



 THE CENTER FOR HEALTH DESIGN®

DESIGN RESEARCH AND BEHAVIORAL HEALTH FACILITIES

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ABSTRACT

In the interest of determining the state of knowledge on the relationship between behavioral health and the physical environment, the authors explored the literature on research, guidelines, and funding related to this topic. Approximately 300 articles were reviewed for possible incorporation in the literature review, of which 115 were deemed sufficiently appropriate. The criteria for inclusion included (a) relevance to the topic of behavioral health facilities, (b) a demonstration of clear research methodology or practice/research supported guidelines, (c) post-1960 publication, and (d) publication in peer-reviewed journals. This resulted in the development of a literature analysis at three levels: emerging evidence, studies requiring additional corroboration, and design considerations.

The research team also evaluated existing guidelines and summarized the contents by: intended audience, clinical areas addressed, intent, process, environmental aspect addressed, source of information, peer-reviewed references, and strengths and weaknesses. Additionally, sources of potential research funding were explored and summarized. The review addresses a variety of behavioral health environments, some of which have particularly salient needs in terms of safety and suicide-resistance. The research team concluded that the amount of research on the topic of behavioral health environments is minimal and insufficient to inform the design process.

Likewise, the institutionalized guidelines for these facilities, with few exceptions, lack research evidence to support their recommendations. The authors recommend that more research and effective collaboration between researchers and the generators of guidelines be encouraged via both public and private sectors.

Table of Contents

Abstract	i
Executive Summary	1
Introduction	10
Issues in Mental Health	12
<i>Range of Settings</i>	12
<i>Variety of Diagnoses</i>	13
<i>Data Collection</i>	14
Issues Regarding War Veterans	15
Behavioral Health Facility Evaluation Tools	16
Linking Research to Design	17
Strong Evidence and Emerging Evidence	17
Design Considerations: Best Practices as Suggested by Experts	20
Research	24
Physical Environment and Social Behavior	24
Pre- and Postoccupancy Evaluations	28
<i>Multiple Facility Studies</i>	28
<i>Satisfaction</i>	29
<i>Staff Behavior</i>	31
Harmful Behavior and Stress	32
<i>Suicide</i>	33
<i>Smoking</i>	33
<i>Stress</i>	34
<i>Pathological Behavior</i>	35
<i>Aggression</i>	35
<i>Children and Adolescents</i>	37
Trends Impacting Research	38
<i>Trends in Behavioral Health Environments</i>	38
<i>Trends in Models of Care</i>	38
<i>Alternative Therapies</i>	39
Directions for Future Research	39

Assessment of Behavioral Health Guidelines	42
Summary	42
Assessment	42
Refocused Effort on Design Guideline Motivators	43
Guideline Value	43
Guideline Gaps	43
Guideline Research Agenda	44
Grant Sources	45
Opportunities	45
Challenges and Considerations.....	45
Conclusion	47
References	49
Figures	
Figure 1: Populations and Categories of Behavioral Health Facilities	12
Tables	
Table 1: Emerging Evidence in Behavioral Health Facility Design	18
<i>General</i>	
<i>Patient Rooms</i>	
<i>Dayroom</i>	
<i>Staff Spaces</i>	
<i>Light and Nature</i>	
<i>Safety</i>	
Table 2: Studies Requiring Additional Corroboration	19
<i>General</i>	
<i>Dayroom</i>	
<i>Patient Room</i>	
<i>Other Patient Spaces</i>	
<i>Staff Spaces</i>	
<i>Light and Nature</i>	
<i>Safety</i>	
Table 3: Considerations for Behavioral Health Facilities	21
Appendix	67
Appendix 1: Behavior/Setting Measurement Tools	67
Appendix 2: Guidelines Summaries	68
Appendix 3: Funding Sources	72



EXECUTIVE SUMMARY

Fueled by the trend toward evidence-based design (EBD), research on healthcare facilities has increased over the last 20 years. A variety of topics have been covered in this effort; however, studies addressing the design of behavioral health (BH) environments are few. The absence of research in this area of specialization is surprising, as legal precedents have spoken to the need for quality environments for many years.

In the interest of determining the state of knowledge regarding the relationship between BH and the physical environment, the authors explored the literature on research, guidelines, and funding related to this topic. Approximately 300 articles were reviewed for possible incorporation in the literature review of which 115 were deemed sufficiently appropriate. The criteria for inclusion included:

1. relevance to the topic of BH facilities,
2. a demonstration of clear research methodology or practice/research supported guidelines,
3. post-1960 publication, and
4. publication in peer-reviewed journals.

Unfortunately many studies are confounded by extraneous variables, such as changes to care protocols and transitions in staff and patient populations. One of the primary difficulties in interpreting these studies is limiting the independent variables and discerning which component of the physical environment (e.g., color, views of nature) is impacting the behavior. This limits the generalizability of the studies to other BH settings.

One of the challenging issues in conducting BH research is the wide variety of potential settings. Psychiatric facilities include psychiatric hospitals, psychiatric and neuropsychiatric nursing units of general hospitals, facilities for the psychiatric medically infirm, geropsychiatric units, alcohol and drug addiction treatment facilities, mental health clinics, day hospitals, and day treatment centers (Carr, 2011).

Another issue is the variety of diagnoses. Available research does not provide enough evidence to draw conclusions regarding specific design guidelines for each patient group. A third issue is impediments to gathering data from mental health patients and residents.

Eight BH facility occupancy evaluation tools were uncovered in this literature review. Most of the tools are focused on evaluating the psychiatric ward environment. Some are designed for staff members, while others are designed to be used by both staff and patients to compare their perspectives.

Evidence, Emerging Evidence, Studies Requiring Corroboration, and Best Practice

Via this literature review the authors intended to link research and guidelines. Unfortunately, the number of rigorous studies was too limited to advance EBD recommendations. However, recognizing that designers must create facilities regardless of whether the associated science is available, the authors posit that some information is better than none. In the best case, the research knowledge shared here will ultimately be supported by clusters of studies. Minimally, designs based on the current level of knowledge summarized in this paper will serve as laboratories to examine the appropriateness of preliminary recommendations.

In order to operationalize the results of the review, the authors referred to the rubrics generated by the Active Design Guidelines (ADG) (New York City, 2010) initiative: strong evidence, emerging evidence, and best practice. In the ADG, evidence is defined as those strategies supported by evidence from at least two longitudinal or five cross-sectional studies, and emerging evidence is defined as strategies supported by a pattern of research. There were an insufficient number of BH environmental longitudinal or cross-sectional studies to populate a category under the heading of strong evidence. As a result, the highest category that the authors were able to achieve was emerging evidence. An additional category was added for the purposes of this literature review: studies requiring corroboration. Studies in this category tended to be empirical, but were insufficient in number to contribute to a particular design recommendation. The third category, design considerations, is the equivalent of the ADG best practice. Best practice refers to design strategies that have yet to be substantiated by a formal body of evidence, but are supported by practitioner experience and the observations by researchers.

Research

Social behavior, postoccupancy evaluation, harmful behavior, and children's environments are four of the primary topics targeted in the BH research studies.

Physical Environment and Social Behavior

The appropriate number of patients per bedroom has been a significant topic of discussion regarding social behavior. In one of the first environment and behavior studies in a psychiatric facility, Ittelson, Proshansky, and Rivlin (1970) examined the impact of bedroom size (based on number of occupants) on adult patient behavior. Comparing patient rooms ranging from singles to 12-bed dormitories, they concluded that the higher the number of occupants, the higher the percentage of isolated passive behaviors. Wolfe (1975) suggests that a 2-bed room forces a social intimacy that may be intimidating and detrimental to interaction. While these researchers provide support for the hypothesis that private rooms may be appropriate for some patients, other researchers/practitioners contend that shared rooms support patient safety (as the presence of a roommate might prevent a potential suicide), and that private rooms have the negative impact of encouraging withdrawal from therapeutic group interaction.

Several studies suggest a relationship between furniture location and arrangement and frequency of social interaction. These studies indicated that sociopetal arrangements (seats facing one another or seats perpendicular to one another) are often preferred to sociofugal arrangements (seats parallel to one another).

Pre- and Postoccupancy Evaluations

One of the most extensive postoccupancy evaluations in a BH facility was conducted by Rivlin and Wolfe (1979). Apart from a critique of the effectiveness of the facility spaces relative to the design intentions, the authors noted that regardless of certain environmental changes, programs are likely to fall back on institutional models of treatment delivery. Multiple occupant evaluations have addressed satisfaction. Corey et al. (1986) found that even superficial changes such as furniture and finishes had a positive impact on staff and patients. Dorr, Honea, & Pozner (1980) found a positive correlation between psychiatric nurse job satisfaction and higher scores on Moos' Ward Atmosphere Scale (Moos & Daniels, 1967).

Harmful Behavior

Most environmental psychologists agree that the physical environment can reinforce and encourage appropriate behavior (Gabb, Speicher, & Lodl, 1992). The physical environment can reduce the possibility of suicide by avoiding elements that might support hanging or self-injury. Some aspects of the environment, such as nature art, may help reduce stress, pathological behaviors, and aggression. In 2012, Ulrich, et al. compared a number of chemical or physical constraints used in two hospitals and showed that the presence of a bundle of design attributes can decrease patient aggression. These items included availability of private rooms, less crowding, movable furniture, better acoustics, nature window views, nature art, higher daylight exposure, homelike design, and proximity and visibility of common spaces to the staff station.

Children and Adolescents

Regarding facilities for children and adolescents, Wilson, Soth, and Robak (1992) noted that smaller inpatient clusters resulted in reductions in vandalism, theft, and acting out on the part of patients and an increased feeling of belonging, competence, and satisfaction on the part of staff. Shepley (1995) conducted a pre- and postoccupancy evaluation of an old children's psychiatric facility with wards to a new children's psychiatric facility with 2-bed rooms and found that the number of incidents reduced significantly during the period immediately after the building completion. Also of note was that more negative behaviors occurred in the new semiprivate rooms than the old dormitories, although the behaviors were less harmful.

Trends

Over the last 20 years, there has been a transition from creating visually plain environments (so as not to overstimulate patients) to richer, more complex spaces and increased access to the outdoors (Cochran, 1978). According to Levin (2007), the primary trends in contemporary psychiatric facility design address environments that support recovery, induce shorter stays, and allow the patient to participate in his or her treatment. Environments that support recovery likely involve access to natural light and the outdoors and artwork involving nature. Sense of control is a critical factor contributing to the healing of a variety of mental illnesses. Providing environmental flexibility (acoustics, lighting, and furniture options) may be helpful in supporting this goal. Spaces that support participation in treatment are those that

provide environments that are sufficiently flexible in configuration as to allow for a variety of activities. Other trends include the increased need to provide environments that address program spaces for drug and alcohol addiction and the more common use of single-patient rooms. In general, the body of research on BH facilities is limited and lacks rigor, making it premature to establish evidence-based guidelines.

Assessment of BH Guidelines

Guidelines for BH design help to guide the planning, programming, and design process, but do not provide direct references to evidence-based research. Either these guides are part of the industry standard (such as the Facility Guidelines Institute), federal health care systems (such as Military Health Systems), or national standards (such as Australian and Canadian Healthcare Standards).

The assessment team reviewed eight design guidelines for BH from five different organizations: the Department of Defense, the Department of Veterans Affairs, Facility Guidelines Institute (FGI), the Australasian Health Facilities Guidelines (HFG), the Canadian Standards Association, and guidelines by J.M. Hunt and D.M. Sine in partnership with the National Association of Psychiatric Health Systems. Guidelines were published by the American Institute of Architects (AIA) 20 years ago, but they have not been updated since. The assessment team reviewed the intent of each guideline, intended audience, areas covered, and how the guideline was used.

The motivation for promoting research to inform standards is to improve outcomes and decrease costs. However, available guidelines are not comprehensive, lack references to evidence-based research, and are not validated by third-party entities. In general, to promote research that could validate design guidelines for this unique population the following are recommended:

1. Define the variables of interest, as well as their application and measurement tools.
2. Identify the most vulnerable populations.
3. Acknowledge the specific needs of each setting type.

Grant Sources

Few funding opportunities exist to address the impact the designed environment has on this vulnerable and unique population. Those that are available include:

1. Government funding sources such as the National Institute of Mental Health (NIMH), National Institutes of Health, and Agency for Research
2. Non-profit funding sources such as the Robert Wood Johnson Foundation, Johnson & Johnson Grant/Society for the Arts, the Graham Foundation, the Patient-Centered Outcomes Research Institute, and the Kresge Foundation

Regarding for-profit funding sources, none were found but there could be companies that set aside money for research and development and have an interest and investment in the design of facilities that serve this population. Approaching these companies directly might result in the identification of funding toward research in this area.

Per the mission statement of the NIMH funding in this area could change our awareness and treatment of behavioral illness through basic research, bringing us closer to prevention and cure (NIMH, 2013). The following are suggested ways to encourage available funding sources:

1. Work closely with the NIMH (and other organizations that provide research funding services to people with mental health diagnoses) to develop a shared mission for design research surrounding the populations addressed within the NIMH to open up the possibility to share funding resources allocated.
2. Encourage research funding agencies to focus on the following:
 - a. promotion of interdisciplinary research
 - b. recognition of the interconnection between people and organizational process
 - c. promotion of BH research that addresses external validity and reliability
 - d. support of practice-based research

Conclusions

While there was a surge in studies on the role of the physical environment in behavioral settings in the 1970s, little attention has been given to this topic in the intervening 40 years. To initiate this effort an agenda is required.

The first step in setting a research agenda is to establish theoretical structures around which studies can be built. Potential theoretical approaches are Antonovsky's salutogenic theory, which proposes that health is supported by coherence, and coherence is supported when the environment is comprehensive, manageable, and meaningful. Ulrich's Theory of Supportive Environments (Ulrich, 1997), which addresses positive distraction, is also relevant.

In conclusion, the amount of research on the topic of environments is minimal and insufficient to inform the design process and support the generation of design guidelines. One of the reasons for the lack of research is the lack of funding for studies that address the impact of BH environments. In light of the continued demonstration of the positive effects of EBD on the health of patients, BH must be a priority for design researchers and funding entities.

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INTRODUCTION

Fueled by the trend toward evidence-based design (EBD), research on healthcare facilities has increased over the last 20 years. A variety of topics have been covered in this effort. However, studies addressing the design of behavioral health (BH) environments are few. The absence of research in this area of specialization is surprising, as legal precedents have spoken to the need for quality environments for many years. In 1971 a U.S. court (*Wyatt v. Stickney*, 1971) ruled that psychiatric patients have a right to quality physical environments that support treatment goals (Sommer & Kroll, 1979).

In 1985 at the Joint Hearings before the Subcommittee on the Handicapped, staff presented findings from 31 facilities and 600 interviews indicating that hospital patients and staff were subject to injury and living conditions were unacceptable (U.S. Senate, 1985). Subsequently, the United Nations General Assembly adopted a resolution of “Principles for the Protection of Persons with Mental Illness and Improvement of Mental Health Care” (G.A. Res. 119, U.N. GAOR, 46th Sess., Supp. No. 49, Annex at 189, U.N. Doc. A/46/49 (1991)). In spite of multiple legal precedents and national and international resolutions, examples of good BH facility design are not widely disseminated. The reality may be that mental health patients are expected to adapt to environments where others would not elect to spend long periods of time (Spivak, 1984).

The concept of therapeutic milieu has been discussed by mental health experts, such as Tuck and Keels (1992) and Thomas, Shattell, and Martin (2002). In his 2008 paper, Sine describes the evolution of psychiatric architecture, from prisonlike units to a more therapeutic environment throughout the years. To this end, Jonas and Chez (2004) identify seven components of optimal environments, one of which is, “the physical space in which healing is practiced, including characteristics of light, music, architecture, and color among other elements...” (p. S-1). Mahony Palyo, Napier, and Giordano (2009) emphasized application of systems thinking model to mental healthcare. In this model, the environment influencing occupant’s health extends from the cell and molecular level to interactions between individuals, followed by role of the healthcare system.

Awareness of the impact of architecture and acknowledgement of the inappropriateness of many BH settings encourages development of the design guidelines that support the objectives of care in behavioral health facilities. Early studies by Kasmar, Griffin, and Mauritzen published in 1968 and 1969 (Griffin, Mauritzen & Kasmar), used experiments and literature reviews to investigate the impact of design on psychiatric patients' behavior and perception of their surrounding environment.

While these early studies expressed a lack of guidelines and clear-cut findings, later studies continued to bridge the research gap by establishing the relationship between the built environment and psychiatric treatment. A review of the research findings and clinical conjecture of the past 50 years indicates that “intervening environmentally through clinically informed, patient-centered design can improve functioning both among and between patients and staff” (Karlin & Zeiss, 2006, p. 1376). The limited number of studies is evident when reviewing the literature on the impact of behavioral healthcare environments on patient outcomes, including systematic literature reviews conducted by Devlin and Arneill (2003); Dijkstra, Piesterse, and Pruyn (2006); Drahota, et al., (2012); and Evans (2003).

The purposes of this paper are multiple. Firstly, the authors summarize the literature on research studies and tools regarding BH facilities. Secondly, a summary of design guidelines and potential funding sources are provided. Thirdly, recommendations are suggested regarding future research. The reviewed literature primarily focused on general inpatient psychiatric wards, but does address other settings as well.

Approximately 300 articles were reviewed for possible incorporation of which 115 were deemed sufficiently appropriate for this literature review. The criteria for inclusion included (a) relevance to the topic of behavioral health facilities, (b) a demonstration of clear research methodology or practice/research supported guidelines, (c) post-1960 publication, and (d) publication in peer-reviewed journals. In a few cases, the publications occurred in non-peer-reviewed journals. In these cases, the structure of the data or the experience of the author(s) merited inclusion.

The authors accessed the following databases in pursuit of these research papers: EBSCO (academic and business), CAB abstracts (Ovid), Pubmed, Medline, ERIC, PsychINFO (Proquest), ScienceDirect (Elsevier), and Web of Science. Search

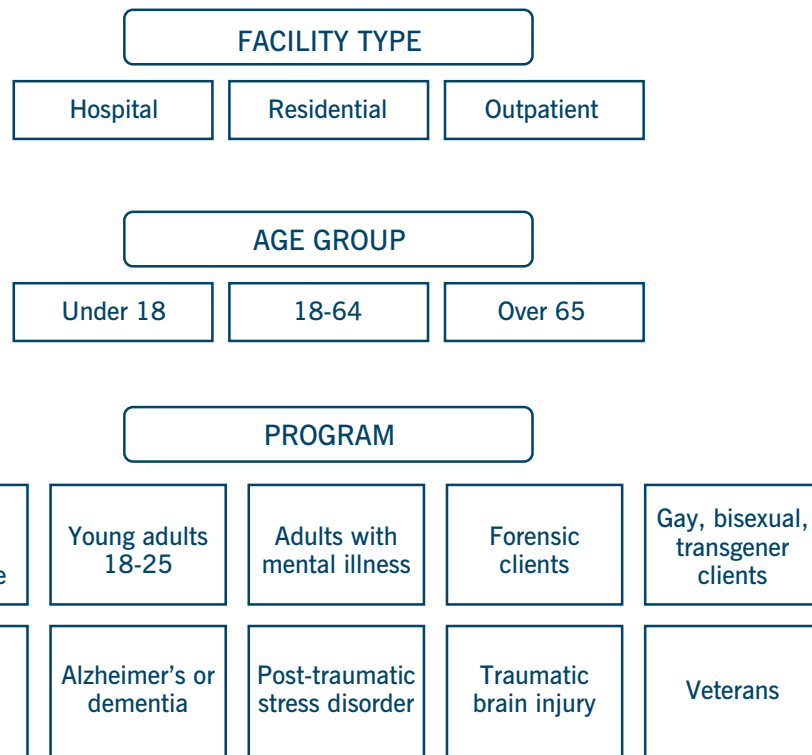
terms included combinations of the following: psychiatric, behavioral, design, architecture, facility, health, environment, mental, rehabilitation, as well as other synonyms for these terms. Within the typology of BH facilities, the review does not include a summary of therapeutic environments for individuals with developmental disabilities, autism spectrum disorder, or dementia. Although the emphasis in the literature is placed on residential/inpatient facilities, the design principles also apply to outpatient environments.

Issues in Mental Health

Range of Settings

One of the challenging issues in conducting BH research is the variety of potential settings. Psychiatric facilities include psychiatric hospitals, psychiatric and neuro-psychiatric nursing units of general hospitals, facilities for the psychiatric medically infirm, gero-psychiatric units, alcohol and drug addiction treatment facilities (both inpatient and outpatient), mental health clinics, day hospitals, day treatment centers, and others (Carr, 2011). A summary of patient categories and settings is provided in Figure 1.

FIGURE 1
Populations and
Categories of Behavioral
Health Facilities



Note: Derived from Substance Abuse and Mental Health Services Administration, U.S. Department of Health and Human Services website "Behavioral Health Treatment Services Locator" available at <http://findtreatment.samhsa.gov/MHTreatmentLocator/faces/servicesSearch.jspx>

The settings in which patients find themselves vary dramatically. Apart from inpatient and outpatient environments, there are multiple residential hybrids, such as halfway houses. Some settings are not designed to deal with the care needs of individuals with BH diagnoses. For example, Rabins, et al. (1996) point out the high prevalence of psychiatric disorders in senior residents of public housing facilities. In some cases, mentally ill patients and cognitively impaired patients share space, to the detriment of each.

At least one study demonstrates the impact of mixed purpose facilities on staff and patient satisfaction. Craig, et al. (2000) used behavior observation and patient tracking methods in an elderly psychiatric ward and found that patient and staff satisfaction could be improved by separation of cognitively impaired (i.e., dementia) from functionally challenged (i.e., depressed) patients. However, available research does not provide enough evidence to draw conclusions regarding specific design guidelines for each patient group or groups of patients that need a separate environment of care.

Variety of Diagnoses

Another issue is the variety of diagnoses. The National Institute of Mental Health identifies 11 primary topics in the discussion of mental health in relationship to diagnosis:

- anxiety disorders
- attention deficit hyperactivity disorder
- autism spectrum disorders
- bipolar disorder
- borderline personality disorder
- depression
- eating disorders
- prevention
- research on HIV and AIDS
- schizophrenia
- suicide prevention

Under the category of anxiety disorders are generalized anxiety disorder, obsessive-compulsive disorder, panic disorder, posttraumatic stress disorder, and social phobia (NIMH, 2013).

It is difficult to simultaneously support the needs of such a wide variety of individuals, many with sensory processing deficits and cognitive disorders. Consequently, research on BH patients is challenging due to the patient's unique needs, preferences, symptoms, and behaviors, ranging from suicide risk (Appleby, 1992) to short-term memory deficiencies (Tek, et. al., 2002), or absconding (Nijman, et al., 2011).

In addition to type of diagnosis, certain characteristics of the population may influence their evaluation of the environment. A study conducted by Klett, Berger, Sewall, and Rice (1963) suggests that, while education and length of hospitalization did not influence patient evaluations of the ward environment, variables such as age, gender, and patients' predicted date of discharge significantly correlated with their evaluation. Among these variables, predicted date of discharge merits attention, which influences patients' mental readiness to cope with the existing condition as a permanent versus short-term situation.

Data Collection

A third problem is the difficulty in gathering data from mental health patients and residents. First and foremost, the methods for gathering data must honor the privacy and preferences of subjects. The reliability and validity of subject responses are also important issues in research. Particular concern has been expressed with regard to the capacity of mental health patients to respond clearly to evaluation surveys, as their responses might be influenced by "personalized and idiosyncratic responses which might be of questionable validity" (Rice, Berger, Klett, Sewall, & Lemkau, 1963, p. 251). Questions exist regarding validity of responses considering patients' cognitive abilities, memory issues, and emotional stability. Additionally, as psychiatric patients are frequently evaluated for their personal characteristics, these evaluation tools might be perceived as clandestine means of psychological state assessment, and subjects might attempt to manipulate the results.

On the other hand, gathering of data from patient proxies might not be appropriate. In studies of social or physical ward environments, staff evaluations of the physical

and social environment have not always been found to accurately reflect patient evaluations. Brunt and Rask (2005) used the Ward Atmosphere Scale (WAS) to obtain psychiatric patient and staff perceptions of the ward atmosphere. They found that the two groups assess the ward social environment differently in terms of autonomy and involvement, program clarity and order, and organization. Beazley and Gudjonsson (2011) noted a reciprocal relationship between WAS scores and depression. Main, McBride, and Austin (1991) surveyed psychiatric patients and staff using WAS and concluded that staff and patients scored various categories of behaviors differently. For example, staff self-evaluations were higher than patient evaluations of staff regarding involvement, support, spontaneity, practical orientation, personal problem orientation, and program clarity. Meanwhile patients rated staff higher than staff in categories perceived as negative (control). As another example of dissimilar responses, Marcheschi (2012) found that staff perception of the social climate was more positive than resident perception.

Schjødt, et al. (2003) also found differences in patient and staff ratings of the ward atmosphere, but concluded that such differences reflect “nuances in views rather than fundamental differences in opinion” (p. 215). Marcheschi (2012) recommends integrating users’ and experts’ environmental assessments to better understand the interaction between physical and social environment and related impacts on user well-being.

Issues Regarding War Veterans

One of the motivators for producing this report was the importance of conducting a literature review on research on facilities for war veterans. Challenges faced by military personnel include pain management, posttraumatic stress disorder (PTSD), traumatic brain injury, drug addiction, and suicide. The number of suicides by U.S. military personnel has more than doubled since 2004 (Bryan, Rudd, & Wertenberger, 2013). While many of these suicides take place outside of BH settings, they are an indicator of the increased need for mental health treatment facilities for veterans.

Very few studies were uncovered that gather data on BH facilities for veterans (e.g., Watts, et al., 2012). For example, while several research projects address access to healing outdoor spaces in healthcare environments in general, in their 2013 review

of literature, Wagenfeld, Roy-Fisher, & Mitchell (2013) found no peer-reviewed article that connected positive health outcomes in veterans with PTSD to access to healing nature. However, they used available literature on healthcare environments to conceptualize a model to suggest benefits of access to nature for this unique population. Similarly, the literature summarized in this white paper is pertinent to the needs of veterans grappling with BH issues and their needs in the built environment.

Behavioral Health Facility Evaluation Tools

Eight BH facility occupancy evaluation tools were identified in this literature review. These tools are designed to evaluate the social or physical environment, and some of them cover the characteristics of the treatment plan as well. Most of the tools are focused on evaluating the psychiatric ward environment. However, a few can be used for all types of mental health facilities. Available tools also vary in terms of intended respondents, some of them are designed to be used by staff members, while others are designed to be used by both staff and patients to compare their perspective on various characteristics of the social or physical environment. Tools are summarized in Appendix 1.



LINKING RESEARCH TO DESIGN

Via this literature review the authors intended to link research and guidelines. Unfortunately, the number of rigorous studies was too limited to advance EBD recommendations. However, recognizing that designers must create facilities regardless of whether the associated science is available, the authors posit that some information is better than none. In the best case, the research knowledge shared here will ultimately be supported by clusters of studies. Minimally, designs based on the current level of knowledge summarized in this paper will serve as laboratories to examine the appropriateness of preliminary recommendations.

Strong Evidence and Emerging Evidence

In order to formulate potential design guidelines that at this point reflect more design hypotheses than well-documented, evidence-based recommendations, the authors sought a structure in which to categorize the implications of the literature content. Using, in part, the model generated by the *Active Design Guidelines* (ADG) (NYC, 2010) initiative, the authors developed strategies focusing on evidential support. In the ADG, *strong evidence* is defined as those strategies supported by evidence from at least two longitudinal or five cross-sectional studies, and *emerging evidence* is defined as strategies supported by a pattern of research.

There were an insufficient number of longitudinal or cross-sectional studies to create a category in this BH paper suggesting strong evidence. The highest category that the authors were able to substantiate was emerging evidence. Examples of emerging evidence are summarized in Table 1 (on the next page). An additional category was added for the purposes of this literature review: studies requiring corroboration. (See Table 2 on page 19.) This category refers to studies or pairs of studies that suggest potential conclusions, but lack enough documentation to be considered evidence.

Table 1 Emerging Evidence in Behavioral Health Facility Design

Unlike some bodies of research, there are very few rigorous studies on the topic of behavioral health facilities. If we were to evaluate the literature identified in this review, of the approximately 115, no more than 10 are sufficiently rigorous to merit the drawing of conclusions, and of those, there is little overlap to generate what might be described as strong evidence. Nevertheless, we attempted to identify recurring patterns in the literature, as reflected below, and categorize them as emerging evidence. Future research should consider addressing one of these topics to elevate the issue to strong evidence.

General

1. Provide a flexible and deinstitutionalized and homelike environment (Carr, 2011; Devlin, 1992; Grosenick & Hatmaker, 2000; Priebe & Broker, 1999; Potthoff, 1995; Shepley, Frohman, & Wilson, 1999; Tapak, 2012; Ulrich, et al., 2012; Wilson, Soth, & Robak, 1992; Whitehead, Polsky, Crookshand, & Fik, 1984).
2. The ward environment should support patient autonomy and spontaneity (Sorlie, Parniakov, Rezvy, & Ponomarev, 2010; Middelboe, Schjodt, Byrsting, & Gjerris, 2001; Cleary, Hunt, & Walter, 2009).
3. Order and organization are recommended in a ward environment (Schjodt, Middelboe, Mortensen, & Gjerris, 2003; Eklund & Hansson, 2001).
4. Provide higher quality maintenance, furniture, and landscaping (Potthoff, 1995; Holahan & Saegert, 1973; Grosenick & Hatmaker, 2000; Christenfeld, Wagner, Pastva, & Acrish, 1989).
5. Choose furnishings that resist damage and are easily replaced and repaired (Davis, Glick, & Rosow, 1979; Carr, 2011; Shepley, et al., 1999).

Patient Rooms

6. Provide private patient rooms (Wolfe, 1975; Tyson, Lambert, & Beattie, 2002; Turlington, 2004; Shepley, et al., 1999; Izumi, 1968; Cleary, et al., 2009; Chou, Lu, & Mao, 2002; Ulrich et al., 2012).
7. Provide lower density patient rooms (large two-person bedrooms) (Wolfe, 1975; Wilson, et al., 1992; Turlington, 2004; Izumi, 1968; Chou, et al., 2002; Ulrich, et al., 2012).

Dayroom

8. Provide dayrooms and common areas that encourage social interaction and promote sense of community (Turlington, 2004; Sidman & Moos, 1973; Holahan & Saegert, 1973; Gutkowski, Ginath, & Guttmann, 1992; Devlin, 1992; Davis, et al., 1979).
9. Facilitate the staff observation of the day room and spaces used by patients from the nursing station (Whitehead, et al., 1984; Turlington, 2004; Shepley, et al., 1999; Christenfeld, et al., 1989; Chou, et al., 2002; Carr, 2011; Ulrich, et al., 2012).
10. Locate a mix of seating arrangements that support social interaction between different groups of patients (Priebe & Broker, 1999; Minde, Haynes, & Rogenburg, 1990; Baldwin, 1985).
11. Provide smoking rooms (Tyson, et al., 2002; Salerno, Forcella, Di Fabio, Figà Talamanca, & Boscolo, 2012; Shepley, et al., 1999).

Staff Spaces

12. Provide areas suitable for private one-to one interaction between staff and patients (Tyson, et al., 2002; Perkins, Prosser, Riley, & Whittington, 2011; McGuire, et al., 1977; Gutkowski, Ginath, & Guttmann, 1992).
13. Include spaces for staff mental health consultation and therapy (Salerno, et al., 2012; Chen, Huang, Hwang, & Chen, 2010).

Light and Nature

14. Maximize use of daylight (Turlington, 2004; Ulrich, et al., 2012; create well-illuminated interior spaces (Gutkowski & Guttmann, 1992); use a combination of natural and artificial light (Davis, et al., 1979).
15. Provide indoor and outdoor spaces for therapeutic activities (Sorlie, et al., 2010; Gjerden, 1997; Bryan, Rudd, & Wertenberger, 2013).
16. Provide visual or physical access to nature (Shepley, 1995; Potthoff, 1995; Shepley, et al., 1999; Ulrich, et al., 2012; Wagenfeld, Roy-Fisher, & Mitchell, 2013).

Safety

17. Enhance staff safety and security (Forster, Cavness, & Phelps, 1999; Lynch, Plant, & Ryan, 2005; Martin, 1995; Salerno, et al., 2012).
18. Avoid anchor points in the bathroom such as shower heads and breakaway towel hooks and architectural elements that can be used as weapons (Watts, Young-Xu, Mills, DeRosier, et al., 2012; Jeffers, 1991; Geddes, 1999; Carr, 2011).

Table 2 Studies Requiring Additional Corroboration

The list of items represented here was suggested by at least one researcher or research team and is supported by experience from practice. Multiple rigorous studies are needed on each of these conclusions to consider them to be evidence. The reader should also be cautioned that the recommendations be placed in the context of the particular study and patient type, and the associated articles should be reviewed prior to application to a specific project.

General

1. Provide locked doors between units (Wilson, Soth, & Robak, 1992).
2. Accentuate functional uses and humanistic values through color and graphics (Whitehead, Polsky, Crookshand, & Fik, 1984).
3. Include open closet arrangements (Watts, Young-Xu, Mills, DeRosier, et al., 2012).
4. Use art that is realistic and displays social engagement (Nanda, Eisen, Zadeh, & Owen, 2010).
5. Provide spaces with clear territorial designations (Shepley, Frohman, & Wilson, 1999).
6. Provide entrance that is visible from staff locations in the interior of the building (Shepley, et al., 1999).
7. Provide high-quality air filtration systems in psychiatric wards (Salerno, Forcella, Di Fabio, Figà Talamanca, & Boscolo, 2012).
8. Ambiguity in design should be avoided (Izumi, 1968).
9. Evacuation routes must allow egress from each area to an area of refuge (Jeffers, 1991).
10. Provide good temperature control (Devlin, 1992).
11. Provide small ward for patients to have wide freedom of choice on various activities and large ward for patients to have isolated passive behavior (Ittleson, Proshansky, & Rivlin, 1970).
12. Play music selected by the ward therapist (Hunter & Love, 1996).
13. Create a welcoming reception area (Gutkowski & Guttman, 1992).
14. Define different function units with clear boundary (Gutkowski & Guttman, 1992).
15. Clearly separate public and private areas (Gutkowski & Guttman, 1992).
16. Facilitate closer contact between hospital and its neighborhood (Gutkowski, Ginath, & Guttman, 1992; Geddes, 1999).
17. Provide acoustic privacy when needed (Carr, 2011).

Dayroom

18. Provide direct orientation of seating for more affiliative behavior; provide greater distance between seating to decrease social pressure (Mehrabian & Diamond, 1971).
19. Smaller activity space creates stronger sense of community (Townley, Kloos, & Wright, 2009).

Patient Room

20. Provide large closet in adolescent rehabilitation facilities (Potthoff, 1995).

Other Patient Spaces

21. Provide a central meeting area or living room for staff and patients where patients can visit their families (Carr, 2011).
22. Provide space for exercise and sports for adolescent rehabilitation (Potthoff, 1995).
23. Reduce restraint space (Perkins, Prosser, Riley, & Whittington, 2011).
24. Provide onsite childcare for substance abuse environment (Grosenick & Hatmaker, 2000).

Staff Spaces

25. Provide an office for the psychiatric physician to be present and visible during daytime hours (Wilson, Soth, & Robak, 1992).
26. Provide an office for the interns (Wilson, et al., 1992).
27. Minimize staff walking distances (Carr, 2011).
28. Make nursing station and doctors' office readily accessible to patients (Gutkowski & Guttman, 1992).
29. Staff rooms should be designed to lower authoritarianism (Anderson, Good, & Hurtig, 1976).

Light and Nature

30. Provide access to the main courtyard during meals (Hunter & Love, 1996).

Safety

31. Implement mental health Environment of Care to reduce suicide rates (Watts, Young-Xu, Mills, DeRosier, et al., 2012).
32. Limit the number of large shared spaces to reduce the chance of violence (Perkins, et al., 2011).

Design Considerations: Best Practices as Suggested by Experts

The third category is design considerations, or best practice, as suggested by experts. The items in this category indicate design strategies without a formal evidence base. However, common understandings of behavior and experience from existing practice suggest that these are viable concepts. Many competent design decisions have been made based on the knowledge brought to the table by designers and BH practitioners.

Multiple researchers and designers have made recommendations for the design of behavioral health facilities. Izumi (1968) suggested that the provision of privacy and density control, coupled with unambiguous, cohesive, and reassuring design, can support treatment goals in psychiatric units. Dix (2001) recommended that a mental health facility consider safety measures against aggression, impulsive behavior, and absconding, while accommodating a range of therapeutic activities. While experienced practitioners and researchers debate the role of color and visual complexity, most recommend interiors that are: stylistically familiar to the prior experience of residents (noninstitutional), safe, provide access to nature (windows, courtyards, etc.), and address privacy through the provision of private rooms.

Table 3, Considerations For Behavioral Health Facilities, is an amalgamation of the recommendations derived from 17 publications and The Department of Veterans Affairs (2010).

The authors note that the dates of most of these recommendations range from 1966 to 2006 and that the characteristics of the residential populations served over this period have changed. Most notably, the number of patients in residential care has decreased significantly. Only the most acute patients have been retained in traditional psychiatric settings, a circumstance that impacts the design goals of that environment.

Some of the guidelines addressed in Table 3 are not based on specific research projects. However, they are included here due to the credentials of the authors and the absence of a broad research database. The recommendations have been divided into two categories, one summarizing issues associated with environmental psychology (Psychological Needs), and the other (Functional Needs) summarizing recommendations regarding functional factors.

It is noteworthy that most of the studies conducted on psychiatric facilities fail to elaborate on type of mental disorders that the patient population had, probably due to the fact that psychiatric facilities serve a wide range of patients. Hence, the authors have presented generic design guidelines and considerations that apply to design of psychiatric facilities in general.

While Rivlin and Wolfe (1979) point out that operational protocols supersede the impact of the physical environment, the environment can serve to support good therapy objectives. Ultimately, the development of guidelines that are reliable is critical to the creation of environments that support the psychological needs and functional requirements of a well-designed facility.

Table 3 Considerations for Behavioral Health Facilities

PSYCHOLOGICAL NEEDS						
	Common areas	Patient units	Patient rooms	Staff spaces	Furniture, fixtures, equipment	General considerations
Personal Space/Density	Avoid overcrowding.	Incorporate clusters of 11 or fewer patients (ideally six) per pod.	Use a combination of double and single patient rooms.	Nursing station should not serve as a barrier that prevents normal interaction between patient and staff.		Provide acoustical privacy; increase the body-buffer zones for individuals with schizophrenia.
Control and Choice	Provide access to a kitchen and different portions of the facility when possible.		Provide opportunities to personalize the bedroom.		Use modular furniture so it can be converted and rearranged.	Provide spaces for autonomy; provide spatial flexibility.
Sensory Considerations	Avoid long corridors and reverberation; use color to adjust corridor proportions; provide a well-lit and ventilated dayroom.		Provide large, low windows to enhance the senses and reduce delirium.		Avoid artificial materials, complex patterns, color stimulation, monochromic schemes, and reflective surfaces.	Incorporate moderate noise and light stimulation; provide soft, indirect, full-spectrum lighting; good air quality; and neutral odors.

Table 3 Considerations for Behavioral Health Facilities (continued)

PSYCHOLOGICAL NEEDS						
	Common areas	Patient units	Patient rooms	Staff spaces	Furniture, fixtures, equipment	General considerations
Special Clarity / Organization	Clear separations between functional areas and clear circulation.		Use built-in furniture to delineate bedroom divisions.	Design an easily identifiable reception area that reflects the treatment goals and expectations.	Use finishes to differentiate areas and support activities and space.	Provide visual clues that help building users to understand the function of spaces; address human scale by providing appropriate transitions.
Stress Reduction	Include an exercise facility.	Use open layout, with no unnecessary barriers; avoid overcrowding.	Seclusion rooms should have a calm color, not white or gray.	Include staff lounge and garden.	Provide soothing artwork and pictures of familiar images.	Introduce blues in areas where calming is important.
Comfort	Corridors should be 8-9 feet in width in facilities for adolescents to accommodate their activity level.		Provide electric beds for the elderly.	Provide adequate office space for staff.	Specify upholstered comfortable furniture.	Avoid too much furniture in areas with patients in wheelchairs.
Hominess	Provide spaces that parallel functions experienced in the home.				Specify noninstitutional furniture.	Design style should be familiar and indigenous, not “decorative” or “trendy.”
FUNCTIONAL NEEDS						
Effective communication	Include private visiting areas and spaces that support family participation. Gathering areas for patients near the nurse station are encouraged.	Support communication between staff and patients in patient units.	Cordless phones may be provided to allow the patient to check out a phone for private conversations when appropriate.	Chart rooms and other staff areas should be located so conversations regarding patients and other clinical matters are private.	Arrange furniture in small group circular arrangements.	

Table 3 Considerations for Behavioral Health Facilities (continued)

FUNCTIONAL NEEDS						
	Common areas	Patient units	Patient rooms	Staff spaces	Furniture, fixtures, equipment	General considerations
Connection to the Outside	Provide windows in group room; maintain links to the local community.		Locate windows to serve as focal points in the room and provide views.		Incorporate infrastructure for new technology and access to computers when possible.	Make the building contextual with the community and easily accessible to vehicles and pedestrians; demonstrate its purpose.
Access to Nature	Provide access to porch areas, outdoor gardens, therapeutic landscape.	Provide multiple windows with views of nature	Provide sunlight and fresh air in patient rooms		Use natural wood when possible. Furniture should not be located adjacent to a fence or wall.	Use courtyards instead of fenced outdoor areas. Avoid placing trees near the building.
Treatment and Care	Design multiple spaces that support a range of treatment activities; group kitchens may provide therapeutic milieu.			Locate nursing stations next to seclusion rooms, if possible.		Provide retreat/private spaces.
Safety	Sprinkler heads that are tamper resistant and cannot be used as an anchor point should be installed.	Provide controlled access between patient units.	Patient rooms should be abuse resistant.	Nurse stations should provide the least possible barrier between staff while preventing patients from jumping over the counter.	Use movable furniture but too heavy to throw; shatterproof glass, tamperproof outlets, lockable water taps. Avoid sharp corners.	Doors shouldn't swing into areas where people may be moving past. Limit window openings; avoid hiding places and blind corners.
Maintenance	Use hard floor surfaces in circulation areas.		Use carpet in bedrooms and residential areas where soiling isn't a problem.	Provide sufficient housekeeping areas.	Provide durable, cleanable furniture and finishes.	Locate service areas so that they are accessible both from the unit and a service corridor. Locate serviceable parts of patient-rooms where they can be accessed without entering the room.

Design Considerations are an amalgamation of the design recommendations of Anderson, Good and Hurtig (1976); Carr (2011); Davis, Glick and Rosow (1979); Cotton and Geraty (1984); Devlin (1992); Gabb, Speicher, and Lodl (1992); Gross, Sasson, Zahry, and Zohar (1998); Gulak (1991); Heimstra and McFarling (1966); Hunt and Sine (2012); Karlin and Zeiss (2006); Moon, Kearns, & Joseph (2006); Remen (1991); Shepley (1995); St. Clair (1987); Spivak (1984); and Tyson, Lambert, and Beattie (2002), as well as design guidelines published by the Department of Veterans Affairs (2010).



RESEARCH

The research the authors uncovered in this review commonly focuses on traditional psychiatric hospitals as the primary-care sites for people with mental illness. Studies on the design of mental health facilities generally fall into one of three categories: (1) the relationship between the physical environment and social behavior, (2) pre- and postoccupancy studies, and (3) the relationship between the physical environment and harmful behavior. Similar to other healthcare facilities, physical environment is not the only factor influencing patient outcomes. Karlin and Zeiss (2006) categorized the domains that can impact patient outcomes in psychiatric hospital as ambient features, architectural features, and social features.

Along these lines, during a mental health facility relocation, Cleary, Hunt, & Walter (2009) interviewed patients to measure their satisfaction with comfort, safety, cleanliness, privacy, food, information about the facility, and perceptions of care. Likewise, Gjerden (1997) studied psychiatric patients' satisfaction with their stay by mailing a standardized questionnaire to patients discharged from the unit. The questionnaire included categories in which discharged patients would rate their satisfaction with ward staff, physical environment, information and influence, and treatment. In summary, studies of mental health facilities should be mindful of models of care, as well as organizational and cultural factors.

Physical Environment and Social Behavior

The appropriate number of patients per bedroom has been a significant topic of discussion regarding social behavior. In one of the first environment and behavior studies in a psychiatric facility, Ittelson, Proshansky, and Rivlin (1970) examined the impact of bedroom size (based on number of occupants) on adult patient behavior. Comparing patient rooms ranging from singles to 12-bed dormitories, they concluded that the higher the number of occupants, the higher the percentage of isolated passive behaviors, which may run counter to the objectives of a facility. Contrary to the hypothesis, increased density did not increase social interactions.

Additionally, private rooms were found to support a more diverse range of behaviors, while multiple-bed rooms were more likely to provoke a patient's withdrawal. To place this in context, Willer, Staslak, Pinfold, and Rogers (1974) found that patients spend a significant amount of time in their rooms (25.8%) and, while there, engaged primarily in passive activities (73.2%). Studies in substance abuse rehabilitation facilities demonstrate that control over privacy can lead to healthy social interactions and peer support that are instrumental in the success of the treatment program (Novonta, Urbanoski, & Rush, 2011). Similarly Grosenick and Hatmaker (2000) showed that environmental qualities including comfort, perceived attractiveness, noise, privacy, size, and location can contribute to achieving goals of the rehabilitation treatment plan. The treatment goals in this study included: reducing drug use, enhancing physical health, feeling good about oneself, interacting well with others, and preparing for independent living.

Wolfe (1975) confirmed the Ittleson et al. (1970) findings regarding the high frequency of isolated passive behavior for pediatric populations. Wolfe also noticed that children in private rooms used their rooms the most, followed by children in three-bed and four-bed rooms, and then children in two-bed rooms. Wolfe argued that a two-bed room forces a social intimacy that may be intimidating and detrimental to interaction and concluded that (1) activity type rather than mathematical density should dictate room size, (2) private rooms will be used most frequently, (3) the use of the room and interactive behaviors decreases as the number of beds per room increases, and (4) two-person rooms require more than double the space required for a one-person room.

Rivlin and Wolfe (1979) note that room size and group size interact to create the aforementioned behavioral responses. Kho et al. (1998) studied incidents in psychiatric acute admission wards that differed in size and design. Three of the units were new wards with single-patient rooms and the other units were older with shared living spaces. A higher frequency of aggression took place in the older units with shared living space. While these researchers provide support for the hypothesis that private rooms may be appropriate for some patients, other researchers/practitioners argue that shared rooms support patient safety (as the presence of a roommate might prevent a potential suicide) and that private rooms have the negative impact of encouraging withdrawal from therapeutic group interaction.

Apart from the discussion about private and shared rooms, other behavioral outcomes are discussed in the literature. Mehrabian and Diamond (1971) found that furniture arrangements and the presence of sculpture or art increased social interaction among psychiatric patients. Holahan (1972; 1974; 1979) noted that mixed sociofugal (seating arrangements in which seats face away from one another, as is common in a bus station), sociopetal seating (seating arrangements in which chairs face toward one another), and sociopetal seating supported interaction more effectively than sociofugal or free seating (at the discretion of the patient).

Investigating social behavior of schizophrenic patients, Holahan and Saegert (1973) found patients socialized more in a newly remodeled ward with bright colors compared to a ward with old and worn furniture and dark and dull color scheme. They observed no difference in levels of nonsocial active behavior between the two wards.

In a related study, not limited to social interaction, Fairbanks et al. (1977) investigated how the physical environment impacted social organization and behavior, whether there were variations in staff and patient use of space, and whether room designation or furniture arrangement impacted behavior. Using behavior observation, they found (1) patients heavily used the dayroom and TV room in addition to the hallway adjacent to the nurses' station or window, (2) patients frequently used areas with furniture, and (3) staff often sequestered themselves in the nurses' station or the adjacent hallway.

Social factors are particularly critical with regard to counseling environments. Evidence shows that the physical environment affects: client overall comfort, as well as the establishment of a relationship (Morrow & McElroy, 1981; Backhaus, 2008); communication and self-disclosure (Miwa & Hanyu, 2006; Chaikin, Derlega, & Miller, 1976); impressions of therapists' credibility, skills, and expertise (Miwa & Hanyu, 2006; Backhaus, 2008; Delvin, et al., 2009); and stress and anxiety (Rashid & Zimring, 2008; Kweon, Ulrich, Walker, & Tassinari, 2008). These factors can also affect the counseling professionals' health and ability to provide quality therapeutic care (Lynes, 2011). Sagha Zadeh, Shepley, and Gartner (2013) looked at the impact of environmental design on effective therapy from the counseling professionals' perspective using (a) structured and unstructured questionnaires the Ideal Workspace Survey, and the Workspace Satisfaction Survey; (b) participant interviews; and (c) archival and document analysis and walk-through site evaluation.

The following five studies fall into the category of pre- and postoccupancy evaluations, as they compare behavior in facilities prior to and after construction or remodeling. Social behavior facility evaluation studies range from the redesign of a hallway to the examination of multiple units with a strong emphasis on social behavior. The nature of the physical changes made pre- and postevaluation vary enormously. And in many cases, are not described in any detail, making interpretation of what design factors may have led to changes in observed behavior difficult.

1. Research conducted at Dykebar Hospital (Edgerton, n.a.) focused on effects of a new corridor design commissioned by an artist. Changes included new paint color, glass replacement, additional trees planted outside the facility, new floor covering, introduction of structure to alter the visual perspective, timber seating elements, and artwork. After the change, the number of patients using the corridor did not increase, but those who did use it were more likely to converse and walk.
2. McGuire, et al. (1977) observed behavior in four wards and recorded environmental variables. Changes that were noted in modified environments were: (1) removal of glass windows at the nurses' station resulted in more staff visual observations, but did not increase staff-patient interactions and (2) the probability of a conversation between two people increased when only two were in the room.
3. Using interview and behavior mapping techniques, Holahan and Saegert (1973) found significantly more socializing and less isolated passive behavior in a newly remodeled unit than in a control unit. Additionally, patient attitudes toward the new space were more positive. In a subsequent study, Holahan (1976; 1979) examined the impact of a unit remodeling that influenced changes in staff roles, communication, distribution of power, ward social systems, and patient behavior using behavioral mapping techniques. The focuses of the research were interactions between investigators and ward staff, daily ward routines, and critical incidents. After the remodeling, patients were significantly more engaged in social behavior, and researchers observed reductions in the hierarchical structure, better communication, and expansion in roles.

4. Minde, Haynes, and Rodenburg (1990) examined the impact of a remodeled day room (new pictures, plants, furniture, comforters) on a psychogeriatric unit and found increased room usage and more frequent visiting.
5. Apart from interaction between patients, researchers are interested in the interaction between staff and patients. Tyson et al. (2002) evaluated staff in old and new psychiatric units using behavior observation and job satisfaction self-ratings. The percentage of time spent in staff-patient interaction increased from 13.9% to 23.0%, and the proportion of positive quality interactions increased from 17.7% to 98.8%.

The following section describes occupancy evaluations that were developed to address a variety of outcomes in addition to social behavior.

Pre- and Postoccupancy Evaluations

A major concern of clinicians and researchers in the field of psychiatry is evaluation of therapeutic techniques used or models of care implemented with regard to treatment outcomes. Consequently, pre- and postoccupancy evaluations of psychiatric facilities mainly focus on change of treatment plans (Okin, 1995) or deinstitutionalization of the environment of care through a shift from psychiatric hospital ward to the community (e.g., Hobbs, Newton, Tennant, Rosen, & Tribe, 2002).

Another group of studies involves relocation without a fundamental change in the model of care (e.g., Kagan & Kigli-Shemesh, 2005). Christenfeld, Wagner, Pastva, and Acrish in 1989, and Cleary, et al. in 2009, reported that few studies concerning relocation have explored impact of facilities with different design characteristics on patient outcomes and staff attitudes. In this context, the following is a summary of the literature on BH facility evaluation.

Multiple Facility Studies

One of the most extensive postoccupancy evaluations was conducted by Rivlin and Wolfe (1979). This longitudinal interview and behavioral observation in eight 24-bed houses addressed a broad range of physical elements including site, administration, infirmary, school, occupational therapy, recreation, and components

of the residential units. Apart from a critique of the effectiveness of these spaces relative to the design intentions, the authors note that, regardless of certain environmental changes, programs are likely to fall back on institutional models of treatment delivery. It is noteworthy that a review of several mental health facilities by Chrysikou (2013) revealed that designs of mental health facilities rarely follow the model of care and organizational policies they will house.

In another broad evaluation study, Devlin (1992) examined the impact of renovations on four wards of a 40-year-old psychiatric facility. Staff was asked to rate the wards pre- and post renovation. Behavior mapping of patients and staff was conducted on one unit. The survey addressed the day hall, sleeping areas, and bathrooms. Also addressed were ventilation, privacy, furnishes, color, lighting, wayfinding, temperature, socializing areas, plants, safety features, clocks/calendars, and air quality.

The behavior mapping protocol recorded subject location, subject status, and patient activity. Categories included sitting, walking, standing, lying down, eating, sleeping, talking, stereotypy, playing cards, writing, charting, working, and smoking. Based on the survey, it was concluded that staff rated most environmental variables higher in the new than the old facility. Also noted were reductions in patient stereotypy in the new facility. There was no improvement in general staff morale or ward stimulation.

While most of the literature described in this document focuses on settings in the United States, the issue of lack of quality BH environments is an international problem. A multisite study involving 164 of 231 psychiatric intensive care units (PICU) and low-security units (LSU) in the United Kingdom revealed that 37.5% of the PICUs and 36.5% of the LSUs failed on multiple issues (Pereira, Chaudhry, Pietromartire, Dale, & Halliwell, 2006). Shortcomings included lack of gender-specific facilities, the absence of an enclosed garden, and lack of seclusion facilities.

Satisfaction

Patient satisfaction with treatment encourages patients' participation in care (Vuori, 1991). Acceptance of treatment by patients with schizophrenia can positively influence results of the patient treatment (Broker, Rohricht, & Priebe, 1995; Priebe & Broker, 1999). However, satisfaction with care can vary depending on the patient

diagnosis. For example, lower satisfaction with care is found in patients diagnosed with depression (Koivumaa-Honkanen, et al.,1996).

Nijman, et al. (2011) suggested that improved living conditions, leading to patient satisfaction with physical or social environment, may reduce rates of patient absconding (unauthorized absence). Nijman and colleagues found a 30% decrease in absconding among acutely mentally disordered patients when the ward doors were locked during the entire shift. They found a positive correlation between patient unauthorized absence and the following: poor ward environment quality, unqualified staff, conflict behaviors, alcohol and drug use, verbal aggression, and self-harm. However, the authors argue that door-locking is far from a final solution.

Multiple occupant evaluations have addressed satisfaction. Corey, et al. (1986) found that even superficial changes such as furniture and finishes had a positive impact on staff and patients. Anderson et al. (1976) performed an evaluation of a new facility using 12 open-ended interview questions. Patients answered positively regarding the external facility, interior spaces, and general environment. However, the residential units provoked more negative responses. The researchers suggest the negative response to the residential units may have resulted from the change from open to locked connections between units. In a study comparing two wards, Müller, Schlosser, Kapp-Stein, Schanz, and Benkert (2002) found that satisfaction with pharmacotherapy was significantly higher in patients in the open ward compared to the patients in the closed ward for similar patient populations.

Potthoff (1991) conducted a study on adolescent satisfaction with the interior environment at three facilities: a renovated dormitory (previously for priests), a renovated college dormitory, and a facility designed specifically for adolescent inpatient drug treatment. Questionnaires were distributed to the adolescents and medical records were examined. The dormitory environments were institutional-appearing with mismatched furniture, while the environment designed for adolescent drug rehabilitation had carpeting, artwork, and high-quality furnishings and was more highly rated.

In an associated study, Potthoff (1995) also examined the impact of a rehabilitation facility located in a renovated club, hospital wing, and facility built for drug and alcohol treatment. Using questionnaires and records, the researcher found

that satisfaction declined with all three facilities progressively during the 4-week treatment period due to absence of familiar features such as posters, paints photographs, and collectibles. The patients indicated they missed their beds, chairs, and pets from home. Spaciousness, views to the outside, and privacy were the most positively received elements of the new space. Least-liked were lack of carpeting, color scheme, lack of comfort, and particularly the quality of the bed. Lack of recreational equipment was also mentioned as problematic.

Gutkowski, Ginath, and Guttman (1992) found that the addition of entrances in a mental health center resulted in better accessibility, greater sense of freedom, and improved unit identity. In the same article, they reported that the therapeutic atmosphere of a day hospital was reinforced by modifying the lighting, opening a stairway, and defining separate living and dining spaces. Regarding a day hospital, the designers also added bright colors and enhanced lighting and a separate entrance from the rehabilitation ward (Gutkowski and Guttman, 1992).

Townley, Kloos, and Wright (2009) conducted interviews, solicited drawings, and used a global positioning system (GPS) to determine the relationship between activity zones and satisfaction, sense of community, and attitudes toward recovery in patients living in supportive housing in the community versus traditional residential facilities. Individuals whose activity territories were larger (up to 37.40 square miles [96.9 square kilometers]) had higher life satisfaction, more positive attitudes toward recovery, and decreased sense of community than those with more limited activity ranges (as small as .06 square miles (.16 square kilometers)).

Staff Behavior

As with studies involving the social behavior of patients, occupancy evaluation researchers have been interested in staff behavior. Dorr, Honea, & Ponzer, (1980) found a positive correlation between psychiatric nurse job satisfaction and higher scores on Moos' Ward Atmosphere Scale (WAS) (Moos & Houts, 1968; Moos, 1989). Tyson et al., (2002) evaluated staff in old and new psychiatric units by examining burnout rates and analyzing job satisfaction surveys. The results indicated that staff in the new ward experienced less emotional exhaustion and increased sense of personal accomplishment. However, staff burnout rose due to increased engagement with patients, and there was no change in job satisfaction. Tuveesson, Eklund and Wann-Hansson (2011) used

the WAS and found that involvement and psychosocial work environment were indicators of perceived stress.

Setting-Response Inventory (SRI) is another tool used to obtain staff input regarding various settings in psychiatric wards on a 7-point scale. Moos and Daniels (1968) asked staff members to describe eight different ward settings, including individual therapy, group therapy, community meetings, staff rehash, alone, with a patient, with a nurse, and lunch. They were asked to rate the settings in terms of attentive-inattentive, friendly-hostile, outgoing-shy, sure-unsure, trusting-suspicious, and relaxed-tense.

Their study showed that different ward settings can elicit different reactions from staff members. In their study, staff felt more secure, trusting, extroverted, and sociable in individual therapy than in group therapy. They also found that among different staff members, senior staff felt more secure, trusting, extroverted, and sociable in any therapy session. They concluded that different staff members function best in different ward settings depending on their expertise, seniority, and personality.

Other organizational or social factors may also influence staff job satisfaction and quality of life. Chen, Huang, Hwang, and Chen (2010) studied the correlation between health-related quality of life and workplace physical violence (WPV) among the nurses in a psychiatric hospital in Taipei. They found a negative correlation between number of WPVs and years of employment; a 40% reduction was observed in number of WPVs reported among the staff that was employed over 5 years. Their findings also demonstrated a positive correlation between staff feelings of worry at work and number of WPVs reported.

Harmful Behavior and Stress

Most environmental psychologists agree that the physical environment can reinforce and encourage appropriate behavior, and avoidance of potentially harmful behaviors is a common objective in behavioral facilities. An environment can positively impact the behavior of patients and create a more supportive, stabilized environment for schizophrenic patients (Gabb, et al., 1992).

Suicide

The Centers for Disease Control (2007) report that more than 30,000 deaths by suicide take place yearly. In 2003, the American Psychiatric Association (2003) estimated that each year, 1,500 suicides take place in U.S. inpatient mental health units. Bowers et al. (2012) recommend staff visual access to patients at all times, especially individuals at risk of suicide, self-harm, or aggressive behavior. Physical objects and design features that can be exploited by aggressive or suicidal patients should be eliminated or safeguarded.

For example, Li et al. (2008) and Stewart, Ross, Watson, James, and Bowers (2011), among several other researchers, suggest that building fixtures such as handles, doors, fittings, pipes, curtains, shower heads, grab bars, plumbing, HVAC, and lighting be eliminated to reduce risk of self-harm. Dobrohotoff, and Llewellyn-Jones (2011) recommend high ceilings to hinder access to ceiling fixtures that can be used as anchor points for hanging. They also recommend collapsible curtain rails to reduce risk of hanging.

Gournay and Boswers (2000) recommend controlled access to rooftop and window openings where jumping may be possible. Watts et al. (2012) used the Mental Health Environment of Care Checklist (MHEOCC) to ensure compliance of all Veterans Health Administration (VHA) hospitals with safety measures. They found a significant reduction in number of completed suicides in VHA hospitals after implementation of MHEOCC.

Other factors such as time past admission can influence suicide rates as well. Hunt et al. (2013) reported that almost half of suicides take place within the first 3 days of admission. Their research suggests improvements to the ward environment to increase staff supervision and decrease patient distress especially during admission and the first days of hospitalization. In general, available guidelines recommend easy accessibility and proximity of security stations to BH units to allow quick response times (Yeager, et al., 2005).

Smoking

The negative effects of cigarette smoking and secondhand smoke on human health have prompted many healthcare facilities, among other institutions, to ban smoking on their premises (World Health Organization, 1997). However, smoking

bans may lead to challenges in psychiatric wards, more specifically because of higher prevalence of disruptive behavior as well as higher rates of smoking among psychiatric inpatients (Lasser, et al., 2000).

On the other hand, without an indoor smoking policy, staff job satisfaction and staff and patients' health are at risk (Salerno, Forcella, Di Fabio, Figa Talamance, & Boscolo, 2012), especially due to the high percentage of smokers. Crockford, Kerfoot, and Currie (2009) studied psychiatric patient behavior change before and after opening a smoking room in a psychiatric unit with a smoking ban. The smoking room was embedded in a psychiatric unit and shared by two adjacent units, was ventilated to the outside air, and only available to psychiatric inpatients for a maximum of one cigarette per hour. The researchers used staff surveys and chart reviews of 180 inpatients to gather data regarding incidents of disruptive behavior and concluded that implementation of a smoking room did not have a significant impact on reducing incidents of disruptive behavior.

Regardless, staff was in support of allowing the use of the smoking room to avoid spending time discussing smoking privileges with patients. The findings of this study are in alignment with the review conducted by el-Guebaly, Cathcart, Currie, Brown, and Gloster (2002). However, evidence is also available that assumes a direct link between assaultive behavior and smoking bans. Setting limits, such as denying off-site privileges or restrictions on cigarettes, were found to provoke aggression (e.g., Chou, Lu, & Mao, 2002).

Stress

Stahler, Frazer, and Rappaport (1984) made observations of patient behavior in a remodeled ward and a predecessor ward. Immediately after relocation, patient-staff interaction increased in the remodeled ward, but patients expressed increased stress as well as lower sociability and self-maintenance. Five weeks later, however, it was found that negative behavior had decreased below the levels experienced in the old unit, and no changes took place in the un-remodeled ward. Interviews indicated that the remodeling improved morale among patients and staff.

Less focus has been given to the impact of the environment on stress in outpatient settings. One group of researchers, however, recently studied the relationship between art displays and patient anxiety in an acute-care psychiatric unit. Nanda,

Eisen, Zadeh, and Owen (2010) found a significant positive correlation between presence of realistic art displays and anxiety reduction.

Pathological Behavior

Higgs (1970) noted a decrease in pathological behavior and behavioral appropriateness in schizophrenic patients after they had moved to a modernized unit. Similarly, Whitehead, Polsky, Crookshand, and Fik (1984) conducted behavioral observations to compare new and old facilities and found that the renovated environments were characterized by a reduction in pathological behaviors. Christenfeld et al. (1989) had partially conflicting results in their study on the impact of physical changes in the interior design of a ward on staff and severely regressed psychotic inpatients. The researchers compared renovated wards to similar traditional wards. Staff mood level improved, and unscheduled absences were reduced by 50%.

However, the researchers did not report improvement in ward atmosphere or patient functioning. The patients reported improvement in self-image, but not in irritability, depression, or isolation. On the other hand, patients were significantly more satisfied with the dayroom, and patient violence decreased by almost 50%. Teglbjaerg (2011) conducted a qualitative study on impact of art therapy on pathological behavior of schizophrenic patients. Those findings suggested that engagement in the artistic process, either through creation of a new artwork or reflection on an existing one, can help schizophrenic patients gain a strong sense of self, boost their self-esteem, and improve their social competencies. Studies in this area may suggest incorporation of artwork into the design of mental health facilities.

Aggression

Fear of patient aggressive or self-destructive behavior is one of the major concerns of the staff in psychiatric wards (Salerno, et al., 2012). The authors reported a correlation between involuntary admission and incidents of aggressive behavior among psychotic patients.

McGuire et al. (1977) found inappropriate behavior was highest when patients were alone and decreased in presence of other patients. However, aggressive patient behaviors are more likely to take place in areas of high patient concentration (Palmstierna, Huitfeldt, & Wistedt, 1991). In line with this observation, dining

rooms have been noted as time/locations with high incidents of aggressive behavior (Fottrell, 1980; Hunter & Love, 1996; Kennedy, Harrison, Hillis, & Bluglass, 1995). Middelboe, Schjødt, Byrstring, and Gjerris (2001) used the WAS, clinical assessments, and a satisfaction questionnaire and found that, among similar patient groups, patients in locked wards displayed more anger and aggression. Feeney, Kavanagh, Kelly, and Mooney (2007) used hospital computerized admissions data and found that, after moving to a purpose-built acute psychiatric care unit, fewer patients left the new facility against medical recommendation and also found a reduction in overall aggression. In a study on the impact of the manipulation of seating into conversational clusters, Baldwin (1985) noted less reliance on physical removal of patients and a higher number of patient incentive points. Vaaler, Morken, and Linaker (2005) recorded patient symptoms and satisfaction, violent episodes using Brøset Violence Checklist or the Global Assessment of Function, as well as length of stay. They reported that their study on noninstitutional versus traditional design of an acute ward failed to support the relationship between incidents of dangerous behavior and interior design and finishes. Their data, however, showed a higher level of well-being in females experiencing the noninstitutional atmosphere.

For patients with extreme assaultive behavior, seclusion rooms have been used in the past (Renvoize, 1991). However, seclusion rooms have been questioned for numerous clinical, ethical, and practical reasons (e.g., Tooke & Brown, 1992). As an alternative to seclusion rooms, extra care areas, a living space closely supervised by staff, have been suggested (Dix, 2001), but not fully studied.

Available research suggests a link between inactivity and aggressive behavior (Lloyd, 1995). While providing opportunities for recreation and therapeutic activities, safety and security measures should be considered. Janner and Delaney (2012) sought feedback from 100 psychiatric units that implemented the Star Wards program, which is designed to promote staff and patient engagement through “practical, accessible, and inspirational resource ideas” (p.106). They found that boredom and poor staff-patient engagement can contribute to prevalence of aggressive and violent behavior.

Alternatively, implementation of the Star Wards program promoted staff morale as well as the ward atmosphere. The seven major categories incorporated into the Star Wards program include: recreation and conversation, physical health and activity,

visitors accommodation, care planning, talking therapies, ward community, and patient participation in care process and evaluation (Janner & Delaney, 2012). More specifically, the physical environment can be influential in supporting recreational activities and accommodating visitors. However, the available body of research has not focused on attributes of the physical environment that support such programs.

In a recent study, Ulrich, Bogren, & Lundin (2012) compared outcomes in two hospitals and showed that a bundle of design guidelines can decrease patient aggression. These items include private rooms, less crowding, movable furniture, better acoustics, nature window views, nature art, higher daylight exposure, homelike design, and proximity and visibility of common spaces to the staff station.

Children and Adolescents

Regarding facilities for children and adolescents, there are two research projects that lay a foundation for studying the impact of the environment on negative behavior. Wilson, Soth, and Robak (1992) used interviews to examine the impact of dividing a group of 40 adolescents into physical environments that supported four groups of 10. As a result of the smaller clusters, there were reductions in vandalism, theft, and acting out on the part of patients and an increased feeling of belonging, competence, and satisfaction on the part of staff.

Shortcomings included patient restlessness in an enclosed space and resistance on the part of patients to interact in the larger hospital environment. Shepley (1995) conducted a pre- and postoccupancy evaluation of a new children's psychiatric facility using questionnaires, interviews, drawings, and incidents of disruptive behavior data. The new facility had single and private rooms, eliminated corridors, and had visual access to the outdoors throughout. The researcher found that the number of incidents reduced significantly during the period immediately after the building completion. Also of note was that more negative behaviors occurred in the new semiprivate rooms than the old dormitories, although the behaviors were less harmful.

In her interviews and observations at two children's residential psychiatric facilities, Tapak (2012) identified the following considerations for facility design (1) involving children in the design development process, (2) enhancing the residential quality of the space, (3) supporting patient privacy, (4) privacy, (5) sensitive treatment of patient bedrooms, (6) choice of decoration, and (7) exercise areas. As discussed

previously, Potthoff's 1991 and 1995 studies of adolescent rehabilitation facilities found that a renovated facility was well-received in one case, but that patients missed the presence of their room decorations in the other.

Trends Impacting Research

The lack of research on BH environments is a critical issue in providing evidence-based facilities. Future research must respond to trends, increase awareness of potential confounding variables, and fit within a research strategy.

Trends in Behavioral Health Environments

Over the last 20 years, there has been a transition from creating visually plain environments (so as not to over stimulate patients) to richer, more complex spaces and increased access to the outdoors (Cochran, 1978). According to Levin (2007), the primary trends in contemporary psychiatric facility design address environments that support recovery, induce shorter stays, and allow patients to participate in their treatment. Environments that support recovery likely involve access to natural light and the outdoors and artwork involving nature.

Sense of control is a critical factor contributing to the healing of a variety of mental illnesses. Providing environmental flexibility (acoustics, lighting, and furniture options) may be helpful in supporting this goal. Spaces that support participation in treatment are those that provide environments that are sufficiently flexible in configuration as to allow for a variety of activities. Other trends include the increased need to provide environments that address program spaces for drug and alcohol addiction (Carr, 2011) and the more common use of single-patient rooms. In general, the body of research on BH facilities is limited and lacks rigor, making it premature to establish evidence-based guidelines.

Trends in Models of Care

During the past decade new models of care have been proposed. Fenton, Hoch, Herrell, Mosher, and Dixon (2002) suggest specialized treatment centers for residential crisis care (RCC) as a cost-effective replacement for hospital psychiatric units. RCCs are community-based environments that provide treatment, rehabilitation, education, or occupation services to patients. Rather than places of confinement, they are geared to encourage patients to reintegrate with the outside

world. Baltazar, Kapp, Tugny, and Furtado (2013) employed a qualitative approach to study the impact of independent living on well-being of patients with severe mental disorder (SMD). They found that SMD patients who live outside the institutional residential services, despite more vulnerability, enjoy a greater sense of autonomy and social integration, compared to those residing in state-sponsored institutional health facilities.

Alternative Therapies

Use of alternative interventions is also being discussed in the literature. Gaskin, Elsom, and Happell (2007) reviewed literature on interventions that can reduce use of seclusion. They found that staff uses a combination of various tactics and resources ranging from emergency response strategies to pharmacological interventions to decrease need for seclusion. Perkins, Prosser, Riley, & Whittington (2011) argued that using physical restraints is a coercive and traumatic procedure with escalatory effects and should be decreased through improvements in practice and use of alternatives.

Directions for Future Research

While there was a surge in studies on the role of the physical environment in behavioral settings in the 1960s and 1970s, little attention has been given to this topic in the last 40 years. The population studies from the late 60s were on the cusp of “thorazine architecture” that allowed for large multibed (as many as 30) units, the phasing out of electro-convulsive therapy and a simultaneous move to deinstitutionalization (made possible by the use of antipsychotic medications and a growing patient rights movement). In 1955 there were 558,922 resident patients in American state and county psychiatric hospitals. By 1970, the number dropped to 337,619; by 1980 to 150,000; and by 1990 between 110,000 and 120,000 patients. Obviously these changes had profound effects on BH facility design as patient populations were distilled down to those patients who could not be discharged to a community setting. (See testimony before the Joint Hearings of the Subcommittee on the Handicapped, 95th Congress (US Senate, 1985.)) A research agenda is required to restimulate this effort.

The first step in setting a research agenda is to establish theoretical structures around which studies can be built. Golembiewski (2010) offers Antonovsky’s

salutogenic theory as a model. Salutogenic theory proposes that health is supported by coherence, and coherence is supported when the environment is comprehensive, manageable, and meaningful (Golembiewski, 2010). This theory partners well with other theories such as the attention restoration theory proposed by the Kaplans (Kaplan & Kaplan, 1989), Appleton's prospect and refuge theory (Appleton, 1996), Powell Lawton's environmental competence press theory (Lawton & Nahemow, 1973), and the long-documented need for individuals to be able to exercise choice and control, particularly when their health status is challenged. Other theories such as Ulrich's theory of supportive environments (Ulrich, 1997) are also relevant. Future researchers should consider contextualizing their studies in the framework of one or more of these theories, with an emphasis on the particular needs of patients and their families and staff in behavioral health settings.

In this context, specific topics might build upon the predecessor studies identified in Table 1, Emerging Evidence. Focusing on these topics will allow for the formulation of strong evidence that can be used to backup proposed guidelines. When addressing these topics, future studies should: (1) be designed with more precision regarding identification of patient demographics and type of illness; (2) acknowledge differences between staff and patient perceptions; (3) use appropriate, pre-tested tools and methods; (4) corroborate or disprove existing design guidelines; and (5) provide better control of confounding variables.

Unfortunately, most of the existing studies are confounded by extraneous variables, such as changes to care protocols, and transitions in staff and patient populations. One of the primary difficulties in interpreting these studies is limiting the number of independent variables and discerning which component of the physical environment (e.g., color, views of nature) is impacting the behavior. The lack of clarity regarding the relevant components of the physical environment limits the generalizability of the studies to other BH settings. Much more detailed descriptions of the physical environment are necessary, so we can make intelligent interpretations of what factors might be associated with what outcomes.

Other topics for research might include focusing on the innovations associated with alternative care strategies, looking at research that enhances patient safety, and addressing those areas that are rarely examined such as patient outreach, continued care, and outpatient mental healthcare. A variety of other critical issues, which have been addressed in other health facility guidelines (and supported by research studies in those setting), have not been looked at in BH facilities. Prominent among is

the impact of noise levels and daylight and access to nature. More studies, such as those conducted by Kanakri (2012) in facilities for persons with autism, are needed. Other critical factors that need to be considered and described in detail include organizational culture, management style, pharmacological patterns, and technology. In other words, much more attention should be paid to the system characteristics, not just the design.



ASSESSMENT OF BEHAVIORAL HEALTH GUIDELINES

Summary

Guidelines for behavioral health design help to inform the planning, programming, and design process, but do not provide direct references to evidence-based research. These guides are part of the industry standard (such as Facility Guidelines Institute), federal healthcare systems (such as Military Health Systems), or national standards (such as Australian and Canadian healthcare standards), and provide a mechanism to standardize behavioral health designs. The research agenda should focus on the motivators for creating and maintaining design guidelines. If stakeholders find value in evidence-based research, they are more likely to fund efforts to create appropriate environments. Value is perceived by stakeholders as design features that result in improved clinical outcomes, patient/staff safety, or cost savings.

Assessment

The BH guideline assessment team reviewed eight design guidelines for BH from five different organizations: the Department of Defense (DoD), the Department of Veterans Affairs, Facility Guidelines Institute (FGI), the Australasian Health Facilities Guidelines (HFG) Canadian Standards Association (CSA), and guidelines by J. M. Hunt and D. M. Sine in partnership with the National Association of Psychiatric Health Systems. Guidelines were published by the American Institute of Architects (AIA) 20 years ago (AIA, 1993), but they have not been updated since.

The assessment team reviewed the intent of each guideline, intended audience, areas covered, and how the guideline was used. The intent of each guideline led to several conclusions. It appears that the large federal entities developed their guidelines to establish a standard across their healthcare organizations. There are few references to evidence-based research to support their guidelines. The U. S. Department of Veterans Affairs (VA) used in-house teams from both the Veterans Health Administration and the VA's Construction and Facility Management organization. The DoD hired HDR (a national full-service architecture firm) to help update the design criteria. While both methods are based on a breadth of experiences and

knowledge, there is little to no reference to evidence-based research. The National Association of Psychiatric Health Systems focused on architectural accessories, interior finishes, and furniture as they relate to patient and staff safety. Once again there was no direct reference to research in support of these guides.

Refocused Effort on Design Guideline Motivators

The lack of any reference to evidence-based research raises the question of an organization's motivation to generate design guidelines. As stated, federal entities need a standard against which to compare their recommendations. Architecture and engineering firms may find value if the guidelines differentiate their product from their competition. Another motivator is through the healthcare organizations/owners that would require these standards if there were measurable quality or reduced cost. Without these motivators, guidelines must rely on some form of enforcement. Enforcement through state adoption of FGI guidelines may serve this purpose. Another challenge with design guidelines is their potential conflict with code requirements, especially when interpreting National Fire Protection Association (NFPA) Life Safety Code as it relates to Joint Commission accreditation. For these reasons, the authors believe one of the targeted research areas should look at the value of design guidelines in BH and target the various stakeholders who understand that value.

Guideline Value

The eight guidelines contain many elements that help each organization meet its intent. Some of those BH aspects of the built environment found in the guidelines included safety, security, interior design concept development (such as a healing environment), interior finishes, discussion of industry standards, and space planning standards. Both the VA and DoD guidelines serve as mechanisms to not only inform the design process, but also the planning and financial programming for the project. In addition, they place special emphasis on equipment planning and placement. The Australasian HFG serve in the same capacity, but also address unique aspects of the design process such as innovation and the role of culture in design. The FGI applies general hospital requirements as well as specialty requirements for inpatient and outpatient settings. The CSA guidelines were intended to be applied to all Canadian healthcare facilities.

Guideline Gaps

The motivation for promoting research to inform standards is to improve outcomes and decrease costs. However, available guidelines are not comprehensive. For the most part, they lack references to research and are not validated by third-party entities. Research studies in this area are few, and repeat studies and/or multiple studies on the topic are limited or nonexistent, making it difficult to develop standardized guidelines based on evidence. If standardization of guidelines is the goal, then the first step is to promote research that will have the most impact on patient and staff outcomes.

Guideline Research Agenda

In general, to promote research that could validate design guidelines for this unique population the following steps should be taken.

1. Clearly define the variables of interest, as well as their application and measurement tools. For example, what does safety mean, how should it be quantified? How is it affected by the built environment?
2. Identify the most vulnerable populations. Acute inpatient settings seem to be home to the most vulnerable, who may be subdivided further based on age, length of stay, or gender. The design guidelines might need to be customized to address needs of these populations more specifically. Guidelines might need to be categorized or regrouped to clarify which treatment objective they impact.
3. Acknowledge the specific needs of each setting type. The design checklist needs to be customized based on groups of patients and applied models of treatment. For example, residential substance abuse treatment facilities and acute psychiatric wards may have differing needs regarding privacy, supervision, perimeter security, and sense of community.



GRANT SOURCES

Opportunities

Few funding opportunities exist to address the impact the designed environment has on this vulnerable and unique population. There are three potential categories—government, nonprofit organizations, and for-profit funding sources, but only the former two were identified as providing opportunities for funding support. In addition to these resources, interested individuals may approach patient interests groups.

1. Government funding sources such as the National Institute of Mental Health (NIMH), National Institutes of Health, and Agency for Research
2. Nonprofit funding sources such as Robert Wood Johnson Foundation, Johnson & Johnson Grant/Society for the Arts, the Graham Foundation, the Patient-Centered Outcomes Research Institute, and the Kresge Foundation

Regarding for-profit funding sources, none were found, but one cannot rule out companies that set aside money for research and development and have an interest and investment in the design of facilities that serve this population. Approaching these companies directly might result in the identification of funding toward research in this area.

Appendix 3 describes potential sources of government and nonprofit funding. The brevity of this list suggests that there is little incentive to encourage research studies in this knowledge area.

Challenges and Considerations

The goal of research funding agencies is to cover the costs for scientific research studies obtained through a competitive process in which potential projects are evaluated, and those that fit the given criteria receive funding. This committee found that research funding available to study the impact of the built environment on people with mental health illnesses is sparse. Per the mission statement of the NIMH

funding in this area could change our awareness and treatment of behavioral illness through basic research, bringing us closer to prevention and cure (NIMH, 2013). Clearly, this area of research funding should be a priority.

The following are suggested ways to encourage available funding sources:

1. Work closely with the NIMH (and other organizations that provide research funding services to people with the mental health diagnoses) to develop a shared mission for design research surrounding the populations addressed within the NIMH to open up the possibility to share funding resources allocated.
2. Research funding agencies should also focus on the following:
 - a. Promotion of interdisciplinary research—healthcare systems are complex and dynamic with multiple players—promote research that gives everyone a voice.
 - b. The impact of place on people and organizational process are interconnected, this should be recognized in the research design.
 - c. Promote research that addresses external validity issues, such as a focus on study replication, to increase the strength of the study results.
 - d. Promote practice-based research when possible to keep the research close to practice to provide for focused studies that can address practical and relevant topics in care delivery.

Organizations and companies must realize the power of healthcare design research to address outcomes for these vulnerable populations. The Kresge Foundation invests in improving the health and safety of environments for low-income families. Extending this mission to incorporate people with mental health diagnoses must be given higher priority.



CONCLUSION

While the focus of this review has been peer-reviewed journal articles, several other resources can be consulted to gain insight toward successful design of behavioral health facilities. For example, book-length case studies and autobiographies as well as patient blogs can be considered. Literature pertaining to medical anthropology, a subdiscipline of social anthropology that focuses on studies of illness, healing, medical care, and biotechnologies across societies, can also be consulted.

Adhering to design guidelines alone may not provide the best solution for a design question. Perkins (2013) recommends inclusion of patients, staff, and visitors in design programming to identify specific needs of users. Designers should also consider integrating their knowledge to modify the design guidelines according to the needs of each specific project.

Significant expansion in mental health services for 62 million Americans will occur as a result of provisions in the 2010 Patient Protection and Affordable Care Act (ACA)—the largest expansion of such services in a generation.

Building on the Mental Health Parity and Addiction Equity Act of 2008, the ACA's Essential Health benefit categories that include mental health and substance abuse services, must be provided by small group and individual market plans starting in 2014 (Beronio, et al., 2013). It is estimated that approximately 60% of individuals with mental health disorders and almost 90% of people with substance abuse conditions do not receive the care they need (Sebelius, 2013). Enactment of the law will provide these underserved Americans with parity protections and access to insurance coverage that includes care for mental health and substance abuse disorder services (Beronio, Po, Skopec, & Glied, 2013).

The expansion of mental health services was the focus of a recent White House-sponsored National Conference on Mental Health, which highlighted ACA provisions and another administration-driven initiative, BRAIN (Brain Research through Advancing Innovative Neurotechnologies), a research effort to deepen the

understanding of the human mind and uncover new ways to treat brain disorders. The ACA-driven expansions of services are expected to contribute to an 8% growth in healthcare construction in 2013 (FMI Construction Outlook, 2013), which will no doubt include renovating or creating new BH environments.

In conclusion, the amount of research and associated funding on the topic of BH environments is minimal and insufficient to inform the design process or generalized to other BH facilities. Likewise, the institutionalized guidelines for these facilities, with few exceptions, lack research evidence to support their recommendations. The authors strongly suggest that more research and more effective collaboration between researchers and the generators of guidelines be encouraged via both public and private sectors. In light of the continued demonstration of the positive effects of EBD on the health of patients, BH must be a priority for design researchers.



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APPENDIX

Appendix 1 Behavior/Setting Measurement Tools

Abbrev	Name	Author	Setting	Focus	Variables
ASPECT	A Staff and Patient Environment Calibration Toolkit	Department of Health, UK, 2008	All types	Social and physical environment	Privacy, dignity, views, access to nature, comfort, control, place legibility, interiors, facilities
AEDET	Achieving Excellent Design Evaluation Toolkit	Department of Health, UK, 2004	All types	Social and physical environment	Functionality, impact, building performance
SRI	Setting Response Inventory	Moos & Daniels, 1967	Psychiatric ward	Social environment	Trust, extroversion, security, involvement, sociability in the context of eight settings
WAS	Ward Atmosphere Scale	Moos & Houts, 1968	Psychiatric ward	Social environment	Relationship dimension, personal development dimension, system maintenance dimension
WES	Ward Evaluation Scale	Rice, Berger, Klett, Sewall, & Lemkau, 1963	Psychiatric ward	Social and physical environment	Facilities, management of patients, services
PACI	Physical and Architectural Characteristics Inventory	Timko, 1996	Hospital and community psychiatric and substance abuse residential treatment	Social and physical environment	Community accessibility, physical amenities, social/recreational aids, prosthetics aids, safety features, staff facility, space availability
SATQ-98	Satisfaction AT Questionnaire	Müller, Schlosser, Kapp-Steen, Schanz, & Benkert, 2002	All types	Social environment and treatment plan	General satisfaction, doctor, medication, frequency of therapy, content of therapy, nursing care, nursing staff, social program on ward, food, equipment, visiting
MHEOCC	Mental Health Environment of Care Checklist	Watts, et al., 2012	Veterans Affairs Mental Health Hospital	Physical environment	Safety measures for physical features

Appendix 2 Guidelines Summaries

**Mental Health Facilities: Design Guide Department of Veterans Affairs (DVA) Office of Construction and Facilities Management
(to include Environment of Care (EoC) checklist and space planning chapters)
Published December 2010**

Intended audience	Veteran's Affairs (VA) facility planners
Clinical areas addressed	Mental health inpatient, outpatient and rehabilitation
Overall intent of guidelines	The goal is to facilitate the design process and to ensure excellent quality, effectiveness, efficiency, and consistency of VA facilities while controlling construction and operating costs. Developed as a design tool to assist mental health staff and leadership design teams in understanding choices and functional requirements for proper operation of centers and clinics where mental health services are required. Contains Guide Plates, furniture and equipment. Is not project specific and does not include every room listed in the VHA Space Planning Criteria. This guide is intended to be a transformational document, reflecting the important psychological impact environments have on patients and staff. In addition to providing technical architectural and engineering specifications, this guide emphasizes principles and strategies for building state-of-the-art, recovery-oriented environments for mental health settings in the Department of VA.
Intended Phase of the Design Process	This document is intended to be used as a guide and to supplement VA Space Planning Criteria, technical criteria, and other related Veteran's Health Administration (VHA) policies for the planning of mental health services in VA medical centers and clinics
Aspects of the built environment addressed	
Safety	Addressed specifically in 2.4.4 Risk Reduction, 3.0 Planning and Design Criteria, 4.3 Architecture and throughout document.
Security	Addressed in Safety (see above).
Interiors	Focused on creating a safe environment without compromising healing and included welcoming quality of the environment (page 3-1).
Evidence-based design (EBD) industry standards	EBD in 2.2 Guiding Principles: Focused on the 10 fundamental components of recovery.
Space planning	This document serves as a supplement to VA Space Planning Criteria (see below).
Others	A central theme of this Design Guide is that creating a physical, interpersonal, and psychological environment that supports the therapeutic milieu is essential to the recovery process.
Source of information	Partnering Effort within the DVA by the Veterans Health Administration and the Office of Construction and Facilities Management
Peer-reviewed references utilized	Reference 1.2 acknowledgements in the document.
Miscellaneous information	None
Strengths/weaknesses	Strength: Document serves as an overall space planning and design guideline that is used in conjunction with VA Space Planning Criteria to help inform design decision-making.

Appendix 2 Guidelines Summaries (continued)

Department Of Veterans Affairs (DVA) Veterans Affairs (VA) Space Planning Criteria
CHAPTER 260: VETERANS HEALTH ADMINISTRATION: MENTAL HEALTH CLINIC
 Published Washington, DC 20420 March 2008 (SEPS Version 1.6)

Intended audience	VA Facility Planners
Clinical areas addressed	Outlines space planning criteria as it applies to mental health outpatient programs provided by the DVA healthcare facilities.
Overall intent of guidelines	This document sets forth Space Planning Criteria for Chapter 260: Mental Health Clinic, as it applies to Mental Health Outpatient Programs that are provided by the Department of Veterans Affairs (VA) healthcare facilities.
Intended Phase of the Design Process	Appears to be most useful for the programming and planning phases.
Aspects of the built environment addressed	
Safety	Focus is on the space requirements.
Security	Minimal — discusses security and safety devices should be tamper proof.
Interiors	Addresses space criteria.
Evidence-based design (EBD) industry standards	None specifically cited.
Space planning	Provides one functional diagram and interfunctional relationship matrix.
Others	
Source of information	DVA
Peer-reviewed references utilized	None listed.
Miscellaneous information	The mental health clinic provides an interface between inpatient care and the community. As such, it offers preventive care and aftercare. The clinic also serves as a site for research and training of mental health professionals and administrators in all aspects of outpatient treatment of mental health problems.
Strengths/weaknesses	

Department of Defense (DoD) Space Planning Criteria
The Office of the Assistant Secretary of Defense Health Affairs Chapter 318: Behavioral Health Clinic
 September 2012
CHAPTER 318: BEHAVIORAL HEALTH CLINIC

Intended audience	Department of Defense (DoD) Facility Planners
Clinical areas addressed	Behavioral Health Outpatient and Rehabilitation. Both free-standing clinics and those incorporated into a hospital or outpatient setting.
Overall intent of guidelines	Intent of DoD Space Planning guide is to provide objective criteria for developing space requirements for different clinical and support areas. The DoD must justify square feet requirements in a consistent algorithm to justify funding. These programs are frequently locked-in several years before design start
Intended Phase of the Design Process	DoD Guidelines are used with the Unified Facilities Criteria (UFC) and Design Templates to inform the planning, programming, and design process.

Appendix 2 Guidelines Summaries (continued)

Aspects of the built environment addressed	
Safety	Chapter 6 addresses unique safety and security requirements such as tamper resistant surfaces.
Security	Not specifically addressed.
Interiors	Examples of Interior Design guidance. Less institutionalized. Welcoming environments. Functional areas should maximize flexibility.
Evidence-based design (EBD) industry standards	Chapter 6, Planning and Design Considerations, provides guidance on how to follow evidence-based design strategies.
Space planning	Space allocation based on workload projections and planned services/ modalities. Focus is on exam room determination based on workload. Reception areas are based on the number of exam rooms. Other support areas are based on mission, staffing, and input data questions.
Others	Focus on functional relationships of space within the clinic.
Source of information	Contracted HDR, Inc. to lead the effort to address Army, Navy, Air Force, and TRICARE Management Activity facility requirements in support of the Military Health System
Peer-reviewed references utilized	Not recognized in this document
Miscellaneous information	
Strengths/weaknesses	Strengths: Very definitive planning guide for building the space requirements. Weaknesses: Very little on specifics during the design process

Department of Defense (DoD) Space Planning Criteria
The Office of the Assistant Secretary of Defense Health Affairs
CHAPTER 410: NURSING UNITS
Published 2012

Intended audience	DoD Facility Planners
Clinical areas addressed	No specified 'Inpatient Behavioral Health' criteria included. Chapter 460 covers the Inpatient BH Unit and was under revision at the time of this effort.
Overall intent of guidelines	Intent of DoD Space Planning guide is to provide objective criteria for developing space requirements for different clinical and support areas. The DoD must justify square feet requirements in a consistent algorithm to justify funding. These programs are frequently locked-in several years before design start.
Intended Phase of the Design Process	DoD Guidelines are used with the Unified Facilities Criteria (UFC) and Design Guide Plates to inform the planning, programming, and design process.
Aspects of the built environment addressed	
Safety	Specific guidelines on furnishings and artwork that minimize use as weapons. Secure outdoor spaces directly off the unit. No blind corners in layout.
Security	Not specifically addressed.
Interiors	Guidelines on interior design such as, "Home-like, non-institutional environment."
Evidence-based design (EBD) industry standards	Chapter 12, Planning and Design Considerations, provides guidance on how to follow world-class evidence-based design strategies.
Space planning	The intent of the document is to allocate space based on workload, staffing, and hospital mission information.

Appendix 2 Guidelines Summaries (continued)	
Others	Very specific to substance abuse and alcohol rehabilitation. Focused on functional relationships within the ward.
Source of information	Contracted HDR, Inc. to lead the effort to address Army, Navy, Air Force, and TRICARE Management Activity facility requirements in support of the Military Health System.
Peer-reviewed references utilized	Not reported in this document
Miscellaneous information	
Strengths/weaknesses	Strengths: Very definitive planning guide for building the space requirements. Weaknesses: Very little on specifics during the design process.
Mental Health Environment of Care Checklist (MHEOCC)— VHA National Center for Patient Safety, Department of Veterans Affairs Version 10-25-2012	
Note: Retrieved from www.patientsafety.va.gov/SafetyTopics/MHEOCC.xls on July 31st, 2013.	
Intended audience	Specific to Veterans Affairs (VA) facilities having inpatient psychiatric units treating currently suicidal patients (including both locked and unlocked mental health units). The director of each Veteran's Health Administration (VHA) facility housing an inpatient psychiatric unit treating suicidal patients shall designate a Multidisciplinary Safety Inspection Team (MSIT) that will conduct Environment of Care (EOC) rounds on all acute and chronic inpatient psychiatric units that treat suicidal patients using the MHEOCC at least every 6 months. Any mental health unit where actively suicidal patient might be treated, not for residential rehabilitation programs, domiciliary care unit, dementia care units, nursing home care units or medical units.
Clinical areas addressed	Specific to Veterans Affairs (VA) facilities having inpatient psychiatric units treating currently suicidal patients (including both locked and unlocked mental health units).
Overall intent of guidelines	To develop a consensus environmental checklist for the purpose of reducing environmental factors that contribute to inpatient suicides, suicide attempts, and other self-injurious behaviors. A secondary product of the committee [who oversee the guidelines] will be to add items to the checklist that consider environmental factors that reduce employee safety on mental health units.
Intended Phase of the Design Process	Appears to be useful for all phases of design, as well as an ongoing assessment tool.
Aspects of the built environment addressed	
Safety	Environmental safety concerns rated a 5 should be corrected on an emergency basis, within 24 hours. Every 6 months the medical center directors forward a copy of the risk assessment and abatement tracking spreadsheet to their Veteran's Integrated Service Network director.
Security	As it relates to patient and staff safety.
Interiors	Utilizes checklist to identify potential hazards for patients and staff.
Evidence-based design (EBD) industry standards	None cited.
Space planning	Focuses on the environment not space planning.
Others	The checklist should be used to identify and correct environmental safety concerns on locked mental health units in order to prevent inpatient suicide and suicide attempts.

Appendix 2 Guidelines Summaries (continued)

Source of information	Compiled through the use of committee members, all knowledge experts in the VA and others, please see document for full list. The document includes contact information for Peter Mills, PhD, from the National Patient Safety Center at peter.mills.va.gov ; Jan Kemp, PhD, VA National Suicide Prevention Coordinator at jan.kemp.va.gov ; or John Beatty, acting director safety and technical services at john.beatty@va.gov .
Peer-reviewed references utilized	Cited throughout document, where applicable.
Miscellaneous information	Criteria that are only applicable to new mental health care units (including those units undergoing renovation that require use of Chapter 18 of the Life Safety Code have been identified with the designation "only new units." Existing space should be modified to meet ALL of the remaining criteria.
Strengths/weaknesses	Strength: Citations from peer-reviewed articles where applicable. Check-list approach has on-site application. Weakness: General lack of research studies in this area to validate cause and effect in many areas. Many studies are case studies and lack wide application to other settings.

Appendix 3 Funding Sources

BH Funding Sources – Government

Funding source	National Institute of Mental Health (NIMH) www.nimh.nih.gov/research-funding/research-priorities Grants Policy Statement: http://grants.nih.gov/grants/policy/nihgps_2011/index.htm
Organization mission	"NIH is the steward of medical and behavioral research for the Nation. Its mission is to seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce the burdens of illness and disability." Strategic Objective 1: "Promote Discovery in the Brain and Behavioral Sciences to Fuel Research on the Causes of Mental Disorders." Strategic Objective 2: "Chart Mental Illness Trajectories to Determine When, Where, and How to Intervene." Strategic Objective 3: "Develop New and Better Interventions that Incorporate the Diverse Needs and Circumstances of People with Mental Illnesses." Strategic Objective 4: "Strengthen the Public Health Impact of NIMH-Supported Research." Note: From National Institute of Mental Health, Strategic research priorities, Retrieved July 7th, 2013, from http://www.nimh.nih.gov/research-priorities/strategic-objectives/index.shtml
Requirements	Vary by grant type.
Eligibility	Vary by grant type.
Grant deadlines	Vary by grant type http://grants.nih.gov/grants/funding/submissionschedule.htm

Appendix 3 Funding Sources (continued)

BH Funding Sources – Government

Funding source	Agency for Healthcare Research & Quality www.ahrq.gov
Organization mission	<p>The Agency for Healthcare Research and Quality's (AHRQ) mission is to improve the quality, safety, efficiency, and effectiveness of health care for all Americans. As 1 of 12 agencies within the Department of Health and Human Services, AHRQ supports research that helps people make more informed decisions and improves the quality of health care services.</p> <p>AHRQ's special emphasis on research topics and targeted populations are updated frequently, researchers are advised to visit their website frequently.</p> <p>AHRQ at a Glance. September 2012. Agency for Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/about/mission/glance/index.html</p>
Requirements	AHRQ hosts a wide variety of research funding and grants, please see their website for current information. http://www.ahrq.gov/funding/process/grant-app-basics/index.html
Eligibility	Vary by grant type.
Grant deadlines	Vary by grant type.

BH Funding Sources – Government

Funding source	<p>National Institutes of Health Office of Extramural Research (OER): http://grants.nih.gov/grants/policy/policy.htm OER mission: Provides the corporate framework for NIH research administration, ensuring scientific integrity, public accountability, and effective stewardship of the NIH extramural research portfolio.</p>
Organization mission	<p>NIH's mission is to seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce the burdens of illness and disability.</p> <p>The goals of the agency are:</p> <ul style="list-style-type: none"> • to foster fundamental creative discoveries, innovative research strategies, and their applications as a basis for ultimately protecting and improving health; • to develop, maintain, and renew scientific human and physical resources that will ensure the Nation's capability to prevent disease; • to expand the knowledge base in medical and associated sciences in order to enhance the nation's economic well-being and ensure a continued high return on the public investment in research; and • to exemplify and promote the highest level of scientific integrity, public accountability, and social responsibility in the conduct of science. <p>In realizing these goals, the NIH provides leadership and direction to programs designed to improve the health of the Nation by conducting and supporting research:</p> <ul style="list-style-type: none"> • in the causes, diagnosis, prevention, and cure of human diseases; • in the processes of human growth and development; • in the biological effects of environmental contaminants; • in the understanding of mental, addictive and physical disorders; and • in directing programs for the collection, dissemination, and exchange of information in medicine and health, including the development and support of medical libraries and the training of medical librarians and other health information specialists. <p>Note: From National Institute of Health. Retrieved July 25th, 2013 from http://www.nih.gov/about/mission.htm.</p>

Appendix 3 Funding Sources (continued)	
Requirements	Multiple grants available, eligibility varies.
Grant deadlines	Varies, see http://grants.nih.gov/grants/funding/submissionschedule.htm
BH Funding Sources – Non-profit Organization	
Funding source	Graham Foundation http://www.grahamfoundation.org
Organization mission	Founded in 1956, the Graham Foundation for Advanced Studies in the Fine Arts makes project-based grants to individuals and organizations and produces public programs to foster the development and exchange of diverse and challenging ideas about architecture and its role in the arts, culture, and society. Note: From Graham Foundation Mission. Retrieved July 25th, 2013 from http://www.grahamfoundation.org/mission
Eligibility	We support innovative, thought-provoking investigations in architecture; architectural history, theory, and criticism; design; engineering; landscape architecture; urban planning; urban studies; visual arts; and related fields of inquiry. Our interest also extends to work being done in the fine arts, humanities, and sciences that expands the boundaries of thinking about architecture and space. In an effort to bridge communities and different fields of knowledge, we support a wide range of practitioners (such as architects, scholars, critics, writers, artists, curators, and educators) and organizations (such as non-profit galleries, colleges and universities, publishers, and museums). Note: From Graham Foundation Grant Programs. Retrieved July 25th, 2013 from http://www.grahamfoundation.org/grant_programs . (see website for a complete description)
Grant deadlines	GRANTS TO INDIVIDUALS → Inquiry Form deadline: Sep 15, 2014 Inquiry Form available: Jul 15, 2014 GRANTS TO ORGANIZATIONS → Inquiry Form deadline: Feb 25, 2014 Inquiry Form available: Jan 06, 2014 CARTER MANNY AWARD → Inquiry Form deadline: Mar 15, 2014 Inquiry Form available: Jan 26, 2014
BH Funding Sources – Non-profit Organization	
Funding source	Academy of Architecture for Health Foundation http://www.aahfoundation.org
Organization mission	The Mission of the Academy of Architecture for Health Foundation is support the Academy of Architecture for Health and to enhance the knowledge and effectiveness of those who create healthcare environments through the funding of critical educational and research activities. Note: From Academy of Architecture for Health Foundation. Retrieved July 25th, 2013 from http://www.aahfoundation.org .
Eligibility	Will be announced when the next grant is announced... follow the website for grant updates.
Grant deadlines	Will be announced when the next grant is announced... follow the website for grant updates.

Appendix 3 Funding Sources (continued)

BH Funding Sources – Non-profit Organization

Funding source	Patient-Centered Outcome Research Institute http://www.pcori.org/
Organization mission	<p>The Patient-Centered Outcomes Research Institute (PCORI) helps people make informed health care decisions, and improves health care delivery and outcomes, by producing and promoting high integrity, evidence-based information that comes from research guided by patients, caregivers and the broader health care community.</p> <p>Vision: Patients and the public have the information they need to make decisions that reflect their desired health outcomes.</p> <p>Note: From Patient-Centered Outcome Research Institute, Mission and Vision. Retrieved July 25th, 2013 from http://www.pcori.org/about-us/mission-and-vision/</p>
Requirements	<p>Our Funding Center contains all of the resources applicants need to respond to current PCORI Funding Announcements (PFAs), our broad calls for patient-centered comparative clinical effectiveness research (CER) projects based on PCORI's National Priorities for Research and Research Agenda.</p> <p>Please see their website for further information: http://www.pcori.org/funding-opportunities/funding-center/</p>
Eligibility	<p>The following groups are eligible for funding:</p> <ul style="list-style-type: none"> • Integrated healthcare delivery systems, • Health plans, • Accountable care organizations (ACO's), • Practice-based research networks, and • Similar organizations. <p>Note: From Patient-Centered Outcome Research Institute, Mission and Vision. Retrieved July 25th, 2013 from http://www.pcori.org/get-involved/pcori-cdrn-and-pprn-funding-announcement-faqs.</p>
Grant deadlines	<p>We have announced two cycles of primary research awards since releasing the first of our PFAs in May 2012 and plan one more round in our first funding year. As of May 15, 2013, when we entered our second full year of primary research funding, we revised our PFAs and associated application guidelines to clarify key review criteria and application definitions.</p> <p>Please see their website for further information: http://www.pcori.org/funding-opportunities/funding-center/</p>

Appendix 3 Funding Sources (continued)

BH Funding Sources – Non-profit Organization

Funding source	Kresge Foundation http://www.kresge.org
Organization mission	<p>To promote human progress.</p> <p>We advance our mission by:</p> <ul style="list-style-type: none"> • creating access and opportunity in underserved communities, • improving the health of low-income people, • supporting artistic expression, • increasing college achievement, • assisting in the revitalization of Detroit, and • advancing methods for addressing global climate change. <p>Note: From Kresge Foundation, Mission and Vision. Retrieved July 25th, 2013 from http://kresge.org/about-us/mission-values.</p>
Requirements	<p>Eligibility requirements and application processes differ from program to program. For complete information, review the program area that best suits your project:</p> <ul style="list-style-type: none"> • Arts & Culture • Community Development • Detroit • Education • Environment • Health • Human Services <p>Note: From Kresge Foundation, Funding Quick Links. Retrieved July 25th, 2013 from http://kresge.org/funding/apply-for-funding.</p>
Eligibility	<p>U.S. 501(c)(3) nonprofit organizations that are not classified as private foundations. International organizations that are the equivalent of U.S. 501(c)(3) organizations. Government entities. Faith-based organizations that welcome and serve all members of the community regardless of religious belief. –</p> <p>Note: From Kresge Foundation, Funding. Retrieved July 25th, 2013 from http://kresge.org/funding#title2.</p>
Grant deadlines	<p>Some of our funding opportunities are open to grant seekers and others are solicited, or by invitation only.</p> <p>Applications for open funding opportunities may be accepted on an ongoing basis or for specific, publicly announced periods of time.</p> <p>Please see their website for more information.</p>

Appendix 3 Funding Sources (continued)	
BH Funding Sources – Non-profit Organization	
Funding source	American Institute of Architects College of Fellows, Latrobe Prize http://network.aia.org/cof/Home/
Organization mission	The AIA College of Fellows' mission is to support the Institute and advance the profession of architecture. Toward that end, the College seeks to encourage research that broadens the perspective and scope of architecture to include cross-disciplinary fields and expertise through its biennial competition: the Latrobe Prize.
Requirements	Research proposals for the Latrobe Prize may include, but are not limited to, building materials and delivery systems, digital design, computer simulation and modeling, energy, eco-design, or integrated design-construction practices and processes. See last year's Call for Proposals for more information: http://info.aia.org/blast_images/mrkt/KC/COF/2013_Latrobe_Prize_Call_for_Proposals.pdf .
Eligibility	Awarded to a research proposal that has the long-range potential to resolve one or more 21st century architectural and built environment challenges, the Latrobe Prize provides the recipient with \$100,000 to conduct research on a critical issue and to develop a solution that enhances the current practice of architecture. Note: From American Institute of Architects College of Fellows, Latrobe Prize. Retrieved July 25th, 2013 from http://info.aia.org/blast_images/mrkt/KC/COF/2013_Latrobe_Prize_Call_for_Proposals.pdf .
Grant deadlines	The 2013 grant application year has passed, see website for further information.
BH Funding Sources – Non-profit Organization	
Funding source	American Institute of Architects Upjohn Research Initiative http://www.aia.org/aiaucmp/groups/aia/documents/pdf/aia098205.pdf
Organization mission	American Institute of Architects is the voice of the architectural profession and a resource for its members in service to society. Note: From the American Institute of Architects, 2010 → 2015 Strategic Plan. Retrieved July 25th, 2013 from http://www.aia.org/aiaucmp/groups/aia/documents/pdf/aia082453.pdf .
Requirements	To provide base funds to be matched for applied research projects that advance the value of design and professional practice knowledge. Description: The AIA seeks proposals for research projects to be completed in an ~18-month period beginning December 1, 2013. The AIA will award up to four grants, between \$15,000 and \$30,000 each, for selected projects (awarded funds must be hard-dollar matched; a maximum of 10 percent of funds may be used for overhead). This grant qualifies recipients to have their findings and outcomes published both electronically and in a nationally distributed publication. Preference will be given to proposals that have teams comprised of both academics and practitioners. Also preferable are long records of team collaboration and a budget using less than the 10 percent maximum for overhead (i.e., indirect costs). Note: From the AIA Call For Submissions, 2013 Upjohn Research Initiative. Retrieved July 25th, 2013 from http://www.aia.org/aiaucmp/groups/aia/documents/pdf/aia098205.pdf .
Eligibility	See Requirements for discussion of matching funds.
Grant deadlines	September 1, 2013 11:59 PM Eastern Time Blind submissions are due to rhayes@aia.org