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As the official journal of the AIA Academy of Architecture for Health (AAH), this publication explores subjects of interest to AAH members and others involved in the fields of health care architecture, planning, design, and construction. The goal is to promote awareness, educational exchange, and advancement of the overall project delivery process, building products, and medical progress that affect all involved in those fields.

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Co-Diagnosis: An Interdisciplinary Design Study of Inpatient Units for Mental and Physical Health

Valerie Greer, AIA, LEED AP, NOMA
Assistant Professor, University of Utah
College of Architecture + Planning

Donna Ware, AIA, EDAC
Executive Director, Planning & Design
BJC HealthCare

Emily Johnson, AIA, NCARB, EDAC, WELL AP, LEED Green Associate
Medical Planner, Associate
Perkins &Will

Virginia Pankey, AIA, LEED, EDAC
Principal, Senior Medical Planner
HOK

ABSTRACT

The contemporary crisis in mental health underscores a need in the healthcare industry to design healing environments for patients who suffer from mental as well as physical illnesses. There is a gap in the literature and little precedent in the industry for designing inpatient units to meet the needs of patients who require hospitalization for medical conditions, and who also suffer from mental and behavioral health conditions. To explore this design problem, we organized an interdisciplinary workshop that engaged healthcare providers, administrators, and architects with undergraduate and graduate students in art, architecture, communications, and urban design. The goal was to examine barriers and opportunities to create a new type of hybridized medical-behavioral health unit to address the needs of co-diagnosed patients as well as their healthcare providers. Lived experiences of doctors, nurses, and healthcare designers were integral to forming an understanding of the design problem and creating concepts for this largely unprecedented space type. The workshop took place at Barnes-Jewish Hospital, an urban academic medical campus, where an existing inpatient unit was identified for renovation to pilot a 'safe unit' that cares for medical patients with mental and behavioral health co-diagnoses. Insights from this interdisciplinary collaboration create pathways for future exploration in design research and industry application.

Introduction

“At the root of this dilemma is the way we address mental health in this country. When it comes to mental health conditions, we often treat them differently from other diseases like cancer, diabetes, or asthma. And that makes no sense. Whether an illness affects your heart, your leg, your brain, it is still an illness, and there should be no distinction.”

– *Michelle Obama*

Prior to the COVID-19 pandemic, nearly 20% of US adults were known to live with a mental illness that ranged from mild to moderate to severe (National Institute for Health, 2020). Following the onset of the pandemic, that percentage of people doubled as the National Institute of Mental Health (NIMH) found 40% of US adults reported mental health issues in 2021 (Panchal, Kamal et al., 2021). Among the recent alarming trends is the drastic rise in suicide and self-harm (John, A., Eyles, E. et al, 2021). The American Academy of Pediatrics declared a National Emergency in Child and Adolescent Mental Health, noting the impact of COVID-19 and the influx of pediatric and adolescent mental and behavioral health cases that have been further exacerbated by the racial inequalities seen in communities of color (AAP-AACAP-CHA, 2021). Literature points to the disproportionate toll the pandemic has placed on the mental health of healthcare providers (Feinstein, R.E., Kotara, S., 2020). The connection between mental and physical health, factors

into the dynamics of the public health crisis; people with severe mental illness are more likely to experience chronic physical conditions, and people with chronic physical health conditions are more likely to experience depression and anxiety (CMHA, 2008). The lasting impacts of the COVID-19 Pandemic paired with the initiative to destigmatize behavioral and mental health resources have highlighted the built environment's role in helping meet the needs of patients and staff. Public concern for mental health brings attention to major gaps in mental health services (World Health Organization, n.d.), and the need for spaces to be designed to support patients who struggle with both mental health and medical conditions. Vulnerabilities we see in today's infrastructure for care highlight a long history of disinvestment and marginalization around the treatment and support of mental health needs.

The origins of organized care for mental health in the US date back to 1752 when Quakers in Philadelphia opened the Pennsylvania Hospital with rooms in the basement dedicated to mentally ill patients. Social isolation was a common spatial strategy in the design of early hospitals to “cure” mental illnesses. Early US-based champions of the mental health movement include Dorothea Dix, who documented the brutal treatment and living conditions of mentally ill patients and forged a more positive, human-centric approach to behavioral health. By 1890, every state had one or more publicly funded mental hospitals even though the American Medical Association did not recognize mental health as an illness when it was

founded in 1847. The 1920s saw a shift of interest in US psychiatry to consider ways that social environments contributed to mental disorders (Horwitz, A.V. & Grob, G., 2011). State-funded hospitals built after World Wars I and II commonly had psychiatric wards that reverted to isolation strategies with patients sequestered in contained, discrete sections of hospitals. The Community Mental Health Act of 1963 aimed to deinstitutionalize state-run care for mental health and help catalyze the growth of community-based care. Only half the proposed centers were built, and none were fully funded, leaving many communities ill-equipped to cope with the later surge in mental health needs, particularly following the Vietnam War.

This framework is integral to contextualizing the landscape of care we see today where physical and mental health are typically regarded in isolation from each other. There is a gap in the literature and few precedents in the healthcare industry for designing to meet the needs of patients who are admitted for medical conditions and who have mental health needs that make hospitalization in a medical inpatient unit unsafe. The term co-occurring disorder (COD) emerged in the 1980s in reference to patients with concurrent mental health and substance abuse disorders as clinicians increasingly recognized the need to identify patient populations with complex, intertwined needs (Hryb, Kirkhart & Talbert, 2007). Today, a co-diagnosed patient—also identified as a dually diagnosed or medically enhanced psychiatric patient—might be hospitalized in an acute care unit after suffering a heart attack, for instance, but has a mental health condition that contributes to delusions and self-harming behaviors. Patient room layouts, equipment, and furnishings in medical units are designed to entirely different standards than in psychiatric units, as are care levels and observation capacities. This poses major risks to safety and security for both patients and providers. It also raises questions about the future capacity of health environments to help patients with intertwined mental and physical health needs. Currently, there are no measures in psychiatric units to meet the medical needs of patients. Stopgap measures in medical units currently include hiring ‘sitters’ to provide 24/7 observation of high-risk inpatients in acute care units and putting ‘mitts’ on patients in order to prevent them from misusing equipment for self-harm. These are often expensive and ineffective uses of time and resources. Temporary fixes belie larger, systemic vulnerabilities.

To address the problem of designing for co-morbidities, we organized a workshop that was a collaboration

between Barnes-Jewish Hospital (BJH) and the Sam Fox School of Design & Visual Arts at Washington University in St. Louis. The conceptual framework of the workshop was grounded in exploring the psychology of space and the impacts of architectural design on human health and wellbeing (Kopec, 2018; Richie, 2020; Robinson & Pallasmaa, 2015; Sternberg, 2010). Investigating connections between architecture and psychological states created a focus for investigating ways that spaces affect behavior and healing in the integrated realm of mental and physical health (Neutra, 1954; Pallasmaa, 2012; Sternberg & Wilson, 2006). This article reports the methods, results, and findings of the design investigation, and discusses the need for future design research into environments that holistically address physical and mental health needs. We additionally discuss the potential for design education and interprofessional initiatives to catalyze innovation around complex health issues, and we advocate for the benefits of examining design problems in the healthcare industry through interdisciplinary lenses.

Methods

This design investigation began with an unmet need identified by BJH in late 2019 to care for co-diagnosed patients. The administrative leadership of BJH began exploring the potential to renovate an existing unit of acute care patient rooms at BJH, an urban academic medical hospital, to test design concepts and strategies for a ‘safe unit’ that would be dedicated to caring for co-diagnosed patients, only to discover there were no precedents for this type of unit to benchmark. The need for this type of space is described by the Vice President of Patient Care and Services, Chief Nursing Officer and Chief Operations Officer: “*BJH is very committed to serving the most vulnerable in the community, many of whom have a psychiatric diagnosis. In order to honor this commitment, it is essential to have a therapeutic environment that supports the safety of the patient, the clinical team, as well as other patients. Typical medical-surgical units are not designed to be therapeutic or to meet the needs of psychiatric patients and as a result create increased risks for the patients, other patients, and their families, as well as the clinical teams.*”

A relationship between BJH and the Sam Fox School of Design & Visual Arts at Washington University in St. Louis prompted the proposal for a Masters Class workshop which was held in Spring 2020, just weeks before the state of emergency was declared because of the COVID-19 pandemic. The curriculum for the three-

day workshop was designed by architects and educators at BJH and the Sam Fox School of Design & Visual Arts. A Curriculum Collaboration Project Proposal was formalized to identify roles and responsibilities in the partnership. Enrollment was limited to 16 undergraduate and graduate students in art, architecture, visual communications, and urban design. Workshop instruction was supported by practicing healthcare architects with industry leadership and research backgrounds in behavioral health.

Students were required to read and watch materials prior to the start of the workshop, including the documentary “Let There Be Light” (Huston, 1980), the film “One Flew over the Cuckoo’s Nest” (Forman, 1975), and the short story “The Yellow Wallpaper” (Gilman, 1892). Confidentiality waivers were additionally required from students, and protocols were observed to protect the privacy of patients and providers.

Tours and lectures were organized on-site at BJH’s urban academic medical campus, where workshop participants

talked with physicians, nurses, executive administrators, and staff. Design work was hosted at the school where students had access to pin-up space, digital fabrication resources, and the photo lab. The group of 16 students were organized into four groups of four students, who each had different disciplinary backgrounds in art, design, architecture, and visual communications, as well as various levels of training in drawing and modeling. Architectural floor plans of the existing unit were provided by BJH, along with a functional program and patient profiles written by clinicians. Figure 1 provides patient profiles; Figure 2 shows the floor plan of the existing 15-bed inpatient unit identified for renovation into a ‘safe unit.’

The workshop focused on the following brief:

“Develop a unit to serve a patient population that presents with acute medical and behavioral health needs. The unit requires patients to have an active medical issue that needs acute inpatient medical care but who have behavioral issues that cannot be safely accommodated on a regular medical unit.”



Figure 1. Hypothetical patient profiles written for use in the design workshop.



Figure 2. Existing floor plans of a 15-bed inpatient unit studied for conversion into a ‘safe unit.’

The workshop concluded with design presentations of four distinct concepts for the renovation of the existing inpatient unit into a ‘safe unit’ for co-diagnosed inpatients. Students made 1/8” = 1’-0” models of their design proposals and created drawings and diagrams to support their ideas. A jury of architects, design studio faculty, practitioners, and stakeholders from BJH and the Sam Fox School of Design & Visual Arts provided feedback on the schemes. Discussions contributed to insight and evaluation of the design concepts and strategies.

Results

The workshop contributed to fact-finding and problem-definition phases which created frameworks for design speculation. A tour of three different levels of psychiatric care inpatient units at the academic medical campus

(severe, geriatric, and step-down) provided insight into various spatial and design strategies that accommodate diverse patient populations. This complemented a tour of an acute care inpatient unit, and a tour of the unit slated for renovation. Overarching themes that emerged from tours and conversations with clinical staff included:

- Concerns for the physical and personal safety of frontline staff
- Space constraints limit the needs of staff to care for patients with best practices
- Lack of resources and space to manage multiple crises occurring at once
- Needing space for staff to decompress and maintain their personal wellness

Clinical staff shared personal and practical insights into the challenges they experience when caring for

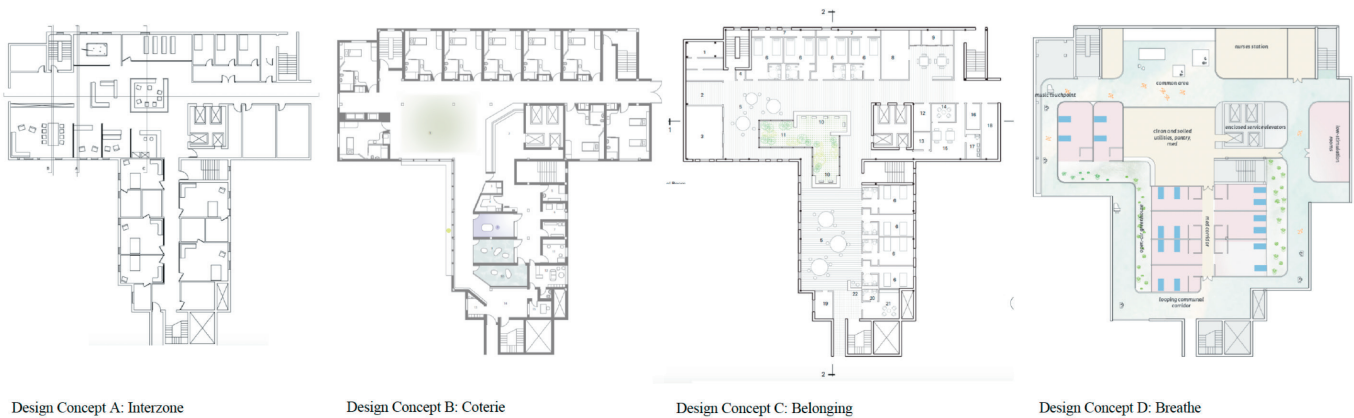
co-diagnosed patients in medical surgical units which are not designed to support the needs of psychiatric patients. A nurse reflects on her own experience, saying “working on a primary medicine floor caring for patients with both medical and psychiatric diagnosis creates compassion fatigue due to lack of resources and untrained staff. Medical units lack the daily activities provided on psych units. Patients are often confined to their room on medical units instead of being able to socialize in a common area with others. Patients feel a lack of privacy if sitters are appropriate on a medical floor. Many times, medical units have unsafe features for patients and staff members in a psychiatric crisis.”

Teams prioritized and articulated the challenges they understood in ways that supported the design concepts they generated. Design themes addressed an understanding of needs for the following spatial and environmental qualities in both medical and behavioral health units:

- Daylight and access to nature
- Social support
- Safety and security
- Diverse sensory environments
- Choice and individuality

Shared common spaces designed to support mental health in psychiatric care units, such as art rooms and therapy areas, were an integral component to concepts proposed for an inpatient unit dedicated to a co-diagnosed patient population. Concerns around visibility and sight lines were a predominant factor to enhance safety and connectivity. Spaces designed to provide respite and support for staff were created in all the schemes. Finally, strategies to recognize and honor the individuality of patients were strongly emphasized. The design concepts, which originated from distinct understandings of the design problem, are summarized here. Figure 3 illustrates floor plans for the proposed schemes.

Figure 3. Floor plans for proposed schemes.



Design Concept A: Interzone

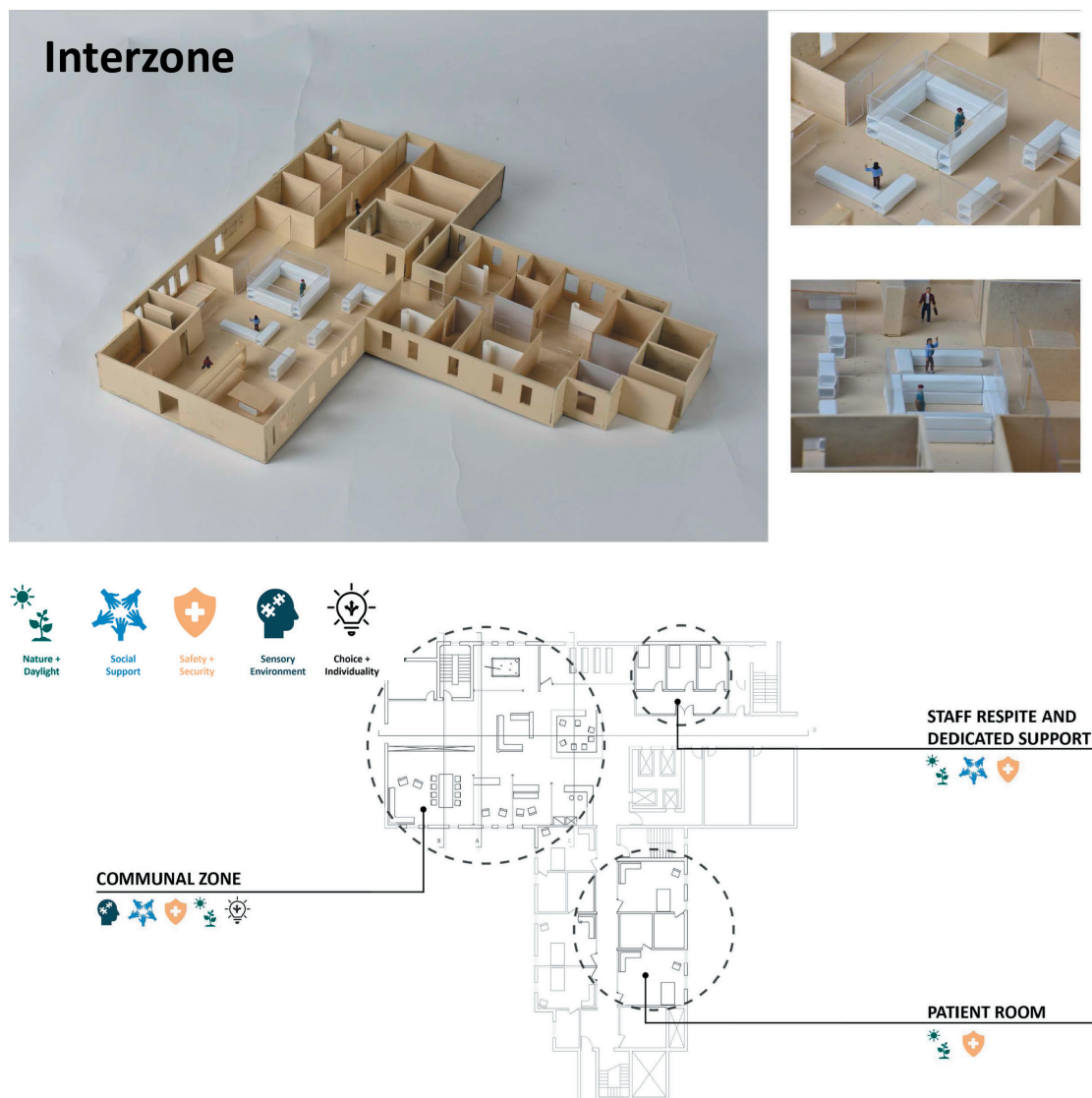
This team began with a spatial analysis of the existing inpatient unit where three categories of space were identified: double-loaded corridors created public circulation space; the elevator lobby and entry areas into rooms created threshold spaces between public and semi-public space; and walls enclosed discrete rooms and semi-private spaces such as patient rooms, bathrooms, clinical work areas, and supply/support spaces. The team was concerned over the lack of intermediate-scaled space which limited the visibility and potential interaction between patients and staff in public and semi-public spaces.

In response, the team proposed a central common area for the unit where a nursing station, a conversation

alcove, a library/resource center, and an arts/recreation space would be located. Rather than using full-height walls, thick half-walls that accommodate built-in seating and perching were proposed to divide zones within the central common space. A full height plexiglass enclosure was designed around portions of the nurse station to add an element of acoustical privacy and protection for staff.

Figure 4 illustrates this design proposal and provides model shots of the visual connections made possible through the centralized common zone of layered spaces. Private patient rooms and clinical support spaces flank the common area, and views across and through the common area promote greater connectivity between patients and providers.

Figure 4. Design concept for Interzone.

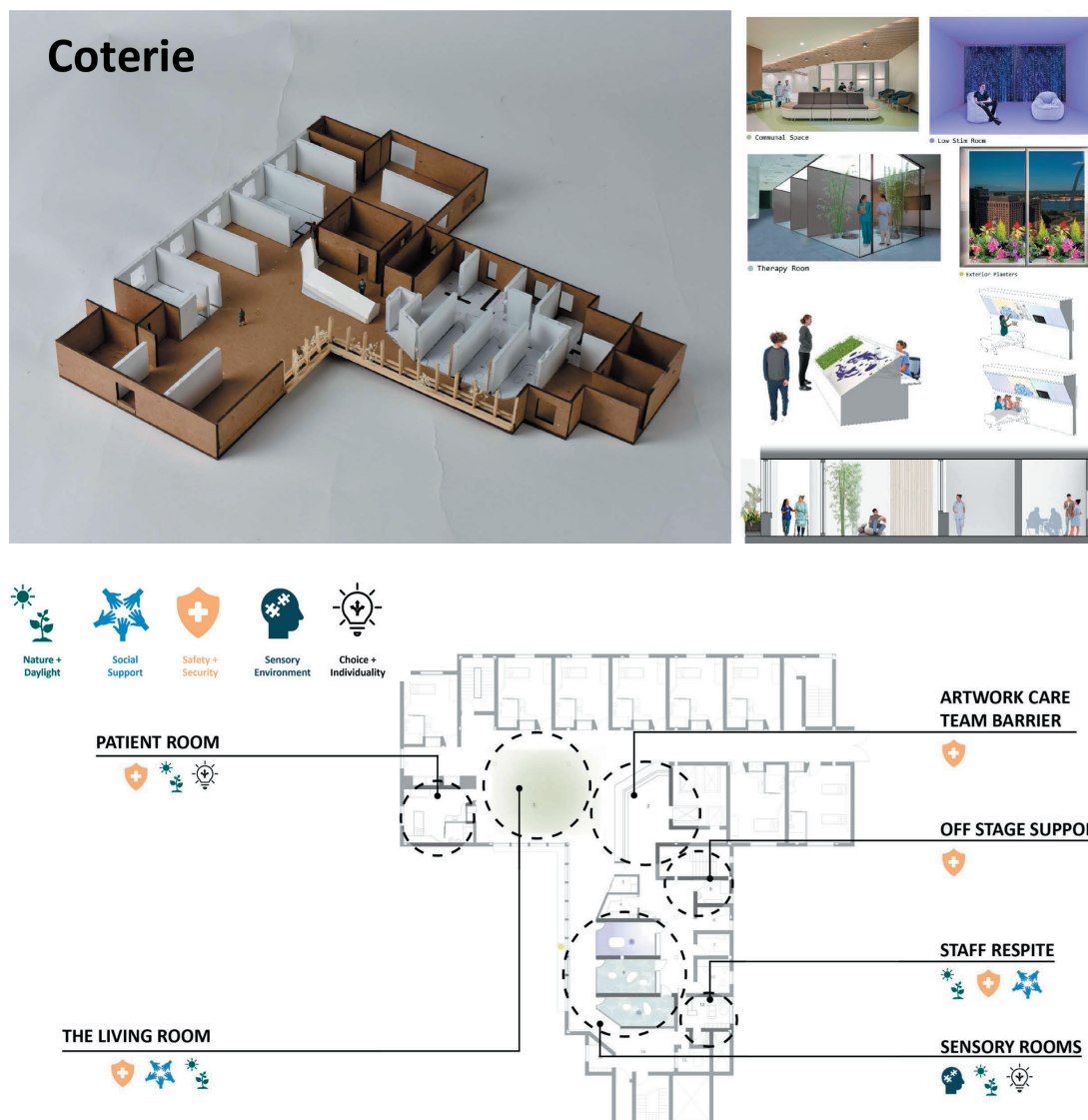


Design Concept B: Coterie

The concept of celebrating the individuality of patients and providers drove the scheme titled Coterie, named to recognize the community of people inhabiting the unit with shared interests and needs. This design approach, illustrated in Figure 5, centered around an open common space and featured a set of distinct sensory destinations, including a low-stimulation room, a therapy room, and a meditation lounge. These were envisioned to be retreat areas that provided relief for patients who needed to get outside of their individual patient rooms. Staff retreat areas were organized alongside, but separated from, patient areas; staff areas included a mother's room, a break area, a small conference room, and a huddle room—all of which were privileged with daylight and views.

Visual display was a critical component of the scheme. An extended front to the nurse station was proposed to both display artwork and to provide a spatial buffer of protection for staff. A canted headboard in patient rooms was designed to contain medical equipment and supply outlets without posing concerns for ligature and self-harm. Restrictions to incorporating live plants in the unit itself were addressed by proposing a ledge for plants that would be housed in the exterior façade system. The team, which was comprised of two students in art and two in architecture, additionally proposed a way for patients to personalize their attire with logos, in lieu of the green and blue hospital scrubs that are common issue.

Figure 5. Design concept for Coterie.



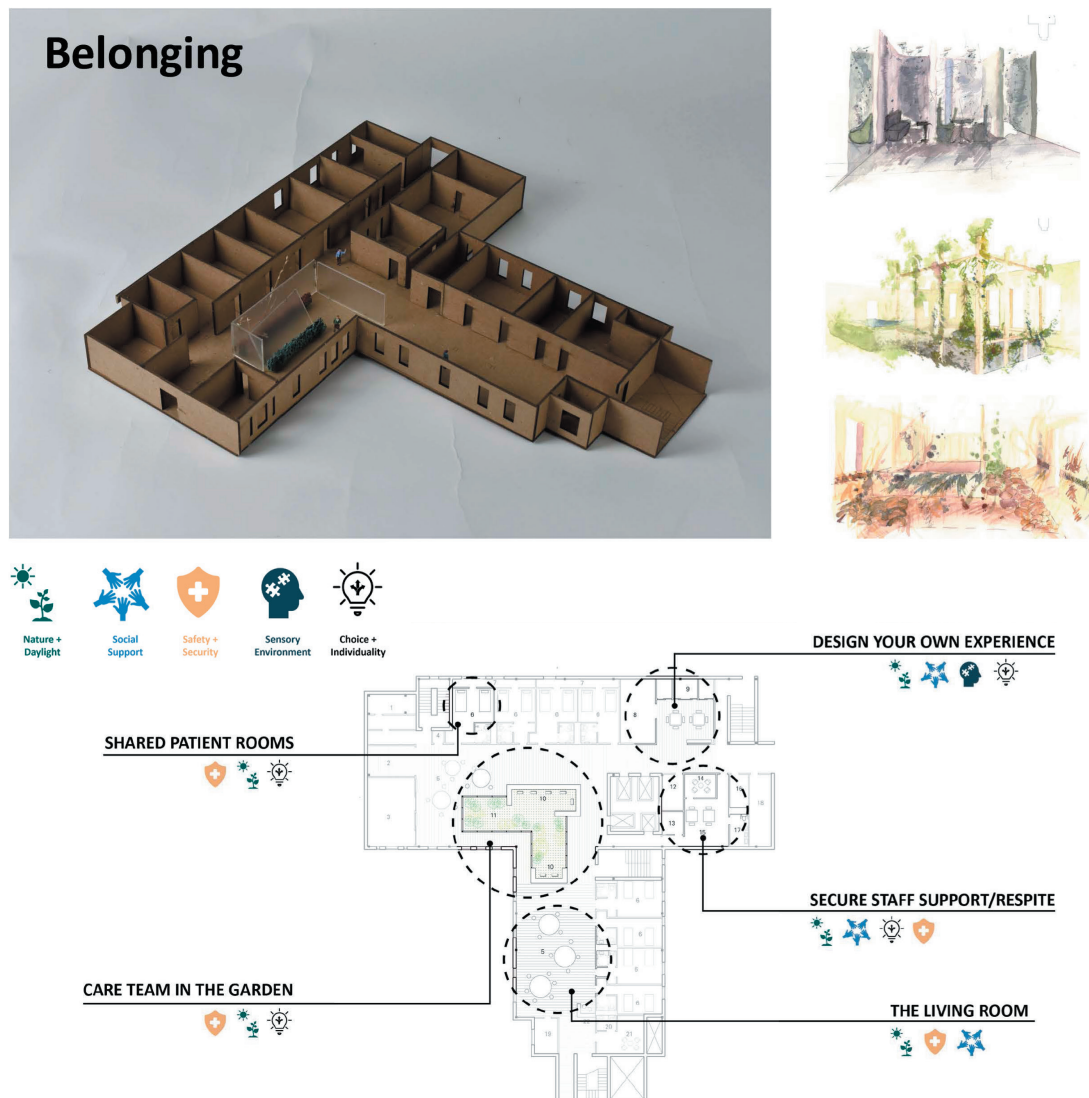
Design Concept C: Belonging

Interest in aggression reduction strategies prompted this team to think about proactive design measures that could engage primary senses such as sound, sight, touch, smell, and taste. Team members were struck by the number of damage-resistant components they saw on tours including locks, observation windows, security cameras, and metal detectors; while acknowledging the need for safety and the incorporation of these features, they were inspired to rethink the ‘safe unit’ as a source of revitalization for the senses.

The team interpreted the program therapy areas to include a sound room, a cool room, an art exhibition area, and a smell zone. Restrictions to having greenery

within the unit were addressed by conceiving of the central nursing station as a kind of greenhouse—filling it with plants and enclosing it with glazing—which creates visibility to greenery and brings plant life into the work zone of healthcare providers. A subtle use of color was also intentionally deployed in the scheme, Belonging, as the team envisioned how daylight or lack of daylight can work with color to create different emotive qualities in semi-public, common spaces. Figure 6 depicts the model and illustrations generated for the scheme Belonging.

Figure 6. Design concept for Belonging.



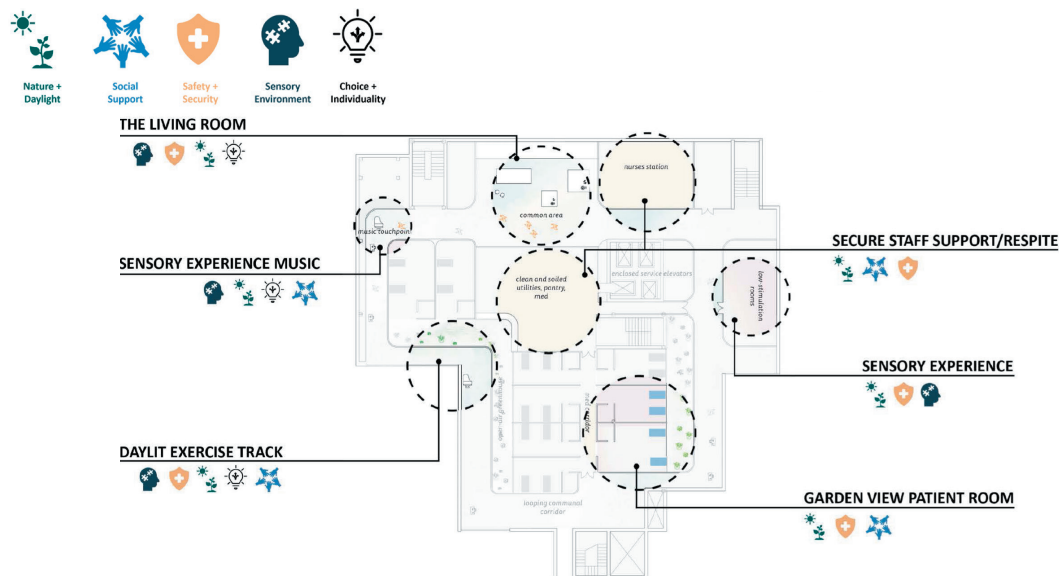
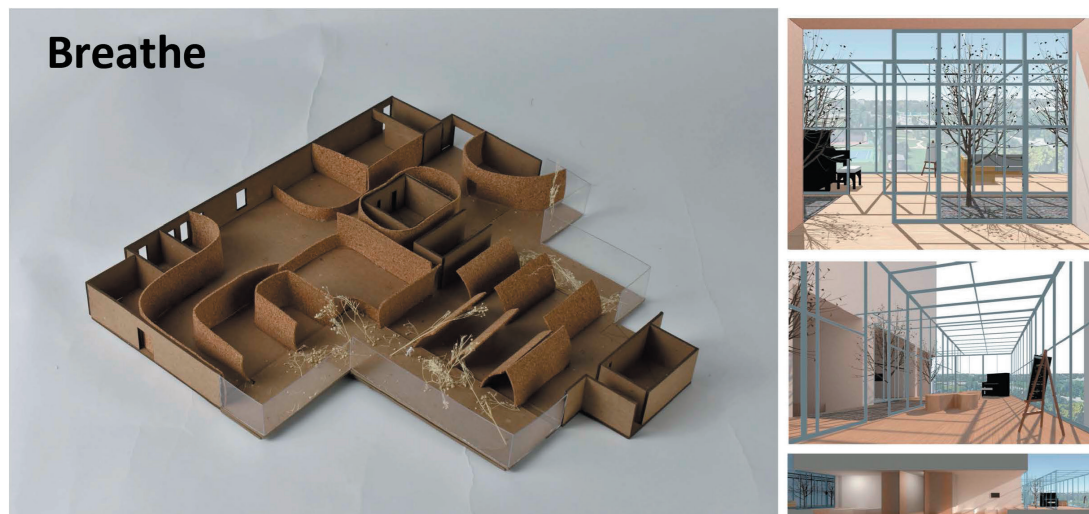
Design Concept D: Breathe

One of the primary concerns that resonated with this team was the sense of confinement and disconnect from the outside world that they experienced in both acute care units and psychiatric care units. Inspired by the need for physical activity and connection to the outdoors, this team proposed a continuous loop of a walking track around the perimeter of the unit, made possible by a cantilevered extension of space off the T-shaped tower. Figure 7 illustrates ideas for the concept Breathe.

Conceived as a hybrid between a conservatory for music and art, and a walking track, the team envisioned this cantilevered space as a linear refuge akin to the linear patio at Aalto's Paimio Sanatorium. The daylight

and privileged views of the city would be brought into the heart of the unit through gently curving walls that enclosed patient rooms and staff work areas. A visual connection to the surrounding city and environment would provide a positive distraction for both patients and providers and be a space where family and friends would be attracted to spend time with their loved ones outside of the context of patient rooms. This space would encourage social interaction, exercise, and creative activities, which team members regarded as critical to supporting mental and physical health. Symbolically, the space would also serve as a beacon at night and celebrate the presence of space on the academic medical campus that cares for co-diagnosed patients.

Figure 7. Design concept for Breathe.



Discussion

The diversity of ideas offers a glimpse into the potential to rethink the model of care for co-diagnosed patients who are admitted for primary medical conditions but who have behavioral and mental health issues and cannot be safely accommodated on a regular inpatient medical unit. This is largely an unprecedented space type with the same challenges and requirements related to infection control in medical surgical units. Rather than focusing on precedents and case studies, this workshop took the approach of investigating design issues from interdisciplinary and collaborative perspectives within a charette format.

Further design research is needed to address this pressing need, and to respond to issues of safety and security that are posed for patients and healthcare providers. While there is currently a lack of precedent for this type of 'safe unit' envisioned in the workshop, the premise of caring for health needs that are both physical and mental is fundamental to the charge of healing environments. Strategies presented here reflect visions of how inpatient units of the future might be designed to dually support mental and physical health. The projected rise in behavioral health crises because of the COVID-19 pandemic underscores the warranted attention.

This design study also calls attention to opportunities for experiential learning and interdisciplinary exchange which are critical to the education of the next generation of designers. The ability to form an understanding of novel problems and issues through the lived experiences of patients and providers is core to mobilizing education around unmet social and health needs. Meaningful experiences and collaborative processes of working with practitioners, providers, and fellow students in other fields of study create formative portals for entry into the profession. Projects and learning opportunities which build on 'real world problems' engage students with their local communities and tie curriculum and learning objectives into tangible contexts.

Increasingly, the design problems we face are ones without precedent. The relationship between the healthcare organization and the university presented a unique opportunity for interdisciplinary and interprofessional collaboration in this workshop and offers a model for design investigation that pairs the next generation of designers with healthcare providers, administrators, and architects. The authors hope that these types of collaborative endeavors continue to shape and contribute to the realm of education, the field of practice, and the larger healthcare design industry.

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