by maintenance staff....Against the intent of the design and there's…really very little you can do about it, and once your off the job, you're off... (Designer Interview, 12/16/15).

One designer explained that the difficulty in maintaining plants can come from mistakes made during construction:

> The…woody plants, we had a hard time keeping the…very upright pines that sort of backed the…sculpture area…and they, they been having trouble with those...Mostly because during construction, you know, the usual happened. This, this was a build site essentially. They…had stockpiled all sorts of bad [building material]…that they ended up using to, to fill this site and....Soil was awful…As it, as it always happens, it was the last thing to get done and owner wanted them out and they wanted out and...as a result,

> the plants have been suffering and will continue to suffer I think (Designer Interview, 7/18/16).

Regrets. In response to the question, "What do you wish could have been done differently? Or, if you had to do it all over again, what would you have someone do differently," most interviewees were candid and brought up the following issues:

More interaction with end users: Related to the issue of user input, one designer, who was brought in late in the overall project's design process, expressed the wish to have had more interaction with the garden's end users: "[I might] have pushed for more interaction with staff, leadership, the donor…[it] would have given us better assurance that it was going to meet certain goals and objectives [but] we would have really needed to push for that" (Designer Interview, 4/17/15).

Furniture and Furnishings: Three designers brought up the site furnishings, which they were not happy with. One designer had specified more furniture (moveable seating, benches with backs) for another garden at the same facility and was frustrated that it had never been installed. The designer had not been able to specify the furniture for the Pilot Test garden and was unhappy with the chairs and tables that had been installed—a common problem:

> In some cases, we don't select the furniture. We quite often don't. And that's always a disappointment, where you get these big clunky….Heavy... People select the worst, you know, furniture and stuff. I mean it's a terrible problem. Like I have a bunch of university projects, where there, you know, the physical plant guys, they have some idea about you know, recycled plastic whatever and its just nasty stuff and it's...So I've gotta Photoshop them out of all my photographs... (Designer Interview, 12/16/15).

Another designer *was* able to specify the garden furniture but was not allowed to put backs on several of the benches because that would have blocked the view. The designers worried that the seating was not comfortable enough (and indeed, several comments from both the Staff and Visitor Surveys were about the uncomfortable furniture). The designer had also recommended moveable seating, but the administration refused:

> I also would have liked to do, have done a better job in…having a more consistent design aesthetic with the benches. The benches, some of the benches are different than the others and maybe that's good from a variety standpoint…but aesthetically it kind of bothers me. I probably should have had a back on…the bench, on some of the flat benches. Up closer to the building, but the intent was not to block any views (Designer Interview (Designer Interview, 7/15/16).

At another Pilot Test garden, the designer was unhappy with the original black umbrellas installed at the outdoor tables (they have since been replaced): "They were horrific, like a congregation of black witches" (Designer Interview, 2/12/15).

Not enough shade: One designer regretted not providing enough shade. Vines had been specified to grow over trellises, but due to structural and maintenance reasons, they did not provide enough cover to create adequate shade. When patients complained about the lack of shade, the firm worked with an awning manufacturer for seasonal cover of the trellis (Designer Interview, 7/15/16). Another designer discussed the importance of shade structures, which were installed several years after the Pilot Test garden was first opened. Shade structures are now installed in every garden that that healthcare facility builds (Designer Interview, 12/11/15).

"The garden is too popular": In one interview, the designer noted that the garden's design, or at least its location, made it perhaps "too popular" because it was a relatively small space that served multiple users, including members of the community. He was surprised that despite the heavy usage by so many different people, the garden seemed to function as well as it did:

> I think that in…some ways the garden is too popular for…its own good because there's so many things going on. There's so many activities and events... Because, you know, it's…the one main, open space. They're really isn't... any other place to have…activities. So from a therapeutic garden standpoint, it's almost too popular…too heavily used to really…be used for the…therapeutic benefits…a lot of days because being used for so

> many other things. They're there to do health screenings, which is great. It keeps the garden very active and lively, but if you're just a...Patient that often goes out to the garden for a quiet respite…it's one of those gardens that's a little, it's a little heavily used. But…it's amazing to me every time I see a therapist, a physical therapist, or [horticultural] therapist out there, with a patient, in their, you know, hospital gown and their...IV poles, walking around in the garden. With some people…having their lunch and...Sleeping on the bench. So obviously, the...need to get outside overweighs…the need to have privacy (Designer Interview, 12/11/15).

Happy accidents. With most design and construction projects, there is at least one aspect of the plan that does not get implemented according to plan. Interviewees mentioned budget restrictions, utilities, last-minute decisions imposed by a donor or hospital administrator, and other frustrating issues. There are often points of frustration and regret for the designer. But sometimes, too, there are "happy accidents" where a necessary change turns out better than what was originally planned. One designer relayed a story during the interview:

> Yeah, one of the big things that didn't go according to plan was the, we had those round bases... that were designed for sculpture and…we were going to be working with [the interior designer] on…selecting sculptures and as we got further into the process, it became clear that art work is a very subjective thing and it's easily, easy to insult people or aggravate people without intending to and so it became almost impossible to even…initiate a detailed discussion about what would be appropriate sculptures so we ended up fortunately finding the…president of the local bonsai club…was a senior staff administration member at the hospital and so that was sort of a fortuitous connection. So…the club purchased some [of] those large bonsai. They maintain them on an ongoing basis and even actually in the winter they pack them up and send them back to the place that grew them. And they overwinter in a greenhouse. So, that sort of art work idea, you know if you envision the view of the garden down the hall…as you get off the elevator... There's that bonsai that sits on top of that faux rock at the end of the reflecting part of the pool. That was intended to be a sculpture to grab your attention.
>
> **R:** Right.

S: And so it's not.

R: Well, it is. It's just a nature sculpture.

S: Yes. (Designer Interview, 7/15/16).

5.2.6 Conclusion

Discussion. Stakeholder Interviews can be useful for triangulating, explaining, and contextualizing information gained from other instruments, and for gathering new information. For this study, some examples of explanation and contextualization include:

- Explanation of why gates at one facility were unlocked but did not appear to be, and why they were not left open; the interview conversation also arrived at a potential solution to the conflict between wanting users to access the garden and fear that they (especially children) might get hurt if they wandered in unattended or after hours;
- Background history in one facility about administration discouraging staff from using the garden in their free time; even though this policy has changed, it may be part of the reason that more staff use a different outdoor space at the HCF;
- Background about designers' choices, or lack of control, about such essential elements as types of seating and shade, and the way that maintenance is conducted.

Some examples of new information include:

- Most designers interviewed did not go through a rigorous "evidence-based design" process. With the older HCFs and gardens, such evidence in the form of published books or peer-reviewed articles simply did not exist. Even with newer facilities, most designers still tended to rely on intuition or prior experience from other projects to guide their decisions;
- End-user input is important in guiding the garden's design, construction, programming, and maintenance. End users, particularly community members who will be treated at the HCF, and the staff who will do most of the treating, have valuable information about preferences and needs that may be different from what the architect, landscape architect, or client envision;

- Safety is a primary concern for the healthcare organization, from administration to healthcare providers (nurses, doctors, etc.) to facilities maintenance personnel. Design decisions are often made based on whether or not a policy, or a garden element, is viewed as safe for garden users. Anything with a perceived risk, such as a water feature, may be more of a challenge to implement;

Limitations and future research. Although interviews can yield valuable information, they are usually time-consuming, particularly in the data analysis phase. A researcher will need IRB approval to conduct interviews, even though the Stakeholders (designer, facility manager, and staff member from the original design team) would not usually be considered members of a "vulnerable population." Finding a time to conduct the interview can be a challenge and if the interviews are not face-to-face, technology (recording via phone or Skype) has limitations and failings. It is essential that the interviewer use a back-up system of pen/pencil-and-paper notes. Rigorous data analysis involves transcription of the recorded material and then thorough immersion in the material to identify themes, categories, and codes.

For this study, time was the major constraint. Meetings times were sometimes difficult to arrange, and fewer interviews were conducted than had been initially planned. Of the ten formal Stakeholder Interviews that were held, time did not allow for in-depth data analysis of the transcripts. In follow-up research, the researcher plans to conduct more interviews with Stakeholders from the eight Pilot Test facilities and to use a combination of analog qualitative analysis using Saldaña's "Codifying and Categorizing" method (2013, p. 9) and computer software to identify common words and themes.

CHAPTER VI

CONCLUSIONS

6.1 Introduction

The Healthcare Garden Evaluation Toolkit (H-GET) is a set of four standardized instruments that facilitates evaluation of gardens in general acute care hospitals. When the four instruments are used together, the H-GET becomes a *methodological process* (the H-GEM, Healthcare Garden Evaluation *Method*) that includes each individual research study's design, protocol, data collection, data analysis, and dissemination of findings. The three previous chapters described methodology and results from each of the four H-GET instruments: (a) the Garden Assessment Tool for Evaluators (GATE, Chapter III); (b) Visitor and Staff Surveys (Chapter IV); (c) Behavior Mapping (Chapter V); and (d) Stakeholder Interviews (Chapter V).

6.2 The H-GET is a Flexible and Multipurpose Toolkit

The H-GET as an *evaluative* tool. The H-GET was developed primarily to facilitate evaluation of gardens in HCFs. The H-GET can be used *before* design for pre-occupancy evaluation (Pre-OE) and *after* a project has been completed for post-occupancy evaluation (POE). A full POE with all of the H-GET tools may not be necessary or even appropriate, depending on the project scope (research question(s), budget, time, expertise and number or evaluators, and so on). Although the most well-rounded picture of the garden will come from use of all four H-GET tools together, this is not essential. The H-GET can be "unpacked" so that one, two, or three instruments are used rather than all four.

The H-GET as a *design* tool. Even without a Pre-OE, the H-GET instruments can be used to help with design of new or renovation of existing projects. The GATE, in particular, can serve as a checklist for what should be incorporated into a healing garden to promote the best outcomes for patients, visitors, and staff.

The H-GET as a *research* tool. In addition to *evaluation* research, the H-GET instruments may be useful as research tools that facilitate exploration of other specific questions about healthcare gardens. For example, before and after a design intervention (adding a water feature, or new seating, or signage to the garden) to determine the intervention's success. Or to determine what garden features contribute most to use and to positive user outcomes.

6.3 Summary of Instruments and Discussion of Findings

Garden Assessment Tool for Evaluators (GATE). The GATE was tested in nine gardens at all eight Pilot Test HCFs and was tested at an additional 25 sites in the Houston Medical District. Strong support for content and face validity is derived from (a) an extensive literature review, with particular focus on previous healthcare garden evaluation research; (b) use of existing comparable tools for healthcare garden evaluation, particularly Cooper Marcus and Barnes' Therapeutic Garden Audit for Acute Care Hospitals (2012) and Rodiek's Seniors' Outdoor Survey audit tool (2016); and (c) feedback on GATE iterations from experts and lay people from a diverse range of fields and backgrounds, including healthcare garden designers, healthcare providers, healthcare design researchers, healthcare garden users, and lay people outside of the healthcare realm. Strong support for convergent validity comes from a high correlation between two different scoring methods that were used in the GATE and both surveys (Visitor and Staff): "Overall Impression" scores and "Cumulative Item" scores within each instrument were highly correlated, and the scores also correlated highly between the GATE and the Surveys. Principal Component Analysis was also used to support convergent validity; although items loaded strongly into domains, they did not always load into the GATE's specific domains and sub-domains. Interrater reliability, as measured with Kappa and Intraclass Correlation Coefficient (ICC) was high some for domains, sub-domains, and items, and lower for others. Issues with low or no variability, insufficient data, and non-normal distribution made ICC analysis difficult. Some of these issues may be related to the 1–4 Likert-type scale (a 1–5 scale might be yield more reliable results) and the "Not Sure/Not Applicable" category, which accounted for most of the missing data. Scores of percent of agreement between evaluators revealed a higher level of agreement than ICC.

Surveys. A total of 95 valid (usable for statistical analysis) Visitor Surveys (of patients and visitors) were collected from Baylor Scott & White Hospital, Greenwich Hospital, Legacy Good Samaritan, Legacy Salmon Creek, Smilow Cancer Hospital, and St. Joseph Hospital. A total of 855 Staff Surveys (729 of which were valid and used for data analysis) were collected from all of the Pilot Test sites except Smilow Cancer Hospital. Support for content validity is derived from (a) an extensive literature review; (b) existing surveys from previous healthcare garden research by other practitioners; (c) expert opinion on several survey iterations from professionals in a diverse range of fields, from healthcare garden designers to healthcare providers to healthcare design researchers, as well as from lay people; (d) survey pre-testing before data collection. Convergent validity is supported by the strong correlation between the two different scoring methods mentioned above, the “Overall Impression” scores and “Cumulative Item” scores for the GATE and the Surveys. The two scores correlated highly within each instrument and also between instruments. Additional support for convergent validity comes from triangulation of information gathered and corroborated with the other H-GET instruments, articulated below in the discussion of hypotheses.

Behavior Mapping. Behavior Mapping (BMap) was conducted at all eight H-GET Pilot Test sites in a total of eight gardens and two additional outdoor spaces—terraces adjacent to the cafeteria at two separate HCFs. Support for content validity is derived from (a) an extensive literature review; (b) use of previously published instruments as models; (c) feedback from experts before BMap at the Pilot Test sites; and (d) feedback from the Research Assistants during the Pilot Test process. The BMap and Stakeholder Interview instruments are both more qualitative than the GATE and Survey instruments, although all but the Stakeholder Interviews use mixed methods. Thus, support for convergent validity cannot be derived from statistical analysis but rather from triangulation with the other three instruments, as will be discussed with hypotheses, below.

Stakeholder Interviews. A total of ten Stakeholder Interviews (SI) were conducted; all Pilot Test HCF designers were interviewed and one staff member was interviewed. Other less formal conversations with staff members were not included in SI data analysis. A strict interview protocol was developed based on review of the relevant literature and study of research that used interview methodology. During instrument development, experts reviewed the interview scripts and test interviews were conducted. Interviews yielded new information that had not been, and likely could not have been, gained from the other three H-GET instruments, and also corroborated or helped to explain information from those instruments.

6.4 Results Related to Hypotheses

Several hypotheses were explored during development and testing of the H-GET. Time, budget, and the qualitative nature of much of the data did not allow for detailed statistical analysis across instruments; therefore, these findings are exploratory in nature.

H1: Gardens are used more when people are (a) aware of them; (b) have easy visual access to them; and (c) have easy physical access to them. This hypothesis was supported in at least some of the Pilot Test facilities and with some of the data analyzed. A Chi-square analysis indicated that the more H-GET Survey participants could see the garden from indoors (the more the garden was visible), the more likely they were to be aware of the garden ($\chi^2 = 4.57$, $p < .05$). Behavior Mapping found that in some HCFs people—especially staff—were as likely to use outdoor spaces adjacent or closer to the cafeteria as the official healing garden, which was not always as visible, accessible, or convenient. Information from interviews revealed that both designers and staff were often aware of how visually and/or physically accessible (or not) the garden was. Further correlation and linear regression of GATE scores with BMap and Survey data will likely yield more conclusive results.

H2: Although the physical design of the garden, and its relationship to the building, is important, other factors such as policies, programming, and organizational culture also affect garden usage. Almost half (47%) of Visitor Survey participants reported having first found out about the healing garden from another person, and not from walking by it, seeing it from a window, seeing signs to it, or reading about it. This is evidence that good design—by locating a garden where it can be seen, and by creating a beautiful, welcoming, and restorative garden—is not always enough to make people aware that there is a garden for them to use. A policy of informing patients and visitors about the garden, and encouraging them to visit, is also critical. Further evidence of the importance of policy and programming was provided by BMap: Three of the gardens where the most patients were observed (Legacy Good Samaritan Stenzel Garden, Kaiser Oakland Medical Office Building Serenity Garden, and Smilow Cancer Hospital Rooftop Garden) were also the three healthcare facilities that had active therapy (physical, occupational, horticultural, etc.) programs and/or were designed to facilitate therapy. Data analysis from the four H-GET instruments on a site-by-site level will shed more light on correlation between garden design, programming, and use.

H3: Garden *use* is a good indicator of garden *success*; in other words, there will be a strong positive correlation between gardens that score highly and those that have many users. This hypothesis was not fully supported. As was discussed in Chapter V, BMap at three separate HCFs (Baylor Scott & White, Legacy Salmon Creek, and Smilow Cancer Hospital) revealed that outdoor spaces adjacent to dining areas were at least as heavily used, if not more, than the HCFs' designated "healing gardens." At the one HCF (Smilow Cancer Hospital) where the GATE and Behavior Mapping were conducted in two outdoor spaces, the Rooftop Healing Garden (the Pilot Test garden) received a total mean Cumulative Item GATE score of 3.36 out of 4.0 (84%) and the Cafeteria Courtyard received a lower GATE score of 2.49 out of 4.0 (62%). The contrast between the Overall Impression GATE scores was even more extreme. Mean Overall Impression scores for the Rooftop Healing Garden were 7.86 out of 10 (79%) and for the Cafeteria Courtyard, and were 3.43 out of 10 (34%). And yet, BMap revealed that the Cafeteria Courtyard was more heavily used (241 visitors at the Cafeteria Courtyard and 208 at the Rooftop), especially by staff members. Cooper Marcus and Barnes (1995) strongly recommended that healing gardens be located near dining areas. Research from this study reinforces this recommendation. Staff Surveys asked participants about why they used outdoor spaces other than the healing garden, which corroborated the thinking that people sometimes use the space that is most convenient rather than the most beautiful, comfortable, or restorative. Thus, we cannot simply use head-counts of people in an outdoor space as the sole indicator of whether that space is successful.

H4: Two groups—patients and visitors (one group) and staff and volunteers (another group) would both prefer to have outdoor garden spaces that are separated from each other.
As discussed in Chapter IV, this hypothesis was only partially supported. Of the 71 Visitor Survey participants who answered the question, "***How do you feel about the healthcare staff using the garden IN THEIR FREE TIME?***" 70.4% checked the response, "I like seeing the staff use the garden in their free time." 28.2% checked "I don't mind seeing staff using the garden in

their free time," and only one participant (1.4%) checked "I would prefer not to see staff using the garden." Some open-ended responses indicated that visitors understood the need for staff to unwind by being outdoors in the garden.

Staff Surveys participants also had a more mixed response than was predicted: in answer to the question, "***Do you think that healthcare staff should have their own garden, separate form patients and visitors?***" less than one quarter (23.6%) of the 713 Staff Survey participants responded in the positive, with 11.2% checking "Definitely yes" and 12.4% checking "Probably yes." 31% responded with "Maybe," and the majority—45.3% of staff—responded in the negative, with 34.6% reporting "Probably no" and 10.7% responding "Definitely no." In summary, the majority of Staff Survey participants did *not* feel that staff should have a garden separate from patients and visitors. Another surprise was the Staff Survey answer to ***"If this facility DID have a separate garden for staff, would you use it?"*** A strong positive response was expected. The majority (67.5%) of participants did answer "Yes" and only 6.5% answered "No." However, about one quarter (26%) of participants answered "Not sure." The "Not sure" option invited participants to elaborate on their responses. The two greatest factors with staff being "not sure" related to their busy schedules: if the garden were *close and convenient* and if staff had *enough time* in their day to visit, then they probably would use a separate garden. This finding corresponds to survey responses about what keeps staff from visiting the garden: the highest response by far (60% of the 90 participants who reported not having visited the garden at all, and 64% who reported that they would visit the garden more often or for longer if they could) was "Too busy." Not surprisingly, Staff Survey response to "***Do you think staff should be allowed to use the garden in their free time***" was very positive, with 97% answering either "Definitely yes" or "Probably yes." Thus at least from this research, it appears that staff feel strongly that they should be allowed to use the garden in their free time, but they may not mind sharing the existing space with patients and visitors; some are not even sure if they would use a separate staff garden if it were offered, or feel they would only use a separate garden if it were close and convenient and if they had enough time.

H5: There will be a strong positive correlation between "successful" gardens—gardens that receive high "Cumulative Item" and "Overall Impression" scores with the Garden Assessment Tool for Evaluators (GATE) and Surveys—and patient, visitor, and staff outcomes such as self-reported feelings after garden visits; satisfaction with the HCF; and likelihood to recommend the HCF to others. Six questions, discussed in detail in Chapter IV, addressed Visitor and Staff Survey participants' thoughts and feelings about healthcare gardens in general (one question), and about the specific garden at their HCF (five questions):

1. In your opinion, is it important for healthcare facilities to have gardens?
2. Would you encourage other people (patients, visitors, or staff) to visit the garden?
3. Does the garden improve your satisfaction with this healthcare facility?
4. Does the garden increase the likelihood that you would recommend this healthcare facility to others?
5. How do you usually feel after you spend time in the garden?
6. In your opinion, is spending time in the garden good for people's health (physical and/or mental)?

The strongest correlation between garden score and outcome variables was found with "***Does the garden increase the likelihood that you would recommend this healthcare facility to others?***" (r = -.39, p < .05); "***Does the garden improve your satisfaction with this healthcare facility?***" (r = -.44, p < .05); and "**Would you encourage other people (patients, visitors, or staff) to visit the garden?**" (r = -.46, p < .05). As the garden score increased, the dependent outcome variable increased. Moderate correlation was also found with ***"How do you usually feel after you spend time in the garden?"*** (r = -.21, p < .05); ***"In your opinion, is spending time in the garden good for people's health (physical and/or mental)?"*** (r = -.23, p < .05); and ***"In your opinion, is it important for healthcare facilities to have gardens?"*** (r = -.24, p < .05).

6.5 Limitations and Directions for Future Research

This dissertation study entailed development and testing of four individual healthcare garden evaluation instruments as well as a methodological process for their use. These instruments and the methodology were tested at eight healthcare facilities across the U.S., and the GATE was tested at 27 additional sites. Budget and time limitations did not allow for testing at more sites, or for further data analysis than what has been reported in this dissertation. Many of the present study's limitations, discussed below, will be addressed in future studies by the researcher or by others who will use the H-GET instruments and share their data and results.

Timing of Data Collection. Some of the H-GET testing, particularly in the Pacific Northwest, occurred later in the Autumn than was originally planned. It is likely that fewer people used the garden due to the cooler and wetter weather, which was problematic for getting representative BMap data. In addition, some people who completed the H-GET Visitor Surveys did so from indoors (usually from the cafeteria or main lobby) looking out onto the garden rather from outside in the garden; therefore, their evaluation of the garden was based solely on what they could see rather than a full multi-sensory experience. As has been emphasized in each chapter, timing of data collection is important: the time of year should be optimal for garden usage, and the research should take place during good weather on "typical" days when no out of the ordinary activities take place. Shepley (2011) and other researchers advise that post-occupancy evaluations should be conducted at least six months after construction and move-in. Because most gardens consist primarily of plants, which take time to grow and fill in, Cooper Marcus and Francis (1990) recommend waiting at least one full year or growing season before conducting a POE. All H-GET Pilot Testing took place at gardens that had been constructed more than one year prior. Future H-GET research should follow this protocol.

Geographic Regions. The full H-GET (all four instruments together) was tested at eight Pilot Test healthcare facilities in four diverse U.S. geographic regions: the Pacific Northwest, Central Texas, the Northeast, and Northern California. The GATE was tested at an additional 25 sites in Houston, Texas and at one additional site in New Haven, CT. The healthcare facilities and gardens were diverse in scale, type, and style, which was reflected in the varied H-GET evaluation results. Nevertheless, some areas of the country were not represented, for example, the Midwest, the South, the Southwest, Hawaii, and Alaska. Therefore, the H-GET cannot be assumed to be generalizable to all regions and all types of HCFs and HC gardens. Future H-GET testing and research should focus on areas that were not represented in this study, including those listed above and also international locations.

Research Assistant evaluators. A total of eleven Research Assistants (RAs) were recruited and trained to collect data at the eight H-GET Pilot Test and 25 Houston GATE test facilities, and all but one RA completed their work (data were excluded from the one RA who left the study early). Budget did not allow for the same RAs to travel to all four regions and all 33 sites. Utilizing RAs from each geographic region had benefits and drawbacks. On the positive side, hiring RAs in the each region enabled the researcher to test not only the instruments but also H-GET training techniques, which were refined over the course of the study. These training techniques will be documented in an H-GET User Manual, discussed below. Another benefit to the large and diverse number of evaluators was the larger pool of people to provide feedback on the individual instruments, the overall H-GET method, and the training process. The primary drawback to not having the same evaluators for all 33 gardens was that all data could not be compared for inter-rater and test-retest reliability.

User Manual and training. Cutler (2000) notes that for evaluation instruments, reliability and validity are increased when strict standardization procedures are used, including item definitions, rater training, and collection techniques. An H-GET User Manual will be essential in ensuring that the integrity of the instruments used and data collected is maintained. The H-GET User Manual will: (a) provide users with a context for the H-GET, explaining what it is, why it is important, and how it can be used; (b) provide instructions for site visit planning, including protocol for IRB/human subjects protection; (c) provide detailed instructions for the use of each individual tool, including data collection, analysis, scoring, and reporting results. Time constraints did not allow for the User Manual to be developed in tandem with the H-GET instruments. The TCOPPE School Audit Tool Manual by Lee and colleagues (2013) may be a good model for the H-GET User Manual. The Waterloo Region Shade Work Group's Shade Audit Information Guide + Tool (2014) and the American Institute of Architects' Design for Aging post-occupancy Evaluation Evaluator's Toolkit (2010) may serve as additional models because they present the material, including background research, in an attractive, user-friendly format.

A User Manual alone may not be sufficient; as with the TCOPPE School Audit Tool, training of evaluators may also be necessary. The TCOPPE manual was developed to accompany a training that all users must participate and be certified in before they can use the TCOPPE instrument independently. Full training takes approximately eight hours, and includes: (a) trainees' review of the Instrument and Manual before the training session; (b) attendance of a two-hour pre-scheduled group training session, which includes a PowerPoint presentation by the trainer and a question-and-answer session; (c) attendance of a two-hour Field Practice session, facilitated by the trainer and conducted immediately after the Training Session; and (d) independent use of the TCOPPE Audit tool at an assigned site. The completed audit is then reviewed by the trainer, who awards certification if the Audit has been completed correctly (so that "90%–95% of items perfectly matching with the answers by the development team members" (Lee, Kim, Dowdy, Hoelscher, & Ory, 2013, p. 952). Future testing of and data analysis from the H-GET, as well as feedback from users, will determine whether and how much training is needed.

Technology: benefits and drawbacks of "low-tech." The decision was made early in this study to keep the H-GET instruments as low-tech as possible to enable use by many different people, from design practitioners to healthcare providers to researchers. Most people who utilize the H-GET will not have had extensive research training, nor access to software and hardware technology that might be used for some of the evaluation methods. For example, technology exists for behavior observation, including behavior mapping, but it can be expensive and difficult to learn, especially for a single project. A steep learning curve could lead to measurement error which would undermine the integrity of results. Unless a person, firm, or organization plans to use hardware and software equipment for multiple projects, such an investment is probably not justifiable. The H-GET BMap protocol, which involves paper-and-pencil notations that can be transferred onto an Excel spreadsheet for analysis, is more user-friendly and practical. A drawback to this low-tech approach is that analog data collection is also subject to error, as is transfer of data to an analyzable platform. Furthermore, statistical analysis may be less flexible and have fewer options. Ideally, data from all four of the H-GET instruments would be analyzable in a simple user platform, such as Excel, so researchers could easily compare information about each garden or across multiple gardens.

Additional goals for future research

Systematized data collection and analysis. Bardenhagen, Rodiek, Nejati, and Senes (2016) have developed a simple online system, using Microsoft Excel, that enables SOS Tool users to enter their results and receive instant feedback on scoring of the entire garden and specific items and domains. These data are collected by the SOS Tool developers, which means that in exchange for helping people process the data, they have access to a growing body of knowledge on gardens in residential care facilities. An added benefit to keeping data collected in the same place is that it can be analyzed with the same methodology and software, ensuring higher instrument reliability and validity and greater credibility of results.

Specialization. The H-GET was developed for general acute care hospitals because they serve the broadest and most diverse range of users. In the future, it could be adapted for specialized healthcare facilities, for example pediatric, rehabilitation, behavioral health, and hospice.

How broad can the H-GET be? Some healthcare organizations have begun to adopt a care approach that is not only patient- and family-centered but also community-oriented. Organizations and design firms such as Kaiser, Legacy, HKS, and Perkins + Will are working toward healthcare design models that emphasize preventive, salutogenic instead of pathogenic delivery and care. There is increasing interest in “medical homes” and “medical cities,” in which the entire campus is a restorative environment. Will the H-GET instruments, which were developed for distinct healthcare gardens, function as well in this broader environment? It will be interesting to test the H-GET in these “salutogenic design” HCFs such as the new Parkland Hospital in Dallas, TX and the Baton Rouge Health District in Louisiana.

Add a physiological measurement. The H-GET would, ideally, have a fifth instrument that would measure physiological outcomes of garden users in real time. Technology exists for measurement of heart rate, blood pressure, and salivary cortisol, among other markers. The fifth H-GET instrument could be tested and validated against the four presented in this study.

The H-GET for certification. Professionals in the healthcare garden design field have talked for over a decade about developing a certification of healthcare gardens, similar to LEED or SITES. The American Horticultural Therapy Association is currently working toward this goal. It may be that the H-GET tools, particularly the Garden Assessment Tool for Evaluators (GATE) could serve as the basis for such a certification.

6.6 Conclusion

In a growing number of healthcare facilities, access to nature is no longer treated only as an amenity, something "nice to have" but not essential in the overall environment of care. Healing gardens and other outdoor places of respite are increasingly being built in general acute care hospitals. Most healthcare organizations have the best intentions of providing gardens that promote positive health outcomes for patients, visitors, and staff. However, intentions often fall short, either because there is not enough information available to create a successful garden, or because there is a gap in translation of research into practice. I have seen too many "healing gardens" that consist of a sea of pavement with one bench and one potted plant, or that languish unused on a rooftop because no one knows it is there. Even gardens that win awards in design magazines sometimes fail to provide basic comfort, pleasure, and joy.

This dissertation is my attempt to rectify some of these problems. The study has involved development and testing of four evaluation instruments (the H-GET) so that the next person undertaking similar research does not have to re-invent this wheel. A standardized set of instruments, and a systematized process of evaluation, will enable future researchers to conduct their work more easily and to feel more confident about their results. The entire field can benefit from instruments and data that is more reliable and, thus, generalizable. If we have the tools and benchmarks for evaluation, then completed gardens can be assessed and healthcare organizations and designers can learn whether their garden is performing as planned and how it might be improved for the future. These same tools can be harnessed for better design of healthcare gardens and for research regarding specific questions. I look forward to continuing this research, and sharing the results, at more sites and with many colleagues in the future.

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APPENDIX 2.1

ABSTRACTS FROM PUBLISHED EVALUATIONS OF HEALTHCARE FACILITY GARDENS

Table A2.1 Abstracts from published evaluations of healthcare facility gardens.

Article	Article Abstract
Cooper Marcus, C. & Barnes, M. (1995). *Gardens in healthcare facilities: Uses, evaluation, and design recommendations*. Concord, CA: Center for Health Design.	No abstract.
Davis B. E. (2011). Rooftop hospital gardens for physical therapy: A post-occupancy evaluation. *Health Environments Research & Design Journal*, *4*(2), 14-43.	**Objective:** The goal of this study was to understand successes and weaknesses of a rooftop hospital garden used primarily for physical therapy. **Background:** Literature on the healing benefits of nature and designed outdoor spaces in healthcare contexts continues to become more focused on specific patient populations. This study contributes to the knowledge of rooftop hospital gardens and gardens for physical rehabilitation. **Methods:** A post-occupancy evaluation was conducted using interviews with a lead therapist and landscape architect, behavior mapping, a staff survey, and a patient questionnaire. **Results:** The designer and administrative staff perceived high accessibility while patients and staff reported low accessibility. Patients reported high satisfaction with the garden while staff reported little time for garden use. Poor maintenance decisions resulted in decreased functional and aesthetic value. **Conclusions:** Garden elements take on added layers of meaning and value to users seeking to escape the indoor environment, placing increased importance on evidence-based site design. Multiple perspectives must be considered in facility and garden master planning. Finally, designers and horticultural therapists must be retained in garden management to preserve and enhance garden functionality.
Heath Y., & Gifford R. (2001). Post-occupancy evaluation of therapeutic gardens in a multi-level care facility for the aged. *Activities, Adaption and Aging*, *25*(2), 21-43.	A post-occupancy evaluation of eight therapeutic gardens at a multi-level care facility was conducted. Staff, volunteers, and families of residents were surveyed, and residents were interviewed. Of the 190 participants, 96.5% either strongly liked or liked the gardens. More than 80% believed that four of the five overall design goals of the gardens were achieved. However, participants' evaluations of specific garden features varied, and staff members were more critical than others. About 75% said the money to build the gardens was well-spent. About 20% of users offered extra comments. Implications for the planning of therapeutic gardens are discussed.

Table A2.1, continued

Article	Article Abstract
Naderi, J. R., & Shin, W. H. (2008). Humane design for hospital landscapes: a case study in landscape architecture of a healing garden for nurses. *Health Environments Research & Design Journal, 2*(1), 82-119.	**Objective:** The overall goal of this study was to design a beautiful garden to provide a spatial experience of renewal for hospital nursing staff and for their ecologically- and culturally specific healing. The first objective of this study was to identify the physical, social, and spiritual attributes of an existing courtyard to determine which features encouraged or discouraged use. A site-specific design concept and user-specific survey instrument were developed to gather data directly from the nursing staff on campus. **Background:** There has been growing evidence that landscapes for renewal have measurable characteristics. Physical, social, and spiritual characteristics of the landscape interrelate to determine the appropriateness of a landscape for a particular health outcome. Increasingly, evidence demonstrates that contact with the living world around us is an important part of healing and recovery. This design project created a natural opportunity to research the effect of landscape improvements on renewal.
Pasha, S. (2013). Barriers to garden visitation in children's hospitals. *Health Environments Research & Design Journal*, *6*(4), 76-96.	Researchers have studied the positive effect of healing outdoor environments on hospitalized children, their family members and staff's health and mood. Consequently many modern hospitals dedicate portions of their space to healing outdoor environments. However, these amenities are underutilized due to various design barriers. This research aimed to identify barriers to garden visitation and introduce design guidelines that encourage garden visitation in pediatric hospitals for all groups. Five Texas pediatric hospital gardens were selected to examine the impact of availability of shade, quality and availability of seats, and presence of the healing nature on user satisfaction and garden use. Behavioral observation, surveys, interviews, and site evaluations were conducted. Gardens were ranked based on design qualities, user satisfaction, and frequency and duration of garden visitation. The primary conclusion of this study was that garden visitors' satisfaction with design is positively correlated with presence and quality of hypothesis variables. Duration and frequency of garden visitation also increased in gardens with better shading, seating options, and planting. Other factors identified as influential in increasing garden use included availability of amenities for children and playfulness of design layout. The research findings were instrumental in introducing new design guidelines for future hospital garden design projects. In addition, they served to statistically support design guidelines suggested by previous researchers.

Table A2.1, continued

Article	Article Abstract
Rodiek, S., & Lee, C. (2009). Elderly care: Increasing outdoor usage in residential facilities. *World Health Design, Gateways to Health,* 49-55.	No abstract.
Sherman, S. A., Varni, J. W., Ulrich, R. S., & Malcarne, V. L. (2005). Post-occupancy evaluation of healing gardens in a pediatric cancer center. *Landscape and Urban Planning, 73*(2), 167-183.	This study evaluates three healing gardens surrounding a pediatric cancer center. All gardens contained seating, flowers and plants, but varied in size, features, and in user groups' access to them. A post-occupancy evaluation (POE) yielded a dataset of 1400 garden-users for whom demographic information, activities, and length-of-stay were recorded. Results indicate differential usage patterns across gardens, user category (patient, visitor, or staff), and age (adults and children). The largest garden with most direct patient access was the most used. Staff mostly used the gardens to walk-through or to sit and eat, rarely interacting with features intended for active engagement. Despite patient and child-friendly designs, the overwhelming majority of visitors were adults who mostly engaged in sedentary activities. Children who did use the gardens interacted with garden features significantly more than adults. Although patient rooms are situated at ground-level around the gardens to promote window views of the gardens, the findings suggest an inverse relationship between patient window use and the number of people in the gardens. Finally, preliminary data suggest that emotional distress and pain are lower for all groups when in the gardens than when inside the hospital. Provisional design implications of these findings are discussed.
Whitehouse, S., Varni, J. W., Seid, M., Cooper Marcus, C., Ensberg, M. J., Jacobs, J. R., & Mehlenbeck, R. S. (2001). Evaluating a children's hospital garden environment: Utilization and consumer satisfaction. *Journal of Environmental Psychology, 21*(3), 301-314.	The Leichtag Family Healing Garden at Children's Hospital and Health Center, San Diego was planned and built as a healing environment space for patients, families, and staff. A Post-Occupancy Evaluation (POE) was conducted to determine whether the garden was meeting the goals of reducing stress, restoring hope and energy, and increasing consumer satisfaction. Results from behavioral observations, surveys, and interviews indicated a number of benefits of the garden. The garden was perceived as a place of restoration and healing, and use was accompanied by increased consumer satisfaction. However, the garden was not utilized as often or as effectively as intended. Children, parents and many staff members recommended changes for the garden, such as the inclusion of more trees and greenery, and more interactive \`things for kids to do'. In addition, the majority of family members surveyed throughout the hospital did not know about the garden. Based on the findings, recommendations for changes were developed to promote better use of the garden. These research findings can be used to guide the future planning, design, building, and subsequent evaluation of garden environments in children's hospitals and pediatric settings.

APPENDIX A2.2

SUMMARY OF H-GET PILOT STUDIES

Table A2.2 Summary of H-GET Pilot Test Sites

Note. Information obtained from U.S. News Best Hospital 2016-2017 is denoted by *.
"---" indicates information not available.

Healthcare Facility Garden Sites, Pacific Northwest	**Legacy Good Samaritan Medical Center, Stenzel Healing Garden** 1015 NW 22nd Ave., Portland, OR 97210	**Legacy Salmon Creek Medical Center, 3rd Floor Terrace Garden** 2211 NE 139th St., Vancouver, WA 98686
Architect	---	ZGF Architects
Landscape Architect/ Designer	David Evans & Associates, Ron Mah (First Development Phase); Brian Bainnson, Quatrefoil (Second Development Phase)	Walker Macy
Contractor	---	Skanska USA Building
Client	Legacy Health System	Legacy Health System
Project Type	General medical and surgical	General medical and surgical
Type of Medical Care	Inpatient; Outpatient	Inpatient; Outpatient
Inpatient Beds	247	220
Outpatient Visits	132,152 (2014-2015)	117,566 (2016)
Number of People Served	10,087 admissions, 3,464 inpatient and 9,008 outpatient surgeries, and 30,676 patients visited ER*	12,455 admissions, 2,603 inpatient and 3,868 outpatient surgeries, and 43,978 patients visited ER*
Staff	648 affiliated doctors	526 affiliated doctors
Size of Community	583,776	161,791
Community Setting	Urban; Pop. density 4,375/sq. mi.	Suburban; Pop. density 3,482/sq. mi.
Facility Completed	1980s	2005
Garden Completed	1997	2005
Site Size & Parking	---	---
Hospital Size	---	470,000 SF. (hospital); 180,000 SF. (medical office buildings)
Garden Size	13,000 S.F.	12,400 S.F.
Number of HCF Stories	6	6
Overall HCF Budget	---	Total construction cost $118,000,000 (hospital only)
Garden Design & Construction Budget	$25.00/SF.	---
Garden Maintenance	$14,000/year	---
Demographics of People Served	76% White, 9% Hispanic/ Latino, 7% Asian; Median age 35	80% White, 10% Hispanic/ Latino, 5% Asian; Median age 35

Table A2.2, continued

Note. Information obtained from U.S. News Best Hospital 2016-2017 is denoted by *.
"---" indicates information not available.

Healthcare Facility Garden Sites, Central Texas	Baylor Scott & White Hospital, Healing Garden Scott & White Dr., College Station, TX 77845	St. Joseph Hospital, Marshal Verne Ross Memorial Healing Garden 2801 Franciscan St., Bryan, TX 77802
Architect	Moon Mayoras Architects	WHR Architects
Landscape Architect/ Designer	Yucheng Wang, with Professor Chanam Lee's design studio, Texas A&M University Department of Landscape Architecture	Jodi Naderi and landscape architecture design studio, Texas A&M University (Initial pre-occupancy evaluation and design); Brian Ott, TBG (Landscape Architect)
Contractor	Kitchell	Bryan Construction Company
Client	Scott & White Healthcare System (Now Baylor Scott & White Healthcare System)	CHI St. Joseph
Project Type	Acute Care	General Medical; Surgical
Type of Medical Care	Inpatient; Outpatient	Inpatient; Outpatient
Inpatient Beds	143	229
Outpatient Visits	---	Over 170,000/yr
Number of People Served	4,252 admissions*	14,093 admissions, 4,799 inpatient and 7,372 outpatient surgeries, and 68,698 patients visited ER*
Staff	---	800 affiliated doctors, 800 nurses
Size of Community	93,857	76,201
Community Setting	Suburban; Pop. density 1,978/sq. mi.	Urban; Pop. density 1,716/sq. mi.
Facility Completed	2013	2004
Garden Completed	2013	---
Site Size & Parking	98 acres	---
Hospital Size	324,070 SF.	570,000 SF.
Garden Size	8,000 SF.	2,500 SF.
Number of HCF Stories	3	5
Overall HCF Budget	Total construction cost $90,000,000	Total construction cost $29,500,000
Garden Design & Construction Budget	---	---
Garden Maintenance	$9,000/yr	Included in overall facility maintenance
Demographics of People Served	77% White, 14% Hispanic/Latino, 9% Asian; Median age 22	64% White, 36% Hispanic/Latino, 18% Black/African American; Median age 28

Table A2.2, continued

Note. Information obtained from U.S. News Best Hospital 2016-2017 is denoted by *.
"---" indicates information not available.

Healthcare Facility Garden Sites, Oakland, CA	**Kaiser Oakland Broadway Medical Office Building and Cancer Center (BMOB), Serenity Garden** 3701 Broadway, Oakland, CA 94611	**Kaiser Oakland Medical Center and Specialty Medical Office Building (SMOB), Courtyard Garden** 3600 Broadway, Oakland, CA 94611
Architect	NBBJ	NBBJ
Landscape Architect/ Designer	INTERSTICE Architects	INTERSTICE Architects
Contractor	--	McCarthy Construction
Client	Kaiser Permanente	Kaiser Permanente
Project Type	Non-acute Health Care; Ambulatory Surgery; Oncology	General Medical; Surgical
Type of Medical Care	Outpatient	Inpatient; Outpatient
Inpatient Beds	0	267*
Outpatient Visits	---	---
Number of People Served	---	16,472 admissions; 2,911 inpatient and 5,651 outpatient surgeries; 149,727 patients visited emergency room*
Staff	Specialty, including Care Center and Pediatric Rehabilitation; offices for 50 providers.	830 affiliated doctors; 664 Nurses
Size of Community	390,724	390,724
Community Setting	Urban; Pop. density 7,417/sq. mi.	Urban; Pop. density 7,417/sq. mi.
Facility Completed	2009	2014
Garden Completed	2009	2014
Site Size & Parking	2 acres	7.3 acres, 1,200-stall parking structure
Hospital Size	165,000 SF.	651,483 SF. (Hospital); 237,755 SF. (Special Medical Office Building)
Garden Size	20,000 SF.	2,700 SF.
Number of HCF Stories	5	12
Overall HCF Budget	---	---
Garden Design & Construction Budget	---	---
Garden Maintenance	---	---
Demographics of People Served	34% White, 28% Black/African American, 25% Hispanic/Latino; Median age 36	34% White, 28% Black/African American, 25% Hispanic/Latino; Median age 36

Table A2.2, continued

Note. Information obtained from U.S. News Best Hospital 2016-2017 is denoted by *.
"---" indicates information not available.

Health Care Facility Garden Site, Southern CT	**Smilow Cancer Hospital, Betty Ruth & Milton B. Hollander Healing Garden** 20 York St., New Haven, CT 06519	**Greenwich Hospital, Community Garden** 5 Perryridge Rd., Greenwich, CT 06830
Architect	Shepley Bulfinch	Shepley Bulfinch
Landscape Architect/ Designer	Towers|Golde LLC	Towers|Golde LLC (Landscape Architect); Scenic Design (Landscape Contractor); Eastern Excavation (Site)
Contractor	Turner Construction Company	Turner Construction (Project Manager)
Client	Yale New Haven Hospital	Yale New Haven Health
Project Type	Specialty, Cancer Treatment Center	Acute Care
Type of Medical Care	Inpatient; Outpatient	Inpatient, Outpatient
Inpatient Beds	116/ 1,576 (Yale New Haven Hospital)*	206
Outpatient Visits	---	---
Number of People Served	73,786 admissions, 16,886 inpatient and 22,990 outpatient surgeries, and 141,422 patients visited emergency room (Yale-New Haven Hospital)*	10,306 admissions, 2,359 inpatient and 5,783 outpatient surgeries, and 43,587 patients visited emergency room*
Staff	350-400 oncology nurses; 3,280 affiliated doctors (Yale New Haven Hospital)	829 affiliated doctors, 598 physicians, 1,783 employees
Size of Community	129,779	62,396
Community Setting	Urban; Pop. density 6,500/sq. mi.	Suburban; Pop. density 930/sq. mi.
Facility Completed	2010	---
Garden Completed	2010	2007
Site Size & Parking	64,500 SF./ 1.5 acres. 18 parking spaces 'on-site' with adjacent HCF parking garage, connected by a pedestrian bridge. 2787 spaces for HCF.	---
Hospital Size	511,000 SF.	---
Garden Size	6,120 SF.	2.5 acres
Number of HCF Stories	14 (Healing Garden located at the rooftop of 7th floor)	3
Overall HCF Budget	$467,000,000	---
Garden Design & Construction Budget	$2,100,000 (Project budget includes 2 different garden sites)	---
Garden Maintenance	---	---
Demographics of People Served	42% White, 35% Black/African American, 27% Hispanic/Latino; Median age 29	80% White, 13% Hispanic/ Latino, 7% Asian; Median age 42

APPENDIX 2.3

SACHS IRB OUTCOME LETTER

DIVISION OF RESEARCH

TEXAS A&M UNIVERSITY

DATE: September 09, 2015

MEMORANDUM

TO: Susan Rodiek
TAMU - College Of Architecture - Architecture

FROM: Dr. James Fluckey
Chair, IRB

SUBJECT: Expedited Approval

Study Number:	IRB2014-0182D
Title:	Healthcare Garden Evaluation Toolkit
Date of Determination:	
Approval Date:	04/18/2014
Continuing Review Due:	03/15/2016
Expiration Date:	04/15/2016
Documents Reviewed and Approved:	Only IRB-stamped approved versions of study materials (e.g., consent forms, recruitment materials, and questionnaires) can be distributed to human participants. Please log into iRIS to download the stamped, approved version of all study materials. If you are unable to locate the stamped version in iRIS, please contact the iRIS Support Team at 979.845.4969 or the IRB liaison assigned to your area.

Submission Components			
Study Document			
Title	Version Number	Version Date	Outcome
HGET Garden Staff Survey	Version 1.0	08/27/2015	Approved
HGET Garden Visitor Survey	Version 1.0	08/27/2015	Approved
GATE - Garden Assessment Tool for Evaluators	Version 2.0	08/27/2015	Approved
Graduate Student Research Assistant Contract	Version 1.0	07/21/2015	Approved
Graduate	Version 1.0	07/21/2015	Approved

750 Agronomy Road, Suite 2701
1186 TAMU
College Station, TX 77843-1186
Tel. 979.458.1467 Fax. 979.862.3176
http://rcb.tamu.edu

Student Research Assistant Recruitment			
Stakeholder Interview Questions - Facility Manager	Version 1.0	07/21/2015	Approved
Stakeholder Interview Questions - Staff / Admin	Version 1.0	07/21/2015	Approved
Stakeholder Interview Questions - Designer	Version 1.0	07/21/2015	Approved
Stakeholder Interview Consent	Version 1.0	07/21/2015	Approved
Stakeholder Interview Invitation	Version 1.0	07/21/2015	Approved

Document of Consent: Waiver approved under 45 CFR 46.117 (c) 1 or 2/ 21 CFR 56.109 (c)1

Comments:

- Other components approved. Stamped forms can be found in iRIS.
- Research is to be conducted according to the study application approved by the IRB prior to implementation.
- Any future correspondence should include the IRB study number and the study title.

Investigators assume the following responsibilities:

1. **Continuing Review:** The study must be renewed by the expiration date in order to continue with the research. A Continuing Review application along with required documents must be submitted by the continuing review deadline. Failure to do so may result in processing delays, study expiration, and/or loss of funding.
2. **Completion Report:** Upon completion of the research study (including data collection and analysis), a Completion Report must be submitted to the IRB.
3. **Unanticipated Problems and Adverse Events:** Unanticipated problems and adverse events must be reported to the IRB immediately.
4. **Reports of Potential Non-compliance:** Potential non-compliance, including deviations from protocol and violations, must be reported to the IRB office immediately.
5. **Amendments:** Changes to the protocol and/or study documents must be requested by submitting an Amendment to the IRB for review. The Amendment must be approved by the IRB before being implemented.
6. **Consent Forms:** When using a consent form or information sheet, the IRB stamped approved version

must be used. Please log into iRIS to download the stamped approved version of the consenting instruments. If you are unable to locate the stamped version in iRIS, please contact the iRIS Support Team at 979.845.4969 or the IRB liaison assigned to your area. Human participants are to receive a copy of the consent document, if appropriate.

7. **Post Approval Monitoring:** Expedited and full board studies may be subject to post approval monitoring. During the life of the study, please review and document study progress using the PI self-assessment found on the RCB website as a method of preparation for the potential review. Investigators are responsible for maintaining complete and accurate study records and making them available for post approval monitoring. Investigators are encouraged to request a pre-initiation site visit with the Post Approval Monitor. These visits are designed to help ensure that all necessary documents are approved and in order prior to initiating the study and to help investigators maintain compliance.
8. **Recruitment**: All approved recruitment materials will be stamped electronically by the HRPP staff and available for download from iRIS. These IRB-stamped approved documents from iRIS must be used for recruitment. For materials that are distributed to potential participants electronically and for which you can only feasibly use the approved text rather than the stamped document, the study's IRB Study Number, approval date, and expiration dates must be included in the following format: TAMU IRB#20XX-XXXX Approved: XX/XX/XXXX Expiration Date: XX/XX/XXXX.
9. **FERPA and PPRA:** Investigators conducting research with students must have appropriate approvals from the FERPA administrator at the institution where the research will be conducted in accordance with the Family Education Rights and Privacy Act (FERPA). The Protection of Pupil Rights Amendment (PPRA) protects the rights of parents in students ensuring that written parental consent is required for participation in surveys, analysis, or evaluation that ask questions falling into categories of protected information.
10. **Food:** Any use of food in the conduct of human research must follow Texas A&M University Standard Administrative Procedure 24.01.01.M4.02.
11. **Payments:** Any use of payments to human research participants must follow Texas A&M University Standard Administrative Procedure 21.01.99.M0.03.
12. **Records Retention**: Federal Regulations require records be retained for at least 3 years. Records of a study that collects protected health information are required to be retained for at least 6 years. Some sponsors require extended records retention. Texas A&M University rule 15.99.03.M1.03 Responsible Stewardship of Research Data requires that research records be retained on Texas A&M property.

This electronic document provides notification of the review results by the Institutional Review Board.

APPENDIX 3.1

GARDEN ASSESSMENT TOOL FOR EVALUATORS (GATE) IN COLOR

HEALTHCARE
GARDEN
EVALUATION
TOOLKIT

GARDEN ASSESSMENT TOOL FOR EVALUATORS

INSTRUCTIONS — PLEASE READ BEFORE YOU BEGIN

STEP 1: ESTABLISH CONSENSUS
There should always be at least two evaluators. Evaluators must agree on the 1) Garden boundaries 2) Main doorway 3) Primary pathway.

STEP 2: WALK THROUGH THE GARDEN BEFORE YOU START
Think of the garden from the point of view of a frail patient. Walk through the entire garden, test the furniture, look at the area from different positions – including wheelchair and child height. Ask yourself, "How well does this garden support the needs of patients, visitors, and staff?"

STEP 3: EVALUATE THE GARDEN
For each statement on the next five pages, check the box that best represents your level of agreement. If you are unsure or if the statement is not applicable (N/A), check the last box. Note: It is better to check "Not sure or N/A" than to make a guess! A tape measure will be useful for some of the items.

STEP 4: RETURN THE FORMS
Return by mail to Naomi Sachs, 800 Gilchrist Avenue, College Station, TX 77840 or scan and email to nsachs@tamu.edu.
Questions or concerns? Email nsachs@tamu.edu or call (845) 264-2026.

GENERAL QUESTIONS

01	Your name:		
02	Your role/profession (landscape architect, nurse, etc.):		
03	Date:	Time:	AM or PM (circle one)
04	Weather (sunny, cloudy, windy, etc.):	Temp (°F or warm, cool, etc.):	
05	Name of facility and location (city, state):		
06	Name of garden (if it is named):		
07	Type of facility or patients served:		
08	Location and type of garden (e.g., front entry, central coutyard, rooftop, etc.):		
09	Are there other gardens and/or outdoor sitting areas at the facility?	YES	NO
	If YES, please list:		

OVERALL RATING

NOT RESTORATIVE AT ALL → COMPLETELY RESTORATIVE

*	On a scale of 1-10, how would you rate the **overall restorativeness** of this garden? *"Restorative"= Able to restore a person's strength, health, or well-being.*	1	2	3	4	5	6	7	8	9	10

GARDEN ASSESSMENT TOOL FOR EVALUATORS

For each item, **check the box that best represents your level of agreement.** If you are unsure or if the statement is not applicable (N/A), check the last box.

ACCESS & VISIBILITY 1

	VISUAL ACCESS TO THE GARDEN	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
01	Garden is **visible from main public indoor areas** (entry lobby, major hallway, etc.).					
02	Garden is **visible from indoor areas that involve waiting** (waiting rooms, labs, pharmacy, etc.).					
03	Garden is **visible from floors above** (from offices, patient rooms, etc. on upper floors).					
04	**Entrance to the garden is easy to find.**					
05	**Doors to the garden are glass or have a window in or next to them.**					
06	**Garden looks appealing/inviting from indoors.**					
07	There is **signage TO the garden from indoors** (in lobby, waiting areas, elevator, etc.).					
08	There is **signage for the garden ON OR NEXT TO garden doors.**					
09	**Information about the garden** is available (through pamphlets, signage, website, etc.).					

	PHYSICAL ACCESS TO THE GARDEN	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
10A	Garden is **open 24 hours** a day, 7 days a week.	YES			NO	
10B	If garden is NOT open 24/7, what hours and days is it open?					
11	Doors to the garden from at least one entry are **automatic and easy to use.**					
12	Any **non-automatic doors are easy to operate** (are not too heavy, don't close too quickly).					
13	Doorway **thresholds are flat and smooth** (for a wheelchair or an IV pole to cross easily).					
14	The **space just outside the main doorway* is covered/roofed** (providing protection from rain, sun, etc.).					
15	The space just outside the main doorway has **seating for at least two people and space for at least one wheelchair.**					
16	A **"destination" feature draws people into the garden** (seating area, water feature, special tree or plantings, etc.).					
17	A **restroom in the facility is near a garden entry** (about 50 feet).					
18	Garden has an **emergency phone** that connects with the hospital front desk or security.					

** Remember to make sure all evaluators agree on what is the "main doorway."*

SENSE OF "BEING AWAY" 2

	SENSE OF "BEING AWAY"	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
01	People can find a **desirable sense of enclosure** in the garden.					
02	People can find **privacy in at least one part** of the garden.					
03	People in the garden **cannot look into adjacent private indoor areas** (patient rooms, treatment/consultation rooms).					
04	Garden has at least one **fully covered (roofed) area** (porch, gazebo, etc.).					
05	At least one **seating area is protected from climatic/weather extremes** (with wind shields, patio heaters, overhead fans, etc.).					
	AESTHETICS & MAINTENANCE	**STRONGLY AGREE**	**SOMEWHAT AGREE**	**SOMEWHAT DISAGREE**	**STRONGLY DISAGREE**	**NOT SURE OR N/A**
06	Garden has some features that provide a **rich, multi-sensory experience** (things to do, look at, touch, smell, hear, etc.).					
07	Garden is **free from unpleasant sounds** (air conditioners, traffic, loading docks).					
08	Garden is **free from bad odors** (trash, vehicle exhaust, cooking smells).					
09	Plants **hide or soften unsightly views** (of fences, walls, equipment, etc.).					
10	Garden is **free from trash** (paper, cigarette butts, cans, etc.).					
11	Garden has at least one **trash can.**					
12	There is a **shed or other place to store tools** in the garden.					

NATURE ENGAGEMENT 3

	PLANTINGS	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
01	**More than half of the garden surface areas are planted** (not paved).					
02	Garden has a **rich variety of plants** (combination of trees, shrubs, perennials; variety of species; etc.).					
03	Garden has **plants at multiple heights** (on the ground, raised beds, hedges, vines, trees, etc.).					
04	Garden has **plants that stimulate the senses** (sight, smell, touch, sound, taste).					
05	Some plants are **intriguing, provide "fascination"** (intricate flowers, unusual growth pattern, movement, etc.).					
06	Planting provides **year-round interest** (always something to see, such as flowers, leaves, berries, bark, evergreens, etc.).					
07	Some plants provide **bright colors** in at least one time/season of the year (with flowers, leaves, berries, bark, etc.).					
08	**Planting BEDS look well-maintained** (well-weeded, no large "bare spots," etc.).					
09	**PLANTS look well-maintained and healthy** (vibrant, well-pruned, etc.).					
10	**Plants are sturdy** enough to tolerate extreme weather, people picking flowers and leaves, etc.					

	OTHER NATURAL FEATURES	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
11	**Plants provide food and/or habitat** for birds, butterflies and other desirable wildlife.					
12A	Garden has at least one **water feature.** If NO, skip the next five questions.	YES			NO	
12B	If YES, describe water feature briefly:					
13	Water feature looks **clean and well-maintained.**					
14	Water feature design and location **minimizes slipping hazards.**					
15	Water feature has **minimal splash** (spray from splashing can carry harmful bacteria).					
16	**Sound** from water feature is **pleasant and soothing.**					
17	Some **seating is available near** the water feature (within 15 feet).					

	PRIMARY WALKWAY (PATH OR PAVED THOROUGHFARE)	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
01	Primary walkway is **relatively flat** (not too steep).					
02	Primary walkway **does not have steps or steep ramps.**					
03	Primary walkway is **smooth but non-skid, even when wet.**					
04	Primary walkway is **at least six feet wide** or, if narrower, has frequent passing areas.					
05	Primary walkway has a **curb or raised edges** (to keep wheelchairs, strollers, walkers, canes, etc. on walkway).					
06	Primary walkway has **seating approximately every 30 feet.**					
	ALL PAVED AREAS (WALKWAYS AND PATIOS)	**STRONGLY AGREE**	**SOMEWHAT AGREE**	**SOMEWHAT DISAGREE**	**STRONGLY DISAGREE**	**NOT SURE OR N/A**
07	**Gaps or cracks in paving** (walkways and patios) **are narrow** enough for a wheelchair, stroller, or IV pole to cross smoothly.					
08	Paving **does not create glare** (is tinted concrete, colored stone, brick, etc.).					
09	Paved areas are **clear of debris and other obstacles** (twigs, leaves, hoses, etc.).					
10	**Trees/plants along walkways** and other paved areas **do not drop** a lot of leaves, twigs, seeds or fruits.					
	LIGHTING, WAYFINDING, & AMENITIES	**STRONGLY AGREE**	**SOMEWHAT AGREE**	**SOMEWHAT DISAGREE**	**STRONGLY DISAGREE**	**NOT SURE OR N/A**
11	There are **landmarks and/or signage in the garden to help people navigate their way through** (and back to the entrance).					
12	**A drinking fountain** is in or near the garden.					
13	Garden has **lighting for night usage.** If NO, skip the next two questions.	YES			NO	
14	If garden has lighting: **Walkways are evenly lit.**					
15	If garden has lighting: **Lighting does not shine into patient rooms.**					
	VARIETY & ACTIVITIES	**STRONGLY AGREE**	**SOMEWHAT AGREE**	**SOMEWHAT DISAGREE**	**STRONGLY DISAGREE**	**NOT SURE OR N/A**
16	Garden has **more than one walkway,** with a variety of routes, lengths, and destinations.					
17	At least one **secondary walkway offers increasing levels of difficulty** (with paving material, steepness, steps, etc.).					
18	Garden has **spaces/features for therapists (PT, OT, HT) to work with patients** (handrails, variety of walking surfaces, steps, etc.).					
19	Garden is **safe for children** (e.g., physically enclosed; easily viewed from nearby seating areas; plantings and other features are not harmful).					

PLACES TO REST 5

SEATING AVAILABILITY & TYPE		STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
01	The garden offers **many places to sit.**					
02	People can choose a **variety of types** of seating (benches, chairs, etc.).					
03	**Movable seating** is available (light enough to move but sturdy enough to prevent tipping).					
04	At least **50% of the seating in the garden has backs and arms** (so that people can easily get up and down).					
05	There is a **place where someone could lie down** for a rest (chaise longue, bench, lawn).					
PRIVATE OR SOCIAL						
06	Garden has **separate areas for activities and socializing,** compared with **contemplation/quiet conversation.**					
07	Garden provides a place where **3 or more people can sit together.**					
08	Some seating areas **allow people to interact with passers-by.**					
09	Garden provides **semi-private seating for one or two people.**					
10	Some seating makes it **possible to watch others from a distance.**					
AESTHETICS & SUN						
11	There is a **choice of seating in sun or shade** throughout most of the day.					
12	Seating **does not produce glare** (is not metal, white, etc.).					
13	Seating material **does not get too hot or too cold.**					
14	Seating, tables, and other furniture look **well-maintained.**					
15	Some seating has **attractive or interesting views.**					
TABLES						
16	**Garden has at least one table.** If NO, skip the next four questions.	YES			NO	
17	Some **seats have tables next to them.**					
18	There is at least one table **large enough for four or more people.**					
19	There is at least one **table that can accommodate people in wheelchairs or scooters.**					
20	**Tables do not tip** (for example, when people use as leverage to sit down and get up).					

APPENDIX 3.2

GARDEN ASSESSMENT TOOL FOR EVALUATORS (GATE) IN BLACK AND WHITE

HEALTHCARE
GARDEN
EVALUATION
TOOLKIT

GARDEN ASSESSMENT TOOL FOR EVALUATORS

INSTRUCTIONS — PLEASE READ BEFORE YOU BEGIN

STEP 1: ESTABLISH CONSENSUS
There should always be at least two evaluators. Evaluators must agree on the 1) Garden boundaries 2) Main doorway 3) Primary pathway.

STEP 2: WALK THROUGH THE GARDEN BEFORE YOU START
Think of the garden from the point of view of a frail patient. Walk through the entire garden, test the furniture, look at the area from different positions – including wheelchair and child height. Ask yourself, "How well does this garden support the needs of patients, visitors, and staff?"

STEP 3: EVALUATE THE GARDEN
For each statement on the next five pages, check the box that best represents your level of agreement. If you are unsure or if the statement is not applicable (N/A), check the last box. Note: It is better to check "Not sure or N/A" than to make a guess! A tape measure will be useful for some of the items.

STEP 4: RETURN THE FORMS
Return by mail to Naomi Sachs, 800 Gilchrist Avenue, College Station, TX 77840 or scan and email to nsachs@healinglandscapes.org.
Questions or concerns? Email nsachs@healinglandsdcapes.org or call (845) 264-2026.

GENERAL QUESTIONS

01	Your name:		
02	Your role/profession (landscape architect, nurse, etc.):		
03	Date:	Time:	AM or PM (circle one)
04	Weather (sunny, cloudy, windy, etc.):	Temp (°F or warm, cool, etc.):	
05	Name of facility and location (city, state):		
06	Name of garden (if it is named):		
07	Type of facility or patients served:		
08	Location and type of garden (e.g., front entry, central coutyard, rooftop, etc.):		
09	Are there other gardens and/or outdoor sitting areas at the facility?	YES	NO
	If YES, please list:		

OVERALL RATING

NOT RESTORATIVE AT ALL → COMPLETELY RESTORATIVE

*	On a scale of 1-10, how would you rate the **overall restorativeness** of this garden? *"Restorative"= Able to restore a person's strength, health, or well-being.*	1	2	3	4	5	6	7	8	9	10

GARDEN
ASSESSMENT
TOOL FOR
EVALUATORS

For each item, **check the box that best represents your level of agreement.** If you are unsure or if the statement is not applicable (N/A), check the last box.

ACCESS & VISIBILITY 1

VISUAL ACCESS TO THE GARDEN		STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
01	Garden is **visible from main public indoor areas** (entry lobby, major hallway, etc.).					
02	Garden is **visible from indoor areas that involve waiting** (waiting rooms, labs, pharmacy, etc.).					
03	Garden is **visible from floors above** (from offices, patient rooms, etc. on upper floors).					
04	**Entrance to the garden is easy to find.**					
05	**Doors to the garden are glass or have a window in or next to them.**					
06	**Garden looks appealing/inviting from indoors.**					
07	There is **signage TO the garden from indoors** (in lobby, waiting areas, elevator, etc.).					
08	There is **signage for the garden ON OR NEXT TO garden doors.**					
09	**Information about the garden** is available (through pamphlets, signage, website, etc.).					
PHYSICAL ACCESS TO THE GARDEN		**STRONGLY AGREE**	**SOMEWHAT AGREE**	**SOMEWHAT DISAGREE**	**STRONGLY DISAGREE**	**NOT SURE OR N/A**
10A	Garden is **open 24 hours** a day, 7 days a week.	YES			NO	
10B	If garden is NOT open 24/7, what hours and days is it open?					
11	Doors to the garden from at least one entry are **automatic and easy to use.**					
12	Any **non-automatic doors are easy to operate** (are not too heavy, don't close too quickly).					
13	Doorway **thresholds are flat and smooth** (for a wheelchair or an IV pole to cross easily).					
14	The **space just outside the main doorway* is covered/roofed** (providing protection from rain, sun, etc.).					
15	The space just outside the main doorway has **seating for at least two people and space for at least one wheelchair.**					
16	A **"destination" feature draws people into the garden** (seating area, water feature, special tree or plantings, etc.).					
17	A **restroom in the facility is near a garden entry** (about 50 feet).					
18	Garden has an **emergency phone** that connects with the hospital front desk or security.					

** Remember to make sure all evaluators agree on what is the "main doorway."*

SENSE OF "BEING AWAY" 2

SENSE OF "BEING AWAY"	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
01 People can find a **desirable sense of enclosure** in the garden.					
02 People can find **privacy in at least one part** of the garden.					
03 People in the garden **cannot look into adjacent private indoor areas** (patient rooms, treatment/consultation rooms).					
04 Garden has at least one **fully covered (roofed) area** (porch, gazebo, etc.).					
05 At least one **seating area is protected from climatic/weather extremes** (with wind shields, patio heaters, overhead fans, etc.).					
AESTHETICS & MAINTENANCE	**STRONGLY AGREE**	**SOMEWHAT AGREE**	**SOMEWHAT DISAGREE**	**STRONGLY DISAGREE**	**NOT SURE OR N/A**
06 Garden has some features that provide a **rich, multi-sensory experience** (things to do, look at, touch, smell, hear, etc.).					
07 Garden is **free from unpleasant sounds** (air conditioners, traffic, loading docks).					
08 Garden is **free from bad odors** (trash, vehicle exhaust, cooking smells).					
09 Plants **hide or soften unsightly views** (of fences, walls, equipment, etc.).					
10 Garden is **free from trash** (paper, cigarette butts, cans, etc.).					
11 Garden has at least one **trash can.**					
12 There is a **shed or other place to store tools** in the garden.					

NATURE ENGAGEMENT 3

PLANTINGS		STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
01	**More than half of the garden surface areas are planted** (not paved).					
02	Garden has a **rich variety of plants** (combination of trees, shrubs, perennials; variety of species; etc.).					
03	Garden has **plants at multiple heights** (on the ground, raised beds, hedges, vines, trees, etc.).					
04	Garden has **plants that stimulate the senses** (sight, smell, touch, sound, taste).					
05	Some plants are **intriguing, provide "fascination"** (intricate flowers, unusual growth pattern, movement, etc.).					
06	Planting provides **year-round interest** (always something to see, such as flowers, leaves, berries, bark, evergreens, etc.).					
07	Some plants provide **bright colors** in at least one time/season of the year (with flowers, leaves, berries, bark, etc.).					
08	**Planting BEDS look well-maintained** (well-weeded, no large "bare spots," etc.).					
09	**PLANTS look well-maintained and healthy** (vibrant, well-pruned, etc.).					
10	**Plants are sturdy** enough to tolerate extreme weather, people picking flowers and leaves, etc.					
OTHER NATURAL FEATURES		**STRONGLY AGREE**	**SOMEWHAT AGREE**	**SOMEWHAT DISAGREE**	**STRONGLY DISAGREE**	**NOT SURE OR N/A**
11	**Plants provide food and/or habitat** for birds, butterflies and other desirable wildlife.					
12A	Garden has at least one **water feature.** If NO, skip the next five questions.	YES			NO	
12B	If YES, describe water feature briefly:					
13	Water feature looks **clean and well-maintained.**					
14	Water feature design and location **minimizes slipping hazards.**					
15	Water feature has **minimal splash** (spray from splashing can carry harmful bacteria).					
16	**Sound** from water feature is **pleasant and soothing.**					
17	Some **seating is available near** the water feature (within 15 feet).					

PRIMARY WALKWAY (PATH OR PAVED THOROUGHFARE)	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
01 Primary walkway is **relatively flat** (not too steep).					
02 Primary walkway **does not have steps or steep ramps.**					
03 Primary walkway is **smooth but non-skid, even when wet.**					
04 Primary walkway is **at least six feet wide** or, if narrower, has frequent passing areas.					
05 Primary walkway has a **curb or raised edges** (to keep wheelchairs, strollers, walkers, canes, etc. on walkway).					
06 Primary walkway has **seating approximately every 30 feet.**					
ALL PAVED AREAS (WALKWAYS AND PATIOS)	**STRONGLY AGREE**	**SOMEWHAT AGREE**	**SOMEWHAT DISAGREE**	**STRONGLY DISAGREE**	**NOT SURE OR N/A**
07 **Gaps or cracks in paving** (walkways and patios) **are narrow** enough for a wheelchair, stroller, or IV pole to cross smoothly.					
08 Paving **does not create glare** (is tinted concrete, colored stone, brick, etc.).					
09 Paved areas are **clear of debris and other obstacles** (twigs, leaves, hoses, etc.).					
10 **Trees/plants along walkways** and other paved areas **do not drop** a lot of leaves, twigs, seeds or fruits.					
LIGHTING, WAYFINDING, & AMENITIES	**STRONGLY AGREE**	**SOMEWHAT AGREE**	**SOMEWHAT DISAGREE**	**STRONGLY DISAGREE**	**NOT SURE OR N/A**
11 There are **landmarks and/or signage in the garden to help people navigate their way through** (and back to the entrance).					
12 **A drinking fountain** is in or near the garden.					
13 Garden has **lighting for night usage.** If NO, skip the next two questions.	YES			NO	
14 If garden has lighting: **Walkways are evenly lit.**					
15 If garden has lighting: **Lighting does not shine into patient rooms.**					
VARIETY & ACTIVITIES	**STRONGLY AGREE**	**SOMEWHAT AGREE**	**SOMEWHAT DISAGREE**	**STRONGLY DISAGREE**	**NOT SURE OR N/A**
16 Garden has **more than one walkway,** with a variety of routes, lengths, and destinations.					
17 At least one **secondary walkway offers increasing levels of difficulty** (with paving material, steepness, steps, etc.).					
18 Garden has **spaces/features for therapists (PT, OT, HT) to work with patients** (handrails, variety of walking surfaces, steps, etc.).					
19 Garden is **safe for children** (e.g., physically enclosed; easily viewed from nearby seating areas; plantings and other features are not harmful).					

PLACES TO REST 5

SEATING AVAILABILITY & TYPE		STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
01	The garden offers **many places to sit.**					
02	People can choose a **variety of types** of seating (benches, chairs, etc.).					
03	**Movable seating** is available (light enough to move but sturdy enough to prevent tipping).					
04	At least **50% of the seating in the garden has backs and arms** (so that people can easily get up and down).					
05	There is a **place where someone could lie down** for a rest (chaise longue, bench, lawn).					
PRIVATE OR SOCIAL						
06	Garden has **separate areas for activities and socializing,** compared with **contemplation/quiet conversation.**					
07	Garden provides a place where **3 or more people can sit together.**					
08	Some seating areas **allow people to interact with passers-by.**					
09	Garden provides **semi-private seating for one or two people.**					
10	Some seating makes it **possible to watch others from a distance.**					
AESTHETICS & SUN						
11	There is a **choice of seating in sun or shade** throughout most of the day.					
12	Seating **does not produce glare** (is not metal, white, etc.).					
13	Seating material **does not get too hot or too cold.**					
14	Seating, tables, and other furniture look **well-maintained.**					
15	Some seating has **attractive or interesting views.**					
TABLES						
16	**Garden has at least one table.** If NO, skip the next four questions.	YES			NO	
17	Some **seats have tables next to them.**					
18	There is at least one table **large enough for four or more people.**					
19	There is at least one **table that can accommodate people in wheelchairs or scooters.**					
20	**Tables do not tip** (for example, when people use as leverage to sit down and get up).					

APPENDIX 3.3

COOPER MARCUS AND BARNES THERAPEUTIC GARDEN AUDIT TOOL (CMB AUDIT)

Name of Auditor _______________________________
Date __________________

Therapeutic Garden Audit for Acute Care Hospital

Name & location (city, state) of the facility: ____________________________

Garden type (circle one):

a) Roof garden
b) Garden at entry to facility
c) Courtyard (garden surrounded by buildings)
d) "Back garden" (garden not bounded by buildings on one or more sides)

Location of Garden within the facility (eg., off main foyer; adjacent to a specific ward)

____

Name of Garden (must be considered a healing garden by the institution)

____

When are the doors locked?_____________

Are there other accessible gardens at this facility? ______________

Scoring System

0	=	Not applicable (see note below)
1	=	Feature not present or Quality missing
2	=	Poor
3	=	Moderately successful
4	=	Very successful

Note:

- Mark the score number (in red ink) in the left margin next to the item number.
- If an item is not present, score it a "1" and score all subsidiary items (a, b, c, etc.) "0".
- The only items that can receive a "0" score are the subsidiary features or qualities listed under an item that has been assigned a rating of "1".

0	1	2	3	4
n/a	missing	poor	moderately good	very successful

24 Planting and layout of the garden provides a significant degree of privacy for garden users from windows looking into the space.

25 Hierarchy of paths providing a variety of routes, lengths and destinations.

(Note: If there are not a hierarchy of paths, sub-items 25a-b are rated “0”)

25a Secondary paths that meander (circuitous route).

25b Increasing levels of difficulty available on secondary path system (surface material, grade changes etc.).

26 Attractive views are supported by framing, placement of seating, etc.

27 Pathway where a patient being pushed on a gurney would have interesting and changing views overhead.

28 Raised edges on primary path.

29 Provision of distance "markers" or other landmarks along some pathways.

C. SEATING

30 Seats have backs and arms.

31 Seating material does not retain excessive heat or cold.

32 Movable seating available (light yet sturdy enough to prevent tipping).

33 Seating at least every 25 feet along main path.

34 Choice of seating in sun/shade throughout most of day.

35 Seating options available for person alone or couple.

(Note: If there is not seating options for one or two people, sub-items 35a-c are rated “0”)

35a Semi-private seating.

35b Seating placed to observe others from a distance

35c. Seating placed where one might casually interact with people passing by

36 Seating for groups larger than two.

(Note: If there is not seating for groups larger than two, sub-items 36a-c are rated “0”)

36a Semi-private seating.

36b Seating placed to observe others from a distance.

36c Seating placed where one might casually interact with people passing by.

37 Some benches or chairs have cushions or fabric seats.

38 View close to seating is attractive or interesting (planting or feature).

39 A variety of views are available from seating areas in the garden.

D. PLANTING

0	1	2	3	4
n/a	missing	poor	moderately good	very successful

40 Minimum 6:4 ratio of green to hard surfaces as measured at the ground plane.
41 Avoidance of plants that are highly toxic or have common allergy-triggering properties (high pollen count or strong scent).
42 Plants receive appropriate sun exposure.
43 Plant selection is appropriate for the local climate.
44 Planting with diverse visual interest (shade quality, color / texture combinations, wildlife habitat, etc.).
45 Provision of a multi-sensory experience (vision, touch, hearing, smell).
46 Plants that offer a degree of fascination (intricate flowers, unusual growth habit, swaying in the wind).
47 Planting that displays seasonal interest throughout the year.
48 Vegetation growing at multiple heights (at grade, raised beds, overhead vines and trees, hedges or planted walls, etc.).
49 Mounded or sloped beds that increase visibility from a seated or prone position.
50 Planting softens views of fences, walls, unsightly equipment etc.
51 Generally resilient plants are used (ie. rebound from excessive human interference)
52 Avoidance of plants located near patios or pathways that produce excessive leaf or fruit drop.

E. DESIGN DETAILS (natural or built)

53 Garden provides mitigation for extremes of the local climate
54 Potential to observe wildlife (eg. plants that attract butterflies, fish pond, etc.).
55 Interesting plants or elements that are within reach of a person using a wheelchair or gurney.
56 Provision of acoustic, tactile or fragrance cues for orientation and way-finding.
57 Garden is safe for visiting school age children to play alone while adults are inside (garden is physically enclosed; highly visible from inside; elements in garden are safe for play).
58 Potential for physical therapy staff to work with patients outdoors (handrails, variety of walking surface, steps, slopes, seating and planter heights, etc.).
59 Table(s) with 29 inch clearance.
60 Art and garden features are representational and non-ambiguous.
61 Lighting is provided for evening use and does not shine directly into patient rooms. *(Note: If there is not lighting, sub-item 63a-b are rated "0")*

0	1	2	3	4
n/a	missing	poor	moderately good	very successful

61a Paths are evenly illuminated.
61b Aesthetic lighting provides views of the garden after dark.
62 Garden has covered area for use in inclement weather.
63 Elements in the garden landscape offer opportunities for play (“roll-able” slopes, “jumpable” rocks, play equipment, etc.).
64 Fun or whimsical elements conducive to the imagination of adults or children.
65 Activities that allow a user to contribute to/change the garden (stones that can be stacked, watering cans that can be used, etc.).
66 Provision of graphic signage and visual cues.
67 Contrast in color between seating and ground plane.
68 Element provided for users to record their thoughts (visitor’s book, memory tree, etc.).
69 Space for programmed events (stage, patio or substantial gathering area).
70 The garden has a water feature.
(Note: If there is not a water feature, sub-items 72a-c are rated “0”)
70a Design minimizes tripping and slipping hazards.
70b Extent to which the water feature has calming or soothing effect though out all or part of the garden.
70c Water feature stimulates more than one sense (moving water, touchable water, etc.).
71 Educational/interpretive signage or inspirational quotes placed near the pathway.
72 Elements attracting wildlife can be viewed from inside the building.

F. GARDEN ATMOSPHERE

73 The garden is attractive, and rich with amenities.
74 The garden is naturalistic in feeling in contrast with the hospital interior.
75 The garden is comfortable and inviting.
76 Garden has areas that are free from the smell of cooking or food.
77 Presence of restful sounds within the garden (wind chimes, music, bird songs, etc.).
78 Minimal awareness of sound from outside of the garden (e.g., traffic, loading dock, loud air conditioners, etc.).
79 There is a space where a person could feel comfortable enough to lie down for a rest (e.g. lawn, bench).

G. MAINTENANCE AND AMENITIES

0	1	2	3	4
n/a	missing	poor	moderately good	very successful

80 Plants appear healthy.
81 Planting beds are free from areas that appear empty or neglected
82 Built features, furnishings and hardscape are well maintained.
83 Garden is free from litter.
84 Toilets are nearby, within 50 feet of a garden entry
85 Storage facility for maintenance equipment in or near the garden.
86 Thorough weeding and appropriate pruning.
87 Availability of litter receptacles and (where appropriate) ash trays.
88 Universally accessible drinking fountain(s) in or near the garden.

Prepared by:

Marni Barnes, John Paul Carman, Mark Epstein, and Clare Cooper Marcus (Feb. 2012)

0	1	2	3	4
n/a	missing	poor	moderately good	very successful

A. LOCATION AND ENTRY TO GARDEN

1 Garden is visible from entry lobby, major hallway, etc.

2 The garden is located and viewable near outpatient clinics, pharmacy or other service areas that often involve waiting.

3 Doors to garden are easy to find.

4 Doors to garden have a window in or beside the door.

5 Doors to the garden are easy to operate and have automatic door openers.

6 Threshold of entryways are flat and smooth.

7 One entry to the garden provides shade or shelter immediately outside the door.

8 Garden is physically enclosed.

9 Garden is open in all seasons.

10 Garden is open at night.

11 There is an entry patio near a door with seating.

(Note: If there is not an entry patio, item 11 is rated “1” and sub-item 11a is rated “0”)

11a Attractive garden view from entry patio.

12 There are signs to the garden and/or it is located on maps throughout the hospital.

13 The garden has more than one entry.

B. LAYOUT AND PATHWAYS

14 Universal design concepts are applied throughout the garden.

15 Primary pathway has no steps.

16 Cross slope on paths is approximately 2% or less.

17 Path surfaces reduce glare (colored asphalt, tinted concrete, etc.).

18 Appropriate non-slip traction on paths for canes, wheelchairs, walkers, etc

19 Control joints and gaps in paving are 1/8 inch or less, without beveled or rounded edges.

20 Primary path is at least 6 feet wide or has passing areas / nodes every 25 feet.

21 Planting and layout of the garden provides a significant degree of privacy in rooms adjacent to the garden.

22 The garden has one or two orientation features – visible from most of the garden.

23 The garden has a variety of sub-spaces.

(Note: If there are not a variety of spaces, sub-items 23a-b are rated “0”)

23a Some sub-spaces in the garden have a sense of enclosure.

23b Some sub-spaces in the garden feel expansive.

APPENDIX 3.4

RODIEK'S SENIORS' OUTDOOR SURVEY

SENIORS' OUTDOOR SURVEY (SOS)

Your Name, Location____

Which Outdoor space? ____ Date/ Time ______________________________

PLEASE READ before using this tool:

STEP 1: Choose an outdoor area – First, decide on the boundaries of the outdoor space to be evaluated. (Features that are viewable should be included when appropriate, even if beyond the space itself.)

STEP 2: Walk and sit in the area - Imagine **YOU** are a senior resident with sensory and functional disabilities, using a walker or wheelchair. Walk around slowly, test the furniture, look at the area from different positions – including wheelchair height.) **ASK:** "How well does this space support the needs of frail older adults?"

STEP 3: Evaluate the area – Rate each item from 1 to 7 (1 = worst, 7 = best), based on the climate, context, and functional level of residents, considering what you could *reasonably expect* in this type of setting. If there are several features in an item, rate overall how well they support outdoor usage.

OVERALL, how well does this outdoor area provide a real sense of escape and relief from being indoors? (a feeling of fresh air, views, sky, sunshine, lush plantings, other senses) **Very well ____ Fairly well ____ Not well ____**

1. ACCESS TO NATURE (14) *Subtotal ____÷ 14 = ____ Score for this category*

Abundant greenery - Does this area include or view a substantial quantity of healthy green plants ___; with a diverse mix of trees, vines, flowers and shrubs ___? (instead of all hard paving, or just a few types of plant)

Flowers and color - In season, would residents see an abundance of color, as flowers or bright foliage ___?

Reachable plants - Can residents in wheelchairs see, touch, or smell attractive plants at hand or eye level ___?

Viewscapes - Does seating have pleasant views ___, and are hard boundaries partly screened by plants ___?

Water and motion - Can residents see, hear, or interact with water, such as fountains, ponds, birdbaths, etc. ___? Do any features have movement ___? (e.g., wind chimes, waving banners, spraying fountains, grasses moving in the breeze)

Wildlife/ pets - Does this area provide amenities for pets ___; or to attract wildlife, such as squirrels, birds, and butterflies ___; or does it have views of domestic or farm animals ___? (such as rabbits, chickens, grazing cows or horses)

Private and quiet - Is the garden overall fairly quiet, and free from obnoxious noises ___; with privacy from nearby resident rooms ___; and at least one or more private outdoor places to sit ___?

2. OUTDOOR COMFORT AND SAFETY (15) *Subtotal ____÷ 15 = ____ Score for this category*

Available seating - Is there plenty of seating available ___; with at least a few different types of seating ___?

Sitting choices – Are there places to sit in sun or shade ___; with some seating easily movable by residents ___?

Safe seating - Is the seating stable so it will not tip over ___; with backs and arms to help residents get up safely ___?

Sitting comfort - Are chairs and benches comfortably shaped ___; made of materials that do not get too hot or cold ___; with at least some seat cushions ___?

Sitting amenities - Are there tables near some of the seating, to place a cup of coffee or food ___; and are there any rocking chairs, swings or gliders available ___?

Restroom/ drinking water - Is there a nearby restroom, with access to a drinking fountain or water cooler___?

Maintenance/ air quality/ climate control - Is the outdoor area well-maintained ___; are any smoking areas well-separated from other areas ___; and is there any microclimate control ___? (e.g., outdoor fans, heaters, etc.)

.

3. WALKING AND OUTDOOR ACTIVITIES (14) *Subtotal ____÷ 14 = ____ Score for this category*

Looping walkways - Can residents choose from an abundance of walks of different lengths ___; with round-trip walks available ___; with interesting views ___?

Safe paving - Is paving level, smooth, no deep cracks, and easy for wheelchairs ___; with a non-skid, non-glare surface ___?

Comfortable safe walkways - Are walkways partly shaded from mid-day or hot afternoon sun ___; with handrails along at least a few parts of the walkways ___?

Walkway seating - Can residents find seating along walkways at frequent intervals (~50') ___; with some shaded seating ___?

Attractions/ destinations - In this outdoor area, can residents see interesting features to enjoy or walk toward ___? (such as a sundial, bird house, arbor, pergola, gazebo, fountain, fish pond, flower bed, etc.)

Social interaction/ children - Are there places that support social activities___; (such as picnic tables, gathering spots, etc.) and play areas or other amenities for children, where residents can watch and/or interact with them ___?

Recreation/ exercise/ gardening - Does this area have amenities for residents to watch or engage in specific outdoor activities ___; (such as croquet, horseshoes, golf putting practice, swimming, an exercise station, etc.); are there places that encourage residents and staff to engage in gardening ___?

4. INDOOR-OUTDOOR CONNECTION (11) *Subtotal ____÷ 11 = ____ Score for this category*

Visibility - Can this outdoor space be easily viewed from well-used indoor areas ___; and is it easy to reach ___?

Alternate entrances - Are there multiple ways residents can reach this outdoor area from inside the building ___?

Transition zones - Are there comfortable places to linger next to the doorway, indoors ___; and outdoors ___?

Doors - Are doors unlocked during daytime ___; can residents easily open the door with little effort ___; and the door does not close too quickly ___; is there an automatic door available, that is easy to use___?

Thresholds - Can residents in walkers or wheelchairs easily cross the door threshold without difficulty ___; and is there a wide paved landing outside the doorway ___?

5. CONNECTION TO THE WORLD (6) *Subtotal ____÷ 6 = ____ Score for this category*

Front porch - Is this space an "Entry Garden" or front porch, located at (or next to) a main entry of the building ___?

Watch visitors, deliveries - From this area, could residents watch vehicles arriving at the facility ___; or watch front-door activities, with a chance to greet people ___?

View landscape features - From this area, can residents see nearby landscape features such as trees, hills, etc. ___?

See nearby surroundings - From this area, can residents watch nearby streets and traffic ___; or human activities, buildings, and neighborhoods ___? (such as stores, houses, apartments, a bus stop, people walking, bicycling, etc.)

THANK YOU for using this tool – please feel free to contact us at rodiek@tamu.edu with any questions.

You can add up the subtotal for each category, and divide by the number of items to obtain the score for that category; the total will give you an overall score. Using the same process, you can compare different outdoor areas.

Weighting is being developed to generate scores that reflect the relative importance of the 60 different items. This will be based on the relevant literature, residents' surveyed preferences, outcome-based findings, and surveyed expert opinions. Weighting will be available as a formula embedded in an Excel spreadsheet, allowing you to enter your raw scores, and convert them into weighted scores.

Please see the Access to Nature website at http://www.accesstonature.org/resources.html for more copies of this evaluation tool, and to access an Excel spreadsheet, when available, for weighting your results.

APPENDIX 3.5

GATE MISSING VALUES BY ITEM

TABLE 3.5 GATE Missing Values by Item.

Access and Visibility

n	*M*	*SD*	Missing[a]	Item [b]
31	2.84	1.37	2	Doors to the garden from at least one entry are automatic and easy to use.
13	2.85	0.99	20	*Any nonautomatic doors are easy to operate (e.g., are not too heavy, don't close too quickly).*
28	3.36	0.68	5	Doorway thresholds are flat and smooth (for a wheelchair or IV pole to cross easily).
31	2.74	1.44	2	The space just outside the main doorway is covered/roofed (providing protection from rain, sun, etc.).
31	3.19	1.14	2	The space just outside the main doorway has seating for at least two people and space for at least one wheelchair.
32	2.59	1.04	1	A "destination" feature draws people into the garden (e.g., seating area, water feature, special tree or plantings).
27	2.3	1.41	6	A facility restroom is near a garden entry (i.e., within approximately 50 feet).
33	1.76	1.23	0	Garden has an emergency phone that connects with the hospital front desk or security.
32	2.13	1.21	1	Garden is visible from main public indoor areas (e.g., entry lobby, major hallway).
29	2.28	1.28	4	Garden is visible from indoor areas that involve waiting (e.g., waiting rooms, labs, pharmacy).
32	2.81	1.15	1	Garden is visible from floors above (e.g., from offices, patient rooms).
33	3.09	1.04	0	Entrance to the garden is easy to find.
31	3.9	0.40	2	Doors to garden are glass or have a window in or next to them.
31	3.13	0.85	2	Garden looks appealing/inviting from indoors.
28	1.18	0.55	5	There is signage TO the garden from indoors (e.g., in lobby, elevators, garden entrance).
29	1.72	1.22	4	There is signage ON or NEXT TO garden doors.
19	1.89	0.94	14	*Information about the garden is available (e.g., pamphlets, signage, website).*

Sense of Being Away

n	*M*	*SD*	Missing	Item
33	2.73	1.10	0	People can find a desirable sense of enclosure in the garden.
33	2.36	1.17	0	People can find privacy in at least one part of the garden.
30	3.93	0.25	3	People in the garden cannot look into adjacent private indoor areas (e.g., patient rooms, treatment/consultation rooms).
33	1.67	1.24	0	Garden has at least one fully covered (roofed) area (e.g., porch, gazebo).
33	1.67	0.96	0	At least one seating area is protected from climatic/weather extremes (e.g., with wind shields, patio heaters, overhead fans).
33	2.36	0.96	0	Garden has some features that provide a rich, multi-sensory experience (e.g., things to do, look at, smell, hear).
33	2.27	0.88	0	Garden is free from unpleasant sounds (e.g., air conditioners, traffic, loading docks).
33	3.67	0.69	0	Garden is free from bad odors (e.g., trash, vehicle exhaust, cooking smells).
31	3.13	0.92	2	Plants hide or soften unsightly views (e.g., fences, walls, equipment).
33	3.7	0.64	0	Garden is free from trash (e.g., paper, cigarette butts, cans).
33	3.39	1.17	0	Garden has at least one trash can.
33	1.27	0.88	0	There is a shed or other place to store tools in the garden.

Nature Engagement

n	*M*	*SD*	Missing	Item
33	2.82	0.95	0	More than half of the garden surfaces are planted (not paved).
33	2.7	1.10	0	Garden has a rich variety of plants (e.g., combination of trees, shrubs, perennials; variety of species).
33	3.36	0.78	0	Garden has plants at multiple heights (on the ground, raised beds, hedges, vines, trees, etc.).
33	2.36	0.99	0	Garden has plants that stimulate the senses (i.e., sight, smell, touch, sound, taste).
33	3	0.97	0	Some plants are intriguing, provide fascination (e.g., intricate flowers, unusual growth pattern, movement).
33	2.94	0.75	0	Planting provides year-round interest (e.g., always something to see such as flowers, leaves, berries, bark, evergreens).
32	2.69	1.15	1	Some plants provide bright colors (e.g., with flowers, leaves, berries, bark).
33	3.03	0.64	0	Planting BEDS look well-maintained (e.g., well-weeded, no large bare spots).
32	3.41	0.67	1	PLANTS look well-maintained and healthy (e.g., vibrant, well-pruned).
33	3.82	0.39	0	Plants are sturdy enough to tolerate extreme weather, people picking flowers and leaves, etc.
33	2.85	0.83	0	Plants provide food and/or habitat for birds, butterflies, and other desirable wildlife.
11	3.64	0.67	22	*Water feature looks clean and well-maintained.*
10	3.7	0.95	23	*Water feature design and location minimizes slipping hazards.*
11	2.82	1.25	22	*Water feature has minimal splash (spray from splashing can carry harmful bacteria).*
9	3.22	0.67	24	*Sound from water feature is pleasant and soothing.*
11	3.55	0.93	22	Some seating is available near the water feature (within 15 feet).

Walking and Activities

n	*M*	*SD*	Missing	Item
32	3.94	0.25	1	Primary walkway is relatively flat (i.e., not too steep).
32	3.94	0.35	1	Primary walkway does not have steps or steep ramps.
32	3.63	0.71	1	Primary walkway is smooth but non-skid, even when wet.
32	3.78	0.42	1	Primary walkway is at least six feet wide or, if narrower, has frequent passing areas.
31	2.32	1.42	2	Primary walkway has a curb or raised edges (to keep wheelchairs, strollers, walkers, canes, etc., on walkway).
31	3.48	0.89	2	Primary walkway has seating approximately every 30 feet.
32	2.84	0.72	1	Gaps or cracks in paving (walkways and patios) are narrow enough for a wheelchair, stroller, or IV pole to cross smoothly.
33	3.21	0.82	0	Paving does not create glare (is tinted concrete, colored stone, brick, etc.).
33	3.85	0.36	0	Paved areas are clear of debris and other obstacles (e.g., twigs, leaves, hoses).
31	3.29	0.94	2	Trees/plants along walkways and other paved areas do not drop a lot of leaves, twigs, seeds, or fruits.
9	2.44	1.51	24	*There are landmarks and/or signage in the garden to help people navigate their way through (and back to the entrance).*
24	1.63	1.06	9	A drinking fountain is in or near the garden.
22	2.32	1.25	11	If garden has lighting: Walkways are evenly lit.
19	4	0.00	14	*If garden has lighting: Lighting does not shine into patient rooms.*
33	2.18	1.16	0	Garden has more than one walkway, with a variety of routes, lengths, destinations, etc.
22	1.59	0.96	11	At least one secondary walkway offers increasingly levels of difficulty (e.g., with paving material, steepness, steps).

30	1.43	0.86	3	Garden has spaces/features for therapists (PT, OT, HT) to work with patients (e.g., handrails, variety of walking surfaces, steps).
33	2.45	0.91	0	Garden is safe for children (e.g., physically enclosed; easily viewed from nearby seating areas; plantings and other features are not harmful).

Places to Rest

n	*M*	*SD*	Missing	Item
33	3.33	0.96	0	The garden offers many places to sit.
33	2.36	1.14	0	People can choose a variety of types of seating (benches, chairs, etc.)
33	2.48	1.44	0	Movable seating is available (light enough to move yet sturdy enough to prevent tipping).
33	2.91	1.26	0	At least 50% of the seating in the garden has backs and arms (so that people can easily get up and down).
32	2.47	1.11	1	There is a place where someone could lie down for a rest (e.g., chaise longue, bench, lawn).
33	2.61	1.22	0	Garden has separate areas for activities and socializing, compared with contemplation/quiet conversation.
33	3.45	1.00	0	Garden provides a place where three or more people can sit together.
32	3.81	0.54	1	Some seating areas allow people to interact with passers-by.
33	2.58	1.12	0	Garden provides semi-private seating for one or two people.
32	3.5	0.72	1	Some seating makes it possible to watch others from a distance.
32	2.97	1.03	1	There is a choice of seating in sun or shade throughout most of the day.
32	3.63	0.79	1	Seating does not produce glare (e.g., is not metal, white).
32	3.56	0.84	1	Seating material does not get too hot or too cold.
32	3.53	0.67	1	Seating, tables, and other furniture look well-maintained.
32	2.84	0.92	1	Some seating has attractive or interesting views.
25	3.92	0.40	8	Some seats have tables next to them.
25	3.28	1.21	8	There is at least one table large enough for four or more people.
24	2.83	1.34	9	There is at least one table that can accommodate people in wheelchairs or scooters.
24	3.83	0.38	9	Tables do not tip (e.g., when people use as leverage to sit down or get up).

Note. IV = intravenous Pole; PT = physical therapist; OT = Occupational Therapy; HT = Horticultural Therapy.

[a]Denotes number of missing values. Threshold for not including in statistical analysis is N ≤ 20. [b]Items not included in analysis are italicized.

APPENDIX 3.6

GATE MISSING VALUES BY FACILITY

TABLE 3.6 H-GET GATE Missing Values by Facility

Houston Medical District gardens	RA1	RA2	Researcher	Total
UT School of Nursing - Rooftop garden	7	5	14	26
UT School of Nursing / UT School of Public Health - Grant Fay Park	6	2	3	11
TIRR Memorial Hermann – Greenhouse Garden	6	5	3	14
TIRR Memorial Hermann – Cafeteria Patio	2*	2*	5	5
TIRR Memorial Hermann – Prometheus Garden	5	3	3	11
TIRR Memorial Hermann – Oak Plaza	6*	6*	4	4
Ben Taub Hospital Healing Garden	6	2	3	11
MD Anderson Cancer Center - Fountain of Joy	3*	3*	5	5
MD Anderson Cancer Center - Melcher Fountain	6	7	5	18
MD Anderson Cancer Center - Hudson Garden	2*	2*	1	1
MD Anderson Cancer Center - Saeger Garden	6	4	5	15
MD Anderson / Rotary House International - Well of Life Fountain	7*	7*	11	11
MD Anderson Cancer Center – Prairie Garden	0	1	4	5
MD Anderson Mays Clinic Level 2 – Podium Garden	4	1	3	8
MD Anderson Mays Clinic Lvll 2 - Weingarten Schnitzer Family Gdn	1	3	3	7
MD Anderson Mays Clinic Level 8 – Bartalotta Family Garden	1	3	1	5
MD Anderson Mays Clinic Level 8 – Rita's Garden	1	3	3	7
MD Anderson Mays Clinic Level 8 – Barbara's Garden	1*	1*	2	2
Houston Community College – Small "Zen" entry garden	6	8	12	26
Texas Medical Center Gus S. and Lydall F. Wortham Park	20	23	19	62
Shriner's Hospital for Children – Front entry	12	8	9	29
UT Institute of Molecular Medicine – Courtyard water garden	5	2	3	10
Houston Hospice – Healing Garden	2	0	1	3
UT School of Dentistry – Courtyard garden	11	7	9	27
Harris Health Clinic – Entry garden	6	4	6	16
Totals	**111**	**91**	**137**	**339**

*Indicates 100% agreement between two RAs (Research Assistants)

APPENDIX 4.1

H-GET VISITOR SURVEY

HEALTHCARE
GARDEN
EVALUATION
TOOKIT

HEALTHCARE GARDEN VISITOR SURVEY

GENERAL INFORMATION ABOUT THIS SURVEY

This survey is being conducted by a Ph.D. Candidate at Texas A&M University about gardens in healthcare facilities. It should take 5-15 minutes to complete. **If you work or volunteer at the healthcare facility, please fill out the green Healthcare Garden STAFF Survey instead.**

Even if you didn't know about the garden until now, your feedback is still important!

YOUR RIGHTS AS A RESEARCH PARTICIPANT

Aside from your time, there are no costs for taking this survey. You will not be paid, but your participation is valuable for the research. Your participation is completely voluntary. You may decide not to participate, or to stop at any time. The survey is completely anonymous and we will not collect any identifiable information. By completing the survey, you are giving permission for the researcher to use your responses, combined with those of other participants, for research purposes. There are no known risks for taking part in this survey. Information will be kept confidential to the extent permitted or required by law. People who have access to these records include the Principal Investigator and research study personnel. Representatives of regulatory agencies such as the Office of Human Research Protections (OHRP) and entities such as the Texas A&M University Human Research Protection Program may access these records to make sure the study is being run correctly and that information is collected properly.

QUESTIONS ABOUT THE RESEARCH

You may contact the Principal Investigator, Susan Rodiek, Ph.D., to report a concern or complaint about this research at (979) 862-2234 or rodiek@tamu.edu. You may also contact the Protocol Director, Naomi Sachs, at (845) 264-2026 or nsachs@tamu.edu. For questions about your rights as a research participant, or if you have questions, complaints, or concerns about the research and cannot reach the Principal Investigator or want to talk to someone other than the Investigator, you may call the Texas A&M Human Research Protection Program office by phone at (979) 458-4067, toll free at (855) 795-8636, or by email at irb@tamu.edu.

SECTION 01 PLEASE TELL US ABOUT YOURSELF

01 What healthcare facility are you visiting/ being treated at today?

- ☐ Baylor Scott & White Hospital
- ☐ Legacy Good Samaritan Medical Center
- ☐ Greenwich Hospital
- ☐ St. Joseph Hospital
- ☐ Legacy Salmon Creek
- ☐ Oakland Kaiser Broadway Medical Office Building
- ☐ Oakland Kaiser Specialty Medical Office Building
- ☐ Smilow Cancer Hospital

02 Are you a (please check one):

- ☐ Patient
- ☐ Visitor
- ☐ Other (please specify) :____________________________

Note: If you work or volunteer at this healthcare facility, please fill out the Healthcare Garden STAFF Survey instead.

03 Is this your first visit to this hospital? ☐ Yes ☐ No

If No, about how many times have you visited this hospital?____________________________

04 On a scale of 1–10, how important to you is being outside in nature when you are not at the hospital?

NOT AT ALL IMPORTANT ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 EXTREMELY IMPORTANT

SECTION 02 **GARDEN AWARENESS AND ACCESS**

01 Before taking this survey, did you know that this healthcare facility had a garden?
- [ ] Yes
- [ ] No

02 How did you FIRST find out about this garden?
- [ ] From this survey
- [ ] Saw it from the window
- [ ] Walked by it
- [ ] Someone told me about it
- [ ] Read about it
- [ ] Other: ____________
- [ ] Saw sign in hospital

03 Are there places inside the healthcare facility where you can look out and see the garden?
- [ ] Yes
- [ ] No

If Yes, from where? For example, patient room, lobby, hallway, etc. List all: ____________

If Yes, do you enjoy looking at the garden from inside?
- [ ] Definitely yes
- [ ] Somewhat yes
- [ ] Neutral
- [ ] Somewhat no
- [ ] Definitely no

04 Have you ever visited the garden at this healthcare facility?
- [ ] Yes
- [ ] No

If No, what has kept you from visiting the garden? Check all that apply:
- [ ] Didn't know about it
- [ ] Doors are locked
- [ ] My health
- [ ] There are things about the garden I don't like
- [ ] The health of the person I'm visiting
- [ ] Weather Conditions (Please specify): ____________
- [ ] Too busy
- [ ] Other: ____________
- [ ] Too far away/hard to get to

05 Would you encourage other people (patient, visitors, or staff) to visit the garden?
- [ ] Definitely yes
- [ ] Probably yes
- [ ] Maybe
- [ ] Probably not
- [ ] Definitely not

06 In your opinion, is it important for healthcare facilities to have gardens?
- [ ] Definitely yes
- [ ] Probably yes
- [ ] Maybe
- [ ] Probably not
- [ ] Definitely not

07 Does the garden improve your satisfaction with this healthcare facility?
- [ ] Definitely yes
- [ ] Probably yes
- [ ] Maybe
- [ ] Probably not
- [ ] Definitely not

08 Does the garden increase the likelihood that you would recommend this healthcare facility to others?
- [ ] Definitely yes
- [ ] Probably yes
- [ ] Maybe
- [ ] Probably not
- [ ] Definitely not

SECTION 03 **A FEW MORE QUESTIONS ABOUT YOU**

A person's background can sometimes influence how he or she experiences the surrounding environment. You are NOT required to answer these demographic questions (#s 1-5), but your answers will help us understand any potential relationships that we find. Thank you!

01 What is your gender? ☐ Male ☐ Female

02 What year were you born? ____________

03 Are you Hispanic or Latino? ☐ Yes ☐ No

04 Which one or more of the following best describes your race?

☐ White
☐ Native Hawaiian or Other Pacific Islander
☐ Black or African American
☐ American Indian or Alaska Native
☐ Asian
☐ Other (please specify): ____________

05 What is your primary language?

☐ English ☐ Spanish ☐ Other: ____________

IF YOU HAVE *NOT* VISITED THE GARDEN, PLEASE STOP HERE AND RETURN THIS FORM.

If you have NOT visited the garden, please stop here and turn in the survey to the box next to the stack of surveys. Or you can fill out the rest of the survey after you have visited the garden at least once. **Thank you very much!**

IF YOU *HAVE* VISITED THE GARDEN, PLEASE CONTINUE. *YOUR OPINION IS VERY IMPORTANT!*

SECTION 04 **GARDEN VISITS**

01 Since you started being treated at or visiting this hospital, about how many times have you visited the garden?

☐ 1–2 times ☐ 3–5 times ☐ 6–9 times
☐ 10–15 times ☐ 15 or more times (estimate): ____________

02 During most of your visits to the garden, how much time do you spend there?

☐ I walk through it on my way somewhere ☐ 16-30 minutes ☐ 45–60 minutes
☐ 0–15 minutes ☐ 31–45 minutes ☐ More than an hour

03 Would you visit the garden more often, or stay in it longer, if you could?

☐ Definitely yes ☐ Probably yes ☐ Maybe ☐ Probably not ☐ Definitely not

04 What keeps you from visiting the garden as often or for as long as you would like? Check all that apply:

☐ Too busy
☐ Doors are locked
☐ My health
☐ There are things about the garden I don't like
☐ The health of the person I'm visiting
☐ Weather Conditions (Please specify): ____________
☐ Too far away/hard to get to
☐ Other: ____________

SECTION 04 **GARDEN VISITS, CONTINUED**

05 Why do you visit that garden, and what do you do when you're there? Check all that apply:

- [ ] Get away from the facility
- [ ] Have privacy
- [ ] Relax
- [ ] Get fresh air
- [ ] Look at plants, birds, other natural features
- [ ] Walk slowly, stroll
- [ ] Walk briskly for exercise
- [ ] Just sit down for a while
- [ ] Have lunch or a cup of coffee/tea
- [ ] Talk on the phone
- [ ] Read or do work (on paper or mobile devices)
- [ ] Write/journal/draw (on paper or mobile devices)
- [ ] Text, watch movies or YouTube, etc. on a mobile device
- [ ] Meditate or pray
- [ ] Express emotions I can't express inside (cry, laugh, etc.)
- [ ] Be by myself
- [ ] Talk/be with someone else I know
- [ ] Be amongst other people
- [ ] Smoke
- [ ] Do phyical, occupational, horticultural, or other therapy
- [ ] Attend specific events: ______________________
- [ ] Other: ______________________

06 How do you usually feel after you spend time in the garden?

- [ ] I feel better
- [ ] I don't feel any different
- [ ] I feel worse

07 In your opinion, is spending time in this garden good for people's health (physical and/or mental)?

- [ ] Definitely yes
- [ ] Probably yes
- [ ] Maybe
- [ ] Probably not
- [ ] Definitely not

SECTION 05 **GARDEN RATING**

Note your level of agreement with the following statements:	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
The entrance to the garden is easy to find.					
The garden looks appealing and inviting from indoors.					
I feel safe in the garden.					
When I'm in the garden, I have a sense of "being away" from the healthcare facitlity.					
I can find privacy in at least part of the garden.					
Overall, the garden looks well-maintained.					
The garden feels lush and full of life.					
The main pathway/paved area is safe and comfortable to walk or use a walker/wheelchair/stroller/IV pole.					
The garden provides opportunities for walking.					
The garden offers many places to sit.					
The seating in the garden is comfortable.					
There are places in the garden where people can socialize (talk, meet, play, hang out together).					

SECTION 05 **GARDEN RATING, CONTINUED**

01 On a scale of 1-10 (where 1 = Very bad and 10 = Excellent), how would you rate this garden overall?

VERY BAD ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 EXCELLENT

02 What do you like MOST about the garden? ____________________

03 What do you like LEAST about the garden? ____________________

SECTION 06 **STAFF USE OF THE GARDEN**

01 Do you ever see hospital staff in the garden?

☐ Always ☐ Very often ☐ Sometimes ☐ Rarely ☐ Never

02 If you do see hospital staff in the garden, what are they usually doing? Check all that apply:

☐ Working with a patient
☐ Talking with a family member or friend of a patient
☐ Talking/meeting with a colleague or colleagues
☐ Talking on the phone
☐ Doing paperwork
☐ Eating lunch
☐ Resting/Relaxing
☐ Other: ____________________

03 How do you feel about hospital staff using the garden IN THEIR FREE TIME?

☐ I like seeing staff using the garden in their free time
☐ I don't mind seeing staff using the garden
☐ I would prefer not to see staff using the garden

ADDITIONAL GARDEN COMMENTS

Please share any other comments about the garden: ____________________

THANK YOU!

Thank you for taking this survey! Please return it to the box next to the stack of surveys.

IRB NUMBER: IRB2014-0182D
IRB APPROVAL DATE: April 18, 2014
IRB EXPIRATION DATE: April 16, 2017

APPENDIX 4.2

H-GET STAFF SURVEY

HEALTHCARE
GARDEN
EVALUATION
TOOKIT

HEALTHCARE GARDEN STAFF SURVEY

GENERAL INFORMATION ABOUT THIS SURVEY

This Healthcare Garden STAFF Survey is being conducted by a Ph.D. Candidate at Texas A&M University about gardens in healthcare facilities. It will take approximately 5-15 minutes to complete. **If you are a patient or visitor, please complete the Healthcare Garden VISITOR Survey.**

Take this survey online if it's more convenient for you, and/or if you would like to be entered into a drawing to win one of two $25.00 Amazon gift cards: *http://tinyurl.com/gardenstaff*. For staff and volunteers only.

Even if you didn't know about the garden until now, your feedback is still important!

YOUR RIGHTS AS A RESEARCH PARTICIPANT

Aside from your time, there are no costs for taking this survey. You will not be paid, but your participation is valuable for the research. Your participation is completely voluntary. You may decide not to participate, or to stop at any time. The survey is completely anonymous and we will not collect any identifiable information. By completing the survey, you are giving permission for the researcher to use your responses, combined with those of other participants, for research purposes. There are no known risks for taking part in this survey. Information will be kept confidential to the extent permitted or required by law. People who have access to these records include the Principal Investigator and research study personnel. Representatives of regulatory agencies such as the Office of Human Research Protections (OHRP) and entities such as the Texas A&M University Human Research Protection Program may access these records to make sure the study is being run correctly and that information is collected properly.

QUESTIONS ABOUT THE RESEARCH

You may contact the Principal Investigator, Susan Rodiek, Ph.D., to report a concern or complaint about this research at (979) 862-2234 or rodiek@tamu.edu. You may also contact the Protocol Director, Naomi Sachs, at (845) 264-2026 or nsachs@tamu.edu. For questions about your rights as a research participant, or if you have questions, complaints, or concerns about the research and cannot reach the Principal Investigator or want to talk to someone other than the Investigator, you may call the Texas A&M Human Research Protection Program office by phone at (979) 458-4067, toll free at (855) 795-8636, or by email at irb@tamu.edu.

SECTION 01 PLEASE TELL US ABOUT YOURSELF

01 In which healthcare facility do you work?

- ☐ Baylor Scott & White Hospital
- ☐ Greenwich Hospital
- ☐ Legacy Good Samaritan Medical Center
- ☐ Legacy Salmon Creek
- ☐ Oakland Kaiser Broadway Medical Office Building
- ☐ Oakland Kaiser Specialty Medical Office Building
- ☐ Smilow Cancer Hospital
- ☐ St. Joseph Hospital

02 Where are you when you are filling out this survey? You do not need to be in the garden, but it might help.

- ☐ Outside in the garden
- ☐ In the cafeteria or cafe
- ☐ In the staff breakroom
- ☐ I am not at the healthcare facility
- ☐ Other (please specify) :________________

SECTION 01 **PLEASE TELL US ABOUT YOURSELF, CONTINUED**

03 Are you a (please check one):

- [ ] Registered Nurse (RN)
- [ ] Certified Nursing Assistant
- [ ] Licensed Nurse Practitioner
- [ ] Physician (MD/OD)
- [ ] Physician Assistant (PA)
- [ ] Registration Personnel
- [ ] Security Personnel
- [ ] Chaplain
- [ ] Administration
- [ ] Medical Assistant (MA)
- [ ] Facility Manager
- [ ] Housekeeping
- [ ] Technician
- [ ] Food Services
- [ ] Therapist (OT, PT, HT, etc) (please specify): ____________
- [ ] Facility Maintenance Personnel (please specify): ____________
- [ ] Volunteer (please specify): ____________
- [ ] Other: ____________

04 How long have your worked (or volunteered) at this healthcare facility?

- [ ] Less than one year
- [ ] More than one year (please enter numbers of years): ______

05 About how many hours per week do you usually work at this healthcare facility? ____________

06 When do you usually work at the healthcare facility? During the (please check one):

- [ ] Day
- [ ] Night
- [ ] Both

07 In your everyday life AWAY from the healthcare facility, about how often do you spend time outside in nature (in your garden or another garden, at a park, etc.)?

- [ ] Almost every day
- [ ] A couple times a week
- [ ] Once a week
- [ ] A couple times a month
- [ ] I don't spend much time outdoors

08 On a scale of 1-10 (1 = Not at all important and 10 = Extremely important), **how important to you is being outside in nature when you are NOT at the healthcare facility?**

NOT AT ALL IMPORTANT [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] EXTREMELY IMPORTANT

SECTION 02 **GARDEN AWARENESS AND ACCESS**

Please fill in these questions about the facility's *main garden* (see list on the next page).

01 Before taking this survey, did you know that this hospital had a garden? [ ] Yes [ ] No

SECTION 03 **GARDEN VISITS**

01 Do you spend any time in the garden for work (e.g., working with patients)**?**

- ☐ Yes (please enter approximate number of hours per week): ______________
- ☐ No

02 Over the course of a year, about how often do you visit the garden at this healthcare facility in your FREE TIME (on breaks, before or after work, etc.)**?**

- ☐ More than once a day
- ☐ About once a day
- ☐ A few times a week
- ☐ About once a week
- ☐ A couple times a month
- ☐ About once a month
- ☐ A few times a year
- ☐ I never visit the garden

03 When you visit the garden in your free time, approximately how much time do you usually spend there?

- ☐ I walk through it on my way somewhere (e.g., to another building, parking lot, etc.)
- ☐ 0-15 minutes
- ☐ 16-30 minutes
- ☐ 31-45 minutes
- ☐ 46-60 minutes
- ☐ More than an hour

04 If you COULD spend more of your free time in the garden, would you?

- ☐ Definitely yes
- ☐ Probably yes
- ☐ Maybe
- ☐ Probably not
- ☐ Definitely not

05 What keeps you from visiting the garden as often or for as long as you would like? Check all that apply:

- ☐ Didn't know about it
- ☐ Too busy
- ☐ Too far away/hard to get to
- ☐ Doors are locked
- ☐ I feel like the garden is only for patients and visitors
- ☐ Staff are not supposed to use the garden (hospital policy)
- ☐ There are things about the garden I don't like
- ☐ Weather (please specify): ______________________________
- ☐ Other: ____

06 How do you usually feel after you spend time in the garden?

- ☐ I feel better
- ☐ I don't feel any different
- ☐ I feel worse

07 In your opinion, is spending time in this garden good for people's health (physical and/or mental)?

- ☐ Definitely yes
- ☐ Probably yes
- ☐ Maybe
- ☐ Probably not
- ☐ Definitely not

SECTION 03 **GARDEN VISITS, CONTINUED**

08 Why do you visit that garden, and what do you do when you're there? Check all that apply:

- ☐ Get away from the facility
- ☐ Have privacy
- ☐ Relax
- ☐ Get fresh air
- ☐ Look at plants, birds, other natural features
- ☐ Walk slowly, stroll
- ☐ Walk briskly for exercise
- ☐ Just sit down for a while
- ☐ Have lunch or a cup of coffee/tea
- ☐ Talk on the phone
- ☐ Read or do work (on paper or mobile devices)
- ☐ Write/journal/draw (on paper or mobile devices)
- ☐ Text, watch movies or YouTube, etc. on a mobile device
- ☐ Meditate or pray
- ☐ Express emotions I can't express inside (cry, laugh, etc.)
- ☐ Be by myself
- ☐ Talk/be with someone else I know
- ☐ Be amongst other people
- ☐ Smoke
- ☐ Talk with a patient or family member/friend of the patient
- ☐ Work with patient(s) doing therapy (PT, OT, HT, etc.)
- ☐ Attend a staff or other work-related meeting
- ☐ Attend specific events: ______________________
- ☐ Other: ______________________

SECTION 04 **GARDEN QUALITY**

Note your level of agreement with the following statements:	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
The entrance to the garden is easy to find.					
The garden looks appealing and inviting from indoors.					
I feel safe in the garden.					
When I'm in the garden, I have a sense of "being away" from the healthcare facitlity.					
I can find privacy in at least part of the garden.					
The garden has some features that provide a rich, multi-sensory experience (things to do, look at, touch, smell, hear, etc.).					
Overall, the garden looks well-maintained.					
The garden feels lush and full of life.					
The garden has other pleasing natural features (water, wildlife, etc.).					
The main pathway/paved area is safe and comfortable to walk or use a walker/wheelchair/stroller/IV pole.					
The garden provides opportunities for walking.					
The garden provides opportunities for other activities (children's play, ceremonies, programmed events, etc.)					
The garden offers many places to sit.					
The seating in the garden is comfortable.					
There is a choice of seating in sun or shade during most of the day.					
There are places in the garden where people can socialize (talk, meet, play, hang out together).					

SECTION 03 **GARDEN VISITS, CONTINUED**

08 Why do you visit that garden, and what do you do when you're there? Check all that apply:

- [ ] Get away from the facility
- [ ] Have privacy
- [ ] Relax
- [ ] Get fresh air
- [ ] Look at plants, birds, other natural features
- [ ] Walk slowly, stroll
- [ ] Walk briskly for exercise
- [ ] Just sit down for a while
- [ ] Have lunch or a cup of coffee/tea
- [ ] Talk on the phone
- [ ] Read or do work (on paper or mobile devices)
- [ ] Write/journal/draw (on paper or mobile devices)
- [ ] Text, watch movies or YouTube, etc. on a mobile device
- [ ] Meditate or pray
- [ ] Express emotions I can't express inside (cry, laugh, etc.)
- [ ] Be by myself
- [ ] Talk/be with someone else I know
- [ ] Be amongst other people
- [ ] Smoke
- [ ] Talk with a patient or family member/friend of the patient
- [ ] Work with patient(s) doing therapy (PT, OT, HT, etc.)
- [ ] Attend a staff or other work-related meeting
- [ ] Attend specific events: ____________________
- [ ] Other: ____________________

SECTION 04 **GARDEN QUALITY**

Note your level of agreement with the following statements:	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	NOT SURE OR N/A
The entrance to the garden is easy to find.					
The garden looks appealing and inviting from indoors.					
I feel safe in the garden.					
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I can find privacy in at least part of the garden.					
The garden has some features that provide a rich, multi-sensory experience (things to do, look at, touch, smell, hear, etc.).					
Overall, the garden looks well-maintained.					
The garden feels lush and full of life.					
The garden has other pleasing natural features (water, wildlife, etc.).					
The main pathway/paved area is safe and comfortable to walk or use a walker/wheelchair/stroller/IV pole.					
The garden provides opportunities for walking.					
The garden provides opportunities for other activities (children's play, ceremonies, programmed events, etc.)					
The garden offers many places to sit.					
The seating in the garden is comfortable.					
There is a choice of seating in sun or shade during most of the day.					
There are places in the garden where people can socialize (talk, meet, play, hang out together).					

SECTION 05 **GARDEN RATING**

01 On a scale of 1-10 (where 1 = Very bad and 10 = Excellent), how would you rate this garden overall?

VERY BAD ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 EXCELLENT

02 What do you like MOST about the garden? ______________________

____

03 What do you like LEAST about the garden? ______________________

____

SECTION 06 **STAFF USE OF THE GARDEN**

01 Do you ever see other healthcare staff in the garden?

☐ Always ☐ Very often ☐ Sometimes ☐ Rarely ☐ Never

02 What are they usually doing? Check all that apply:

☐ Working with a patient
☐ Talking with a family member or friend of a patient
☐ Eating lunch
☐ Talking/meeting with a colleague(s)
☐ Talking on the phone
☐ Doing paperwork
☐ Resting/Relaxing
☐ Other: ______________________

03 Does the healthcare facility have a policy about staff using the garden in their free time?

☐ Yes (please describe briefly): ______________________
☐ No ☐ Don't know

04 Do you think staff should be allowed to use the garden in their free time?

☐ Definitely yes ☐ Probably yes ☐ Maybe ☐ Probably not ☐ Definitely not

05 Does this healthcare facility have a separate garden(s) for staff?

☐ Yes ☐ No ☐ Don't know

06 This facility had a separate garden for staff, would you use it?

☐ Yes ☐ No
☐ Not sure (feel free to describe why you're not sure): ______________________

07 Do you think that healthcare staff should have their own garden, separate form patients and visitors?

☐ Definitely yes ☐ Probably yes ☐ Maybe ☐ Probably not ☐ Definitely not

08 Please share any other comments about the garden: ______________________

____

____

____

SECTION 06 **STAFF USE OF THE GARDEN, CONTINUED**

09 **Are there any other outdoor spaces at this healthcare facility where you spend time?** For example, cafeteria patio, or front entrance. ☐ Yes ☐ No

10 **Please say briefly why you also use the other outdoor space or spaces.** Easier to get to? More private? More social? There is no right or wrong answer, we would just like to know how other outdoor spaces compare tothe hospital's garden.

____

____

SECTION 07 **A FEW MORE QUESTIONS ABOUT YOU**

A person's background can sometimes influence how he or she experiences the surrounding environment. You are NOT required to answer these demographic questions (#s 1-5), but your answers will help us understand any potential relationships that we find. Thank you!

01 **What is your gender?** ☐ Male ☐ Female

02 **What year were you born?**________________

03 **Are you Hispanic or Latino?** ☐ Yes ☐ No

04 **Which one or more of the following best describes your race?**

- ☐ White
- ☐ Black or African American
- ☐ Asian
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ American Indian or Alaska Native
- ☐ Other (please specify): ____________________

05 **What is your primary language?**

☐ English ☐ Spanish ☐ Other: ________________

THANK YOU!

Thank you for taking this survey! Please return it to the box next to the stack of surveys.

IRB NUMBER: IRB2014-0182D
IRB APPROVAL DATE: April 18, 2014
IRB EXPIRATION DATE: April 16, 2017

APPENDIX 5.1

STAKEHOLDER INTERVIEW SCRIPT – DESIGNER

HGET Stakeholder Structured Interview Protocol - Designer

Date and time of interview:

Where and how is this interview being conducted? (on site, phone, etc.):

Name of interviewee:

Name of firm:

Name of HCF:

Date of beginning of design and date of garden ribbon-cutting:

1. Tell me about the design process for this garden.

- Who brought you in and why
- Who were the major stakeholders (CEO, President, staff, etc.)
- Who was on the design team (list everyone, not names but roles, including therapy staff, patients, community members, chaplain, etc.). *Note: this may be the same as above, but not necessarily.*
- Who was the primary "driver" of the design – the landscape architect/designer, the architect, the client…?

2. What was the program / goal(s) for the garden?

3. Do you think those were met? How so, or how not?

4. Did you use any research to inform the design?

- Journals, books, etc.
- Interviews or surveys with staff, patients, etc.
- Behavior mapping, site observation, etc.

5. What were the biggest challenges during design and construction, and how did you deal with those?

6. What are the biggest challenges now? Who deals with them, and how?

7. What did NOT happen according to the initial design plan, and why?

8. Have you gotten feedback about the garden since it opened, either formally or informally, from anyone? If so, discuss who, how, and what.

9. What do you feel the (design / construction) team got really RIGHT with the garden?

10. What do you wish could have been done differently? Or, if you had to do it all over again, what would you do differently?

11. Would you be willing to share materials such as plans, drawings, sketches, etc. for use with the on-site research?

12. Anything else to share?

APPENDIX 5.2

STAKEHOLDER INTERVIEW SCRIPT – FACILITY MANAGER

HGET Stakeholder Structured Interview Protocol – Facility Manager

Date and time of interview:

Where and how is this interview being conducted (on site, phone, etc.):

Name of interviewee:

Name of HCF:

Role in HCF:

Date of beginning of design and date of garden ribbon-cutting:

1. Were you involved in the design of this garden? If so, let's discuss the following. Even if you weren't involved on the team, you may know about the design process, goals for the garden, etc.

2. Tell me about the design process for this garden.

- Who brought you in and why
- Who were the major stakeholders (designer/s, CEO, President, staff, etc.)
- Who was on the design team (list everyone, not names but roles, including therapy staff, patients, community members, chaplain, etc.). *Note: this may be the same as above, but not necessarily.*
- Who was the primary "driver" of the design – the landscape architect/designer, the architect, the client…?

2. What was the program / goal(s) for the garden?

3. Do you think those were met? How so, or how not?

4. Did the designer use any research to inform the design?

- Journals, books, etc.
- Interviews or surveys with staff, patients, etc.
- Behavior mapping, site observation, etc.

4. What were the biggest challenges during design and construction?

5. What are the biggest challenges now? Who deals with them, and how?

6. What did NOT happen according to the initial design plan, and why?

7. Have you gotten feedback about the garden since it opened, either formally or informally? If so, discuss who, how, and what.

8. How do people (patients, visitors, staff) use the garden?

9. What do you feel the (design / construction) team got really RIGHT with the garden?

10. What do you wish could have been done differently? Or, if you had to do it all over again, what would you have someone do differently?

11. Anything else to share?

APPENDIX 5.3

STAKEHOLDER INTERVIEW SCRIPT – STAFF

HGET Stakeholder Structured Interview Protocol – Staff

Date and time of interview:

Where and how is this interview being conducted (on site, phone, Skype, etc.):

Name of interviewee:

Name of HCF:

Role in HCF:

Date of beginning of design and date of garden ribbon-cutting:

1. Tell me about the design process for this garden.

- Who brought you in and why
- Who were the major stakeholders (designer/s, CEO, President, staff, etc.)
- Who was on the design team (list everyone, not names but roles, including therapy staff, patients, community members, chaplain, etc.). *Note: this may be the same as above, but not necessarily.*
- Who was the primary "driver" of the design – the landscape architect/designer, the architect, the client…?

2. What was the program / goal(s) for the garden?

3. Do you think those were met? How so, or how not?

4. Did the designer use any research to inform the design?

- Journals, books, etc.
- Interviews or surveys with staff, patients, etc.
- Behavior mapping, site observation, etc.

4. What were the biggest challenges during design and construction?

5. What are the biggest challenges now? Who deals with them, and how?

6. What did NOT happen according to the initial design plan, and why?

7. Have you gotten feedback about the garden since it opened, either formally or informally? If so, discuss who, how, and what.

8. How do people (patients, visitors, staff) use the garden?

9. What do you feel the (design / construction) team got really RIGHT with the garden?

10. What do you wish could have been done differently? Or, if you had to do it all over again, what would you have someone do differently?

11. Anything else to share?

APPENDIX 5.4

STAKEHOLDER INTERVIEW RECRUITMENT LETTER

Request for Stakeholder Interview, sent via email

Subject Heading: Invitation for Interview

Dear [Name],

As a PhD student in Architecture at Texas A&M University, I am conducting research about gardens at healthcare facilities in the United States. With each healthcare facility in my research, I am interviewing the lead designer (landscape architect/designer or architect); a staff member who was on the original design team; and the Facility Manager. I was given your name because you were or are involved with the garden[s] at [Name of HCF].

The interviews will last approximately 45 minutes, and most will take place over the phone. A few will take place in person when I am conducting on-site research. I will audio-record the interview and then the recording will be transcribed by a professional transcription service.

The questions are about the program/design for the garden, including challenges and successes, and about how the garden is used now. You are not expected to "know everything," just share what you do know.

Would you be willing to participate in an interview? Please let me know so I can contact you to schedule a time that is convenient to you.

Best,

Naomi A. Sachs, ASLA, EDAC
PhD student, Texas A&M University
Department of Architecture
Center for Health Systems & Design
845-264-2026
nsachs@tamu.edu

APPENDIX 5.5

STAKEHOLDER INTERVIEW CONSENT FORM

Texas A&M University Human Subjects Protection

Informed Consent form for

Healthcare Garden Evaluation Toolkit Stakeholder Interviews

Introduction
You are invited to participate in a study being conducted by Naomi Sachs, a PhD Candidate at Texas A&M University. The purpose of this research is to develop a Healthcare Garden Evaluation Toolkit (HGET), which will be used to study gardens in general acute care hospitals. You are being asked to take part in this study because you have experience with the planning, design, construction, programming, and/or maintenance of a healthcare garden.

Procedures
After you agree to the interview, the researcher (Naomi Sachs) will schedule a time for a phone or in-person interview. The interview will last approximately 45 minutes, and will be audio recorded with a smartphone. The recording will be sent to a professional transcription service, and the researcher will use the transcript and her notes to identify themes and topics of importance. During the interview, the researcher will ask you questions about the program/design for the garden, including challenges and successes, and about how the garden is used now. You are not expected to "know everything," just share what you do know. You are not required to answer any questions that you do not wish to answer, and you are free to terminate the interview at any time.

Cost and Compensation
Aside from your time, there are no costs for taking part in the study. You will not be paid for the interview, but your participation is a valuable part of the research process and development of the HGET.

Participation
Participation in this interview is completely voluntary, and there is no penalty for not participating. You may decide to not participate, or to stop it at any time. By completing the survey, you are giving permission for the researcher (Naomi Sachs) to use your information for research purposes, where your responses will be combined with those of other participants.

Confidentiality
Information about you will be kept confidential to the extent permitted or required by law. People who have access to your information include the Principal Investigator and research study personnel. Representatives of regulatory agencies such as the Office of Human Research Protections (OHRP) and entities such as the Texas A&M University Human Subjects Protection Program may access your records to make sure the study is being run correctly and that information is collected properly.

Questions about the Research
You may contact the Principal Investigator, Susan Rodiek, D.Arch., to report a concern or complaint about this research at (979) 862-2234 or srodiek@tamu.edu. You may also contact the Protocol Director, Naomi Sachs, at (845) 264-2026 or nsachs@tamu.edu.

Questions about your Rights as a Research Participant
For questions about your rights as a research participant, or if you have questions, complaints, or concerns about the research and cannot reach the Principal Investigator or want to talk to someone other

IRB NUMBER: IRB2014-0182D
IRB APPROVAL DATE: 04/15/2016
IRB EXPIRATION DATE: 04/15/2017

than the Investigator, you may call the Texas A&M Human Subjects Protection Program office. Phone number: (855) 795-8636 Email: irb@tamu.edu.

Thank you very much!

Naomi Sachs, ASLA, EDAC
Ph.D. Candidate
Texas A&M University
Department of Architecture
Center for Health Systems & Design
College Station, TX 77843-3137
Phone: (845)-264-2026
Email: nsachs@tamu.edu

IRB NUMBER: IRB2014-0182D
IRB APPROVAL DATE:04/15/2016
IRB EXPIRATION DATE: 04/15/2017

STATEMENT OF CONSENT

I agree to be in this study and know that I am not giving up any legal rights by signing this form. The procedures, risks, and benefits have been explained to me, and my questions have been answered. I know that new information about this research study will be provided to me as it becomes available and that the researcher will tell me if I must be removed from the study. I can ask more questions if I want. A copy of this entire consent form will be given to me.

____________________________ ____________________________
Participant's Signature Date

____
Printed Name

INVESTIGATOR'S AFFIDAVIT:
Either I have or my agent has carefully explained to the participant the nature of the above project. I hereby certify that to the best of my knowledge the person who signed this consent form was informed of the nature, demands, benefits, and risks involved in his/her participation.

____________________________ ____________________________
Signature of Presenter Date

____
Printed Name