

High Volume Healthcare as a Livable Environment:

Strategies from the ED

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Jim Harrell has been in practice for over fifty years as an architect/designer and planner of healthcare and institutional facilities. His work is nationally recognized for innovation in planning and design. He has lectured to regional, national and international audiences on healthcare design/planning issues and his writings on a variety of architectural subjects are found in divergent publications. Many of his designs have won local, regional and/or national awards for excellence and have been published in regional and national press.

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As a project manager, Jason successfully implements GBBN's Guiding Principles (Vision and Mission) by managing the research, planning, design and construction administration for the multiple projects and teams he serves. His experience ranges from small renovations to large developments incorporating process improvement and Lean techniques to the Design Process. Jason's strong leadership and collaborative nature has led to trusted relationships with GBBN Architect's leading Healthcare clients, consultants, and project teams. In addition to Jason's Project Management role on Healthcare projects he is responsible for overseeing the operations of GBBN's Kentucky office.

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Stephanie Shroyer, an experienced interior designer, is among the first to use Evidence-Based Design research for two Department of Defense projects, (each over 1.2 million SF). Her teamwork to help research the EBD Furniture Checklist, now mandatorily included in the DoD/MHS World-Class Tool Kit, has given her exceptional insight into designing "World-Class" healthcare facilities. Working with institutions like UC Health, DoD Military Health Systems, and Cincinnati Children's gives her a profound understanding of the healthcare environment allowing her to create patient centered interior spaces, which are operationally effective for the healthcare staff while promoting a healing environment for the patient.

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Abstract

High volume Emergency Departments can be chaotic environments that are very stressful for patients, families and staff. There are several challenges that such a department faces: reducing wait times, providing a supportive and efficient work environment for staff, and maintaining a safe and secure environment. This paper recommends evidence-based strategies to improve the patient experience by promoting flow, quality of care, safety and security.

From the importance of the first encounter experience, to the habitability of the waiting room and exam room, to ease of wayfinding; being able to reduce the cognitive load for patients and families helps to reduce stress. We share results of our map of the patient experience and tie it to several measurable aspects of the built environment: amenities (including visual art), acoustics, positive distraction and lighting. Devices such as plan nodes, zoning, color, and artwork break down the scale of a large department so patients and visitors can easily find their destinations. Finally, the importance of nature based themes to reinforce the wayfinding and provide positive distraction is explored.

Staff well-being translates directly to the patient experience, influencing both quality and safety. We discuss ways to employ principles of Crime Prevention Through Environmental Design (CPTED) and a "ribbon layout" - an open and zoned central work core surrounded by a continuous array of exam rooms- to maximize staff visibility for safety and security. A decentralized and zoned network of supplies reduces steps so providers can channel their energy into patient care. Streamlined flow is furthered by having exam rooms that are essentially the same, permitting any case to be handled in any room, with glass doors for patient visualization. Providing quality break and respite areas and work cores that foster collaboration allows staff to function at a higher level and reduces overall noise.

Five keywords:

High Volume, Wayfinding, Emergency Department, Patient Experience, Flow

Category:

Environment

Introduction

Many emergency departments have catapulted into the high volume range in recent years, but are still operating out of spaces designed to accommodate far fewer patients¹. These space constraints result in low performing departments that compromise safety and satisfaction for patients and staff. Adding more space is not the solution, as there can be unintended consequences that arise when a department becomes too large and unwieldy. High volume healthcare environments do not have to be high stress ones. Design strategies break down the scale of operation creating optimal space for staff and patients alike². In this paper, we explore a process of tying delivery of care to operational models to develop a built environment that makes the patient experience the basis of design.

The first aspect of the patient experience that we focused on is efficiency and flow. Design that supports operations is important to any type of facility, but its importance is magnified in a high volume environment. Every inefficiency requires much more effort to overcome with greater opportunity for errors and injuries. Designing for high performance is critical to accommodating the anticipated volumes³. Attention to more subtle psychological needs, like orientation, scale and appropriate complexity, impacts stress levels for patients, families and staff. We explore the environment/behavior link and recommend stress reduction strategies, which can lead to decreases in behaviors, pain, injuries or errors.

1. (Siegler, Price, Pietsch, Mackey, & Mathy, 2008)

2. (Bentley & Koppenheffer, 2007)

3. (Siegler, Price, Pietsch, Mackey, & Mathy, 2008)

Improving Efficiency and Flow

Optimizing efficiency and flow involves several areas; patient arrival, triage, treatment and discharge. While commonly understood as distinct spaces, we propose they be viewed instead as functions that can occur in multiple locations. Eyeball triage, the process of having a nurse stationed within sight of the entry, keeps patients moving through the system; but the common solution of a podium or counter is insufficient to properly assess patients or protect their privacy. We recommend an “external exam room” (Fig. 1) within the waiting area to provide the proper area and seclusion to this function. A high volume environment demands a triage suite; several rooms with work areas for a mid-level physician, registrar, nurse and lab tech and mobile imaging. At least one room should accommodate EKG testing. Adjacent to this space, a separate waiting area for fast track patients facilitates the process of “treat and street” for minor health issues. Within the exam room area, universal rooms zoned by acuity provide the most flexibility. Embedding key processes such as lab and imaging and keeping them staffed further expedites diagnosis and treatment.

Figure 1:



The room without walls concept at the first encounter desk keeps the cue from forming near triage/checkin activities.

Decentralization is a key patient-centered design strategy: it brings services to the patient, resulting in less need to move around. Decentralization breaks down the scale of the department allowing staff, equipment, and supplies to be proximal to the site of care; reducing treatment time and noise. This cultivates greater staff satisfaction, contributing to a more positive attitude and greater level of patient satisfaction, defined as when the patient’s own expectations for treatment and care are met or exceeded⁴. Starting in 1984, we began planning that focusses on patient visibility and staff efficiency by arraying exam rooms around an interdisciplinary team center. We have dubbed this notion the Ribbon ED and it resolves several issues important in emergency care: visualization for patient safety, efficient staffing, and efficient access to supplies. A description of the impact of the Ribbon ED of these factors follows.

4. (Trout, Magnusson, & Hedges, 2000)

Optimal patient visualization for Patient Safety

The radial layout maximizes visibility into patient rooms through the absence of corners and continuous array of rooms. When Emergency Department providers are asked to name the most important aspect of the environment in which they work, a common answer is safety through visualization. The preferred arrangement is to have patients arrayed in circular – or radial - fashion with the care team at the center⁵. (Fig. 2) This maximizes visualization between patients and providers, but there is a practical limit to the size of the arc. In an ED when the arc is greater than eight or nine rooms, the core becomes too big for the required functions and, therefore, inefficient. To avoid compartmentalizing the ED with multiple pods, the Ribbon concept joins the arcs together into a continuous curving line or “Ribbon”⁶.

5. (Harrell, *Emergency Department Planning*, 2007)

6. (Harrell & Mazzi, *Evolution of the ED*, 2012)

Figure 2:



With a radial layout, visualization is maximized

More efficient use of staff

In linear or pod arrangements, a complete set of staff is required when a new care zone is opened, even if only one patient occupies this zone. The ribbon's enhanced visibility and continuous results in fewer FTE's needed to staff partially occupied zones⁷. ED design is driven by looking at the maximum volume to be expected. However, for a significant part of each day, the number of patients presenting are but a fraction of the peak. During these periods – generally between 11:00PM and 8:00AM – staffing is at a minimum. In this configuration, when that “next” patient comes in during the very early morning, additional staff are not required since this patient can easily be seen and managed by the standard night shift.

7. (Bentley & Koppenheffer, 2007)

Flexibility

Flexibility is needed in times when peak volumes are exceeded due to unusual circumstances. The optimal design will support these surges with minimum disarray and confusion. Accommodation for surges in patient volume are inherent in the Ribbon design as most rooms are trapezoidal shaped. With wider headwalls and duplicative gas and electrical devices, these rooms are proven to allow the placement of a second bed therein, keeping the overflow out of hallways.

Efficient equipment and supply stocking

Reducing walking distances for nurses improves patient care⁸. In the ED quick access to supplies is essential. This is best accomplished by decentralizing supplies⁹ so that no more than a few steps are necessary to retrieve material not kept at the bedside. The Ribbon ED concept features three tiers of supplies: Tier 1 located in an exchange cart within each exam room, Tier 2, shown in Figure 3, is located along the ribbon to allow all needed supplies to be replicated in close proximity for quick retrieval, and Tier 3, a large supply room used for restocking Tier 1 and 2. Tier 3 is located at a border of the ED to be easily accessible by material management staff. Carts are most often the choice for storing supplies, especially Tier 2, as they can be moved to wherever most needed. A work surface also follows the perimeter, providing space for many people to work and collaborate while being able to observe patients in their rooms (Figure 4). This system keeps materials management staff to the department periphery instead of having to enter the department to restock¹⁰.

8,9. (Ulrich, Quan, Zimring, Joseph, Chaoudhary, 2004)

10. (Harrell, Emergency Department Planning, 2007) (Harrell & Mazzi, Evolution of the ED, 2012)

Figure 3:



A view of the cart system used for decentralizing supplies

The Environment/Behavior Link

Cognitive fatigue, a condition which occurs in people under stress, affects their ability to process information, alters the patient's ability to easily navigate the department, find destinations or understand placement within the spatial context¹¹. This inability to create a cognitive map generates additional stress, amplifying patient and family member tension and anxiety. Design can combat this by supporting a clear sense of place within the department, even one with multiple, complex destinations - a very large space broken down into few easily understandable (and locatable) components. Within each component, there may be greater complexity, but spaces are easily understood in the context of the larger department. According to Cohen, et. al, (2007) psychological stress is defined as situations that tax or exceed an individual's ability to adapt to them. This in turn causes feelings of anxiety and depression. In contrast, providing an environment that alleviates stress creates positive physiological change¹². Behavioral cueing is one means of supporting the development of a clear, cognitive map.

11. (Persson, 2006)

12. (Cohen, 2007)

By differentiating spaces, a sense of place and destination (toilets, exam room, exits) along a path is established. Clinically, spaces like a triage or exam room seem easy to differentiate, but they become a confusing blur in the mind of a patient or family member. The experiential journey through the Emergency Department is reinforced by color and artwork. A soothing palette is appropriate for the entry/waiting area. In clinical spaces, a warm neutral base palette provides a welcoming crisp, clean backdrop for zoned colorful accents that distinguish major destinations and acuity zones. All of these provide an emotional context that can help enhance the patient experience¹³.

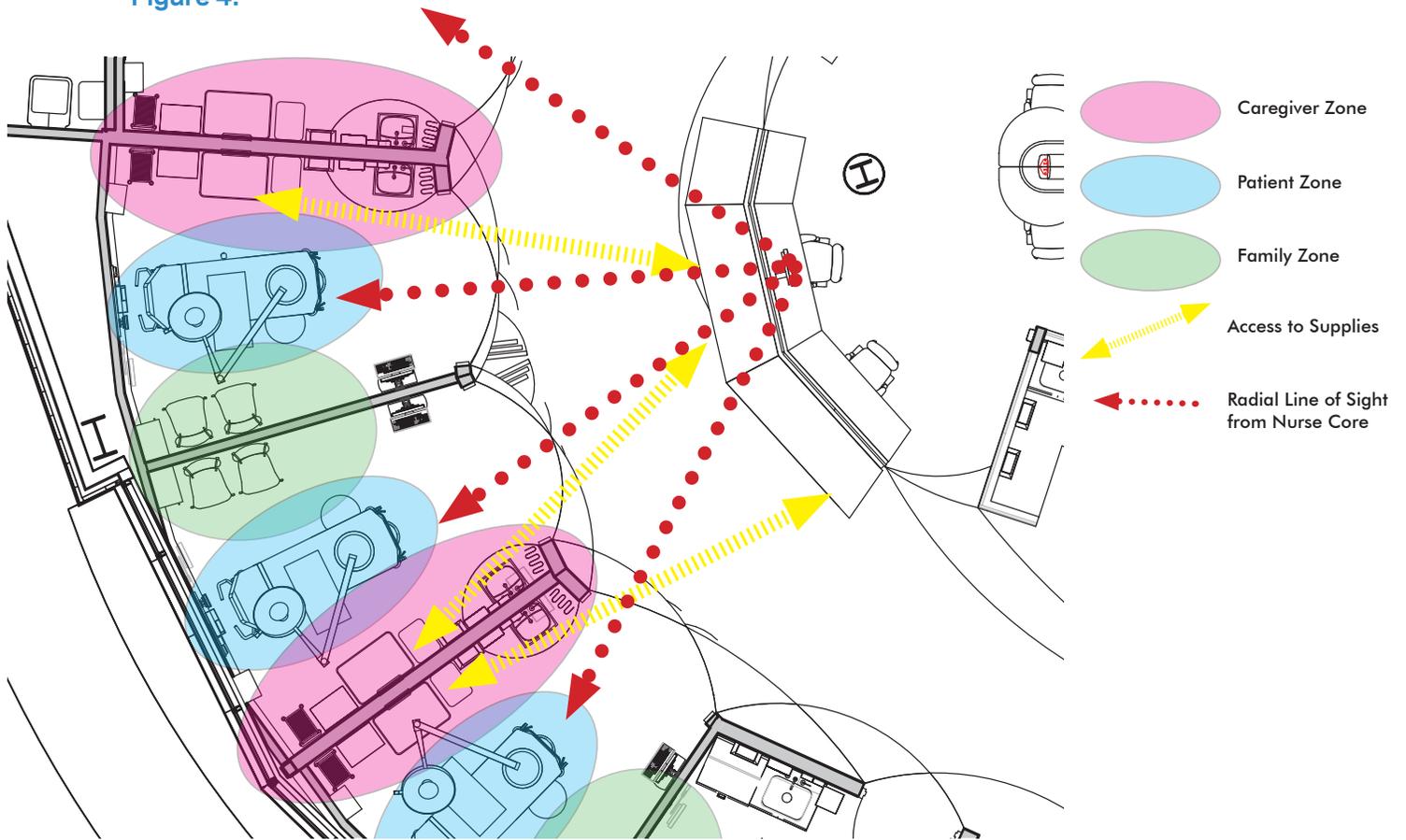
13. (Russ, et al., 2013)

In a high volume setting, patients may arrive simultaneously, compromising patient privacy at the first encounter desk. If a patient is uncomfortable giving details of their complaint, they risk being misdiagnosed. To keep queues from forming too close to the desk where health information is discussed, we have experimented with creating a room without walls so the triage nurse can move beyond the desk creating a personal and more comprehensive first encounter. Architectural clues in the flooring pattern and ceiling planes along with semi-transparent screens, create privacy boundaries that beyond those typically available at such desks, providing the appropriate perception of personal space needed for engaged care.

A patient's journey has many key decision points plus twist and turns, figuratively and literally. Appointing key decision points with color and artwork reinforces the cognitive map. In the public realm, colorful, nature-based artwork featuring local landscapes provide the waiting patient with a virtual escape, the feeling of bringing the comforts of home along with them. The Center for Health Design Research on the Impact of visual art on waiting behavior in the Emergency Department concluded that visual intervention improves the waiting experience¹⁴. Along with visual clues, waypoints along the journey strengthen the cognitive map, emphasizing destinations like fast track waiting, family sub-waiting zones, toilet rooms, and results waiting rooms. With perceived wait time a powerful component of patient satisfaction, it is critical that the time a patient does spend waiting be as pleasant and restorative as possible¹⁵.

14,15. (Nanda, 2011)

Figure 4:

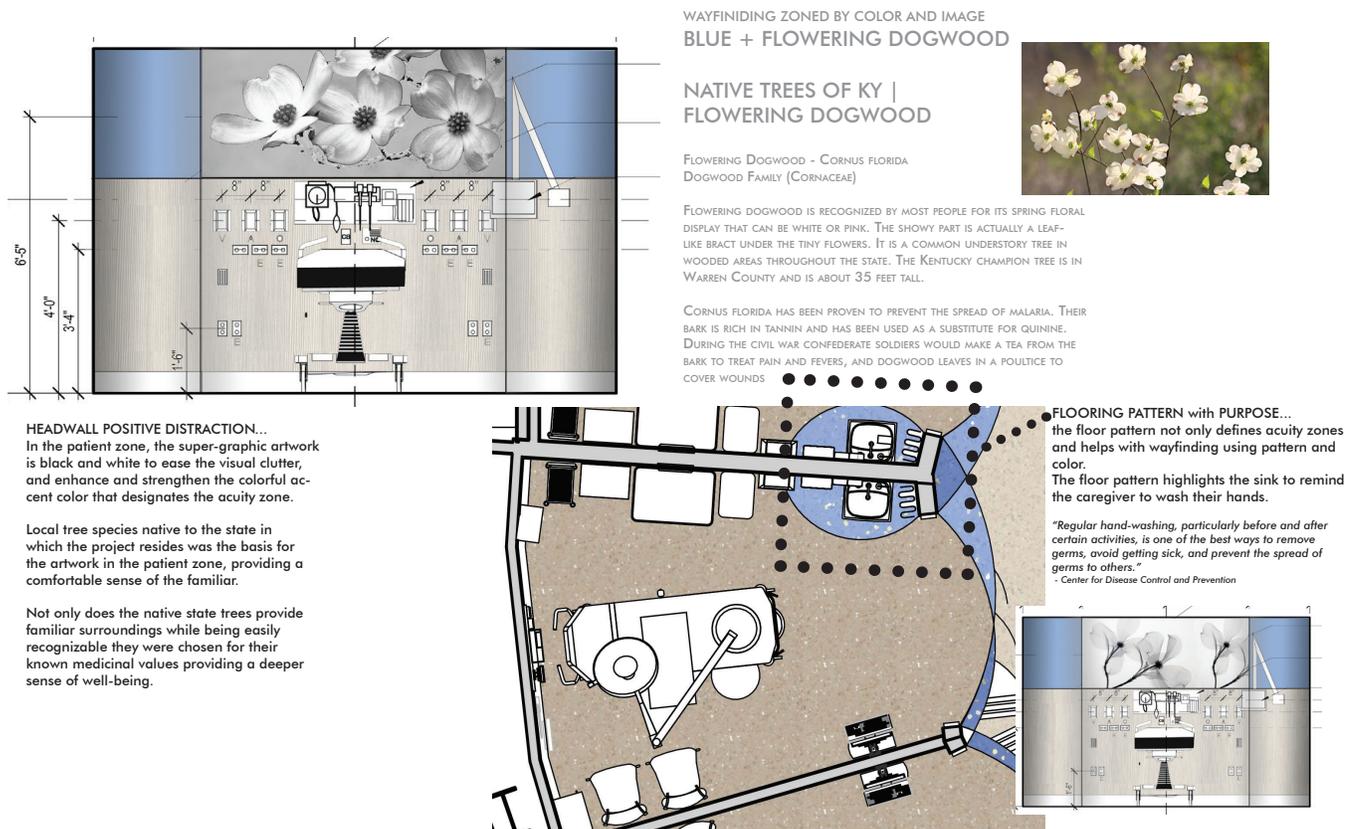


The Ribbon concept showing supply distribution and optimized visualization

Employing “Biophilic Design” concepts reduces stress through strategies such as incorporating images of nature, using analogous color schemes found in nature, more organic planning, and natural materials. Simple visual intervention in the form of nature-based still art has been proven to improve the patient experience, and something that we recommend using as the basis for the wayfinding efforts. As Figure 5 shows, the patient room can be transformed into a calm, peaceful retreat by using natural colors and only black and white artwork. Layering cues such as color and art themes and organizing by zones reduces an array of rooms down to easily understood clusters, providing clear wayfinding and aiding the staff in designating acuity levels on a particular day. An accent color in the flooring can create a pattern to distinguish the zone and also draw attention to the exam room sink, increasing hand washing. Using color and artwork with meaning and purpose provides a backdrop that allows the patient to experience the Emergency Department with familiarity and begin healing¹⁶.

16. (Terrapin Bright Green, 2012)

Figure 5:



Behavioral cues enforced through biophilic elements in an exam room

Supportive Work Environments

Staff well-being translates directly to the patient experience, influencing quality and safety. According to a 1988 paper by Leon Phipps, major sources of stress for clinicians are time pressure, critical decisions, provider-patient dissonance, patient stress, and professional relations¹⁷. Because of the uniquely high stress level of the ED, we recommend the following specific measures to help reduce that stress:

17. (Phipps, 1988)

1. Unified interdisciplinary team center that allows staff to work more collaboratively and provide additional assistance when required
2. Glass wall around the team center to contain noise and to bridge access thereto.
3. Respite area within the work core to relieve stress or have a quick refreshment while on duty
4. A true back of house space for break room, locker room, offices and conferencing that is immediately adjacent to the treatment area but separated by security doors.
5. Views to the outside

A Different Vision Implementing the recommendations in this paper involves also employing strategies to involve stakeholders (staff and caregivers) and gathering information in support of their needs. The challenge for design teams is to get stakeholders to think about how they could do their jobs better and gather data that enhances the designer awareness of the implicit culture within their work environment.

Stakeholders

In order for a new design to be effective, a process that examines caregiving behavior is critical to understanding which processes to preserve and/or improve. Easing the transition to a new way of working starts early in the process by involving key stakeholders. Allowing them to have a voice and opinion in the process yields a sense of ownership and pride. We recommend several process improvement strategies be put in place help owners and users groups think beyond the way they work today to how they could work at their fullest potential.

Design can support a patient centered philosophy, but the strategies require adoption at every level to operate as intended. Operational exploration with a diverse group of stakeholder representatives carefully selected by Hospital leadership includes identifying issues related to the project, which become the basis of the Project Goals and Objectives document and the Project's Mission Statement. In the case of the ED, the stakeholders could be identified as ED staff, security, lab, materials management, housekeeping, and the local EVS service(s) in addition to high level administration from Facilities management and the C-Suite. Designers must facilitate stakeholder activities through a process of formal orientation (organizing steering members and stating desired outcomes), followed by learning (education through observation and research), and finally developing the ideal state (project vision). One of the biggest challenges to achieving a higher level of efficiency is compliance on the part of staff to trust a new environment and care model. Busy staff members can revert to the familiar process they know, bypassing the carefully researched innovations and amenities of the design. Because work process is such a key component of the patient experience in a high volume care setting, minimizing stress for staff is also key.

Information gathering

A research process that includes observations, surveys and interviews, and value stream mapping reveals the culture of the space, as well as operational issues which have been so completely integrated as to make the user groups unaware of them. Facilitating a dialogue with stakeholders is key to gaining perspective on operational decisions and behavior and facilitate meaningful innovations.

Patient profiling is a qualitative exercise whereby staff can focus more abstractly on how to best deliver care or address situations that may arise independent of space. The result is a series of actions that can then be used to inform the design. Using mind mapping techniques, we take Lean processes to another level by getting our stakeholders to envision what the desired experience of being in this new environment would be for patients, families and staff. Armed with this data, we can then look at external research, through benchmarking, case studies, and look at psychological and social research, including Crime Prevention Through Environmental Design (CPTED) principles.

Conclusion

What have we learned? Certain elements are crucial in high volume environments: flow, security, quality and safety. The high volume environment can be a very large space that must still feel intimate and localized in order to support wayfinding and staff visibility, and control factors such as noise. Strategies, including developing pods to break down the scale actually impede safety and visibility. Instead, decentralization is key to keeping staff in work zones, where their work load is manageable.

Features that make a difference in creating a positive patient experience in a high volume environment are:

- Development of a centrally located interdisciplinary team center that emphasizes collaboration

- Layout of exam rooms around the team center to maximize visualization

- Decentralized supplies for quick and easy access
- Zoning patients by acuity and volume

- Positive distractions in exam rooms to help soothe patients and relieve stress

- A dedicated grieving/consult room outside of the treatment areas

- Glass doors on exam rooms for visualization and acoustical privacy

- No built in casework in exam rooms to provide maximum flexibility

- Creating visual "landmarks" through lighting, color and floor patterns to provide visual cueing that will support wayfinding.

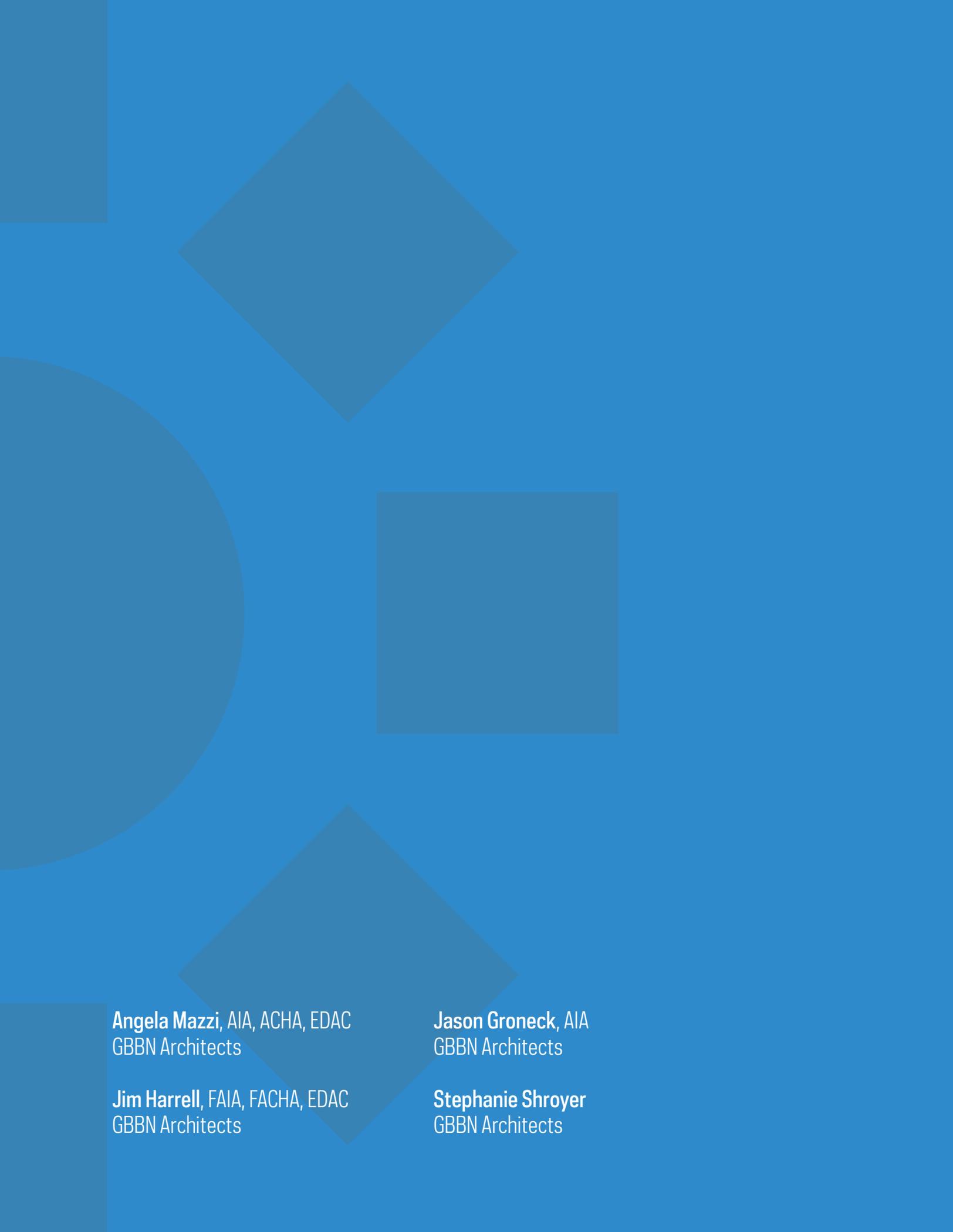
- A simple visual intervention, like still and video art, can improve the patient waiting experience in the Emergency Department

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Managing the environment of a high volume department through these design strategies improves not only the patient experience but the environment of care. Involving stakeholders leads to meaningful change that will be followed though operationally, resulting in a more supportive and healing environment.

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