Crime Prevention through Environmental Design in Healthcare Facility: A Case Study of Sehat Al Sharq at Al Khobar, KSA

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Abstract

This paper shall cover the existing theories and practices in the field of Crime Prevention through Environmental Design with a special focus on Healthcare Projects. The intention is to address the gap between theory and practices. Safety & Security is one of the basic human needs for peaceful existence. Patient safety and security have always been concerns in the successful operation of a healthcare setup. Nowadays, patient-centric healthcare service has given a competitive edge to the hospital; therefore, safety against crime has become very crucial for the hospitals. Other than the patients, safety and security for staff and visitors are equally important. Safety from data theft and breaches of privacy are other concerns in the healthcare setup.

The design approach of best practices, like Crime Prevention through Environmental Design, seeks to create safer spaces through detailed design principles and strategies, and guidelines issued by the International Association for Healthcare Security and Safety. The majority of evidence suggests that designing the physical environment while considering safety features like Access Control, CCTV, Ultrasonic Occupancy Sensor, Public Addressable System & Duress Alarm for healthcare setup, duress alarms have proved to be life-saving measures that are used to alert hospital staff and security personnel when an individual is in need of emergency.

In this paper, qualitative research methodology is used as a case study and physical observations to collect qualitative data and analysis of Sehat Al Sharq Hospital, Al Khobar, KSA, shall be included to identify and propose solution factors affecting the design challenges related to CPTED. Furthermore, it aims to recommend a roadmap to address design constraints, optimize efficiency, and improve safety and patient care in the healthcare facility.

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1. Introduction

To meet the diverse needs of healthcare facility area design, there is a need to address future technological and new medical demands. There are many pieces of evidence available that the physical environment of hospitals can affect the healing process. A safe environment is a major contributor to healing, yet violence generated by patients and visitors is increasing at astonishing rates. Improving security and safety in healthcare begins with design. According to the Bureau of Labor Statistics, while under 20% of all workplace injuries happen to healthcare workers, these same workers suffer 50% of all assaults across all U.S. industries (Ronda G, 2008).

As part of an overall multihazard approach that considers the various building systems including site, architecture, structure, mechanical, and electrical systems, thus allowing security applications to be cost-effectively integrated into architectural, engineering, and environmental design. With directed focus on high-risk areas through IAHSS Design Guidelines, this paper will provide general security recommendations for the protection administrator to share with the design team, and influence construction or renovation at the earliest stages of site selection and design. Alignment with a Security Master Plan is shown as an important element of this process in creating a roadmap for the Security Administrator and the healthcare organization (Shulman A, 2023).

Safety and security in hospital and healthcare settings continue to move up the priority rankings for locations looking to provide the best possible experience for patients, doctors, staff, and visitors. With incidents that can range from a violent individual to car trouble in a parking lot, organizations are seeking out new design features that will help keep the focus on saving lives – and not worrying about their own. Through best practices like Crime Prevention Through Environmental Design, which seeks to create safer spaces through detailed design principles and strategies, and guidelines issued by the International Association for Healthcare Security and Safety, officials are including more proactive security measures during the planning stages of healthcare facilities.

An efficient wayfinding also adds to the CPTED approach. A well-planned wayfinding approach makes the visitors, patients, and all stakeholders' lives easier by navigating them to the desired destination. This can also help in crime prevention by allowing the end-users to watch and monitor their space with clarity of ownership. With proper signage inside and outside of the hospital defining the territory and areas of authority and the due responsibility of the department or zone.

Routine activity theory focuses on three factors – the availability of a suitable target, the lack of a suitable guardian to prevent the crime, and the presence of a likely offender – all of which are affected by physical design, territoriality, and surveillance (Felson, 1998). Rational choice theory assumes that offenders weigh the potential benefits and costs of their offenses. They weigh the likelihood of their offense being observed and interrupted and of their being caught. Again, each of these factors is affected by their perception of the physical environment (Cornish & Clark, 1986). Finally, the crime prevention through environmental design and situational crime prevention approaches provide a broader perspective on the physical environment than previous (IAHSSS, D.G.T.F. 2012).

2. Literature Review

Evidence-Based Design is a process for creating healthcare buildings informed by the best available evidence concerning how the physical environment can interfere with or support activities by patients, families, and staff, and how the setting provides experiences that offer a caring, effective, safe, patient-centered environment. Architectural features, structural enhancements, and spatial definition can deter, detect, and delay potential violent offenders from entering the buildings (Saxena & Kamal, 2018).

A concept called ‘crime prevention through environmental design’ can help to reduce fear, cut the incidence of crime, and promote well-being in healthcare facilities’ buildings and the internal environment. With nine sub-guidelines, this section is the most voluminous and defines zones of protection within the internal environment; management of access systems; and areas requiring special security consideration such as research facilities, shipping and receiving, mailrooms, and administrative office facilities (IAHHS, 2023).

Sub-guidelines within the buildings and the internal environment guidelines largely concentrate on locations of higher risk whose function or activity presents a significant potential for injury, abduction, or security loss. While reviewing the IAHSS (International Association of Healthcare Security and Safety) security design guidelines, designing security features into new or renovated spaces from the beginning can improve safety and security, maximize utilization of resources, and establish the design principles of risk assessment with the concepts of protecting in layers through the creation of concentric rings of control and crime prevention through environmental design (CPTED) as follows:

A. **Parking the external campus**: Establishing the first layer of protection at the property line with the concept of physical barriers; coordinating vehicle entrances; landscaping and pedestrian walkways; surveillance and lighting systems; access control principles at the perimeter to reduce the potential for unobserved pedestrian access by channeling access; using natural barriers or fencing; transit placement; lighting and wayfinding; and parking facility security considerations.
B. **Building and the internal environment:** Building and the internal environment: Mainly covering zones of protection within the internal environment; managing access systems; and including areas requiring special security consideration, such as general areas accessible to the public at all times (i.e., lobbies, EDs, and entrance points), general areas restricted to the public during non-visiting hours or periods of lesser activity (i.e., restricted waiting rooms

and closed departments), screened public areas, staff and accompanied public areas (i.e., operating room recovery areas), general staff-only areas, and areas for designated staff with appropriate clearance.

C. **Inpatient facilities:** Concepts of protection in layers, including zones, control points, circulation routes, and required egress paths. Major points of emphasis for this guideline include the placement of elevators and stairwells to avoid conflicts between life safety and security.
D. **Behavioral/mental/health Areas:** This relates to perimeter design, internal space, and boundary-resistant considerations, as well as safety and security systems that protect the privacy, dignity, and health of patients. Risks of patient elopement and harm to self and others are focal points.
E. **Pharmacies:** This addresses the unique risks presented by the storage and distribution of narcotics and other controlled substances. The design should create a secure physical separation between pharmacy operations and the public while integrating security systems for access and audit functions.
F. **Cashiers and Cash Collection Area:** Security design considerations for primary and secondary cash collection areas should integrate the physical location and layout with security controls and technology. The risks posed by cash collection primarily involve robbery and internal theft. Specific measures covering safes, physical security, video surveillance measures, and internal control audits with emphasis on primary cashier areas and other locations where cash transactions occur.
G. **Infant & Pediatric Facilities:** While designing safe and secure care environments, considerations shall include physical location and layout, as well as the integration of security controls and technology.
H. **MEP, Equipment/Utility Area**: This includes the recognition that such space and the mechanical, electrical, plumbing, and information technology systems within it are critical assets for the facility and must provide security design elements for utility systems, mechanical and infrastructure spaces, and built-in redundancy and expansion capabilities pertaining to technology and mechanical systems.

The International Association for Healthcare Security and Safety (IAHSS) developed this using the expertise of a multidisciplinary team with experience in various aspects of planning and design, CPTED, compliance, and the development of healthcare facility security and emergency programs. All of this has generated concern for hospital administrators, care providers, and healthcare security practitioners alike. However, budgets to make changes or add, the new edition places considerable attention on its updated guidance to help combat violence in healthcare (harm-to-staff and harm-to-self) using the built environment (IAHHS, 2023).

Patients, visitors, and staff feel safe walking from the external grounds and parking areas, or even nearby transit facilities; their confidence in the organization is bolstered. There is a need to focus on their reason, their need, for coming to the healthcare facility. The idea of integrating security into design planning can be easy to overlook with the thinking that video surveillance and access control can be added in. Security design guidance provided includes defining zones of protection, addressing horizontal and vertical circulation routes, as well as the control and restriction of access that address the physical separations provided between general public areas, waiting areas, and restricted access. These security considerations should be made prior to major decisions in the design (IAHSSS, D.G.T.F. 2012).

3.1. Research Methodology

Research and theory concepts revolving around safety factors serve as the framework for an exploration of attributes of a supportive physical environment. This research utilized mixed methods to collect qualitative data and analysis for user-centered evaluation of staff, patients, and visitors' perceptions of environmental and physical infrastructural attributes of supportive healthcare safety environments. Qualitative research methodology is used as a case study, and physical observations to collect qualitative data and analysis of Sehat Al Sharq Hospital, Al Khobar, KSA shall be included to identify and propose solution factors affecting the design challenges related to CPTED, and to recommend design solutions for safety and better facility outcomes as established in Figure 1.

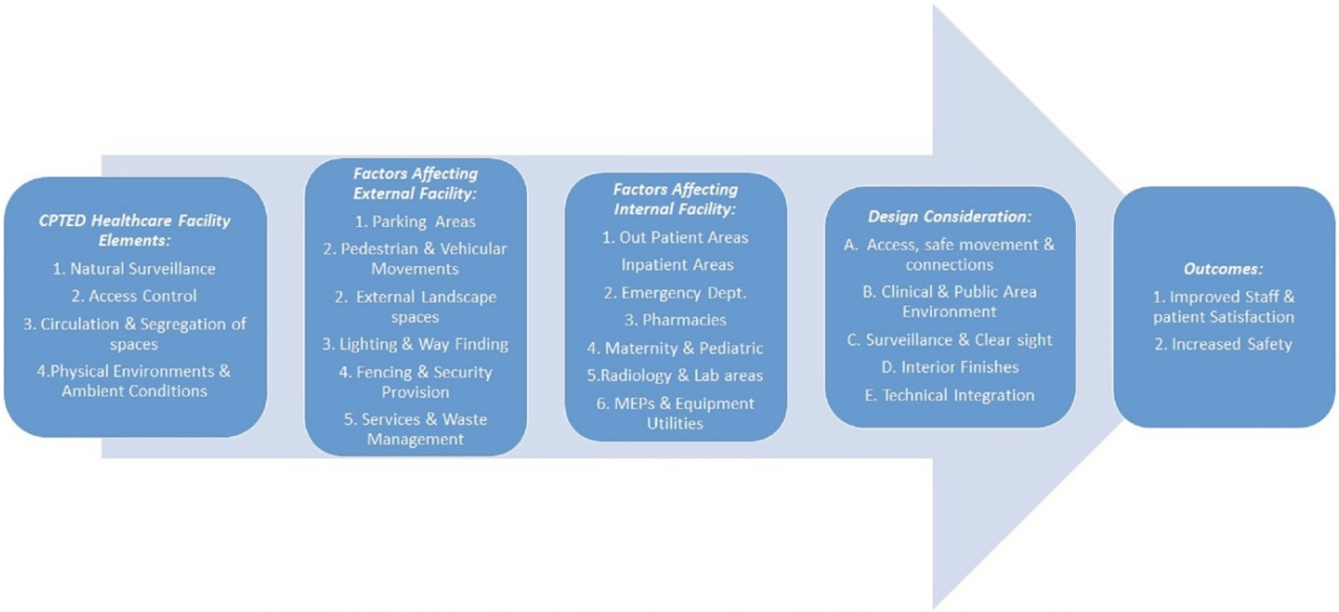

Figure 1. HMG Sehat Al Sharq Conceptual Model demonstrating CPTED Elements & Environmental Impact

3.2. Study Setting

With the KSA Vision 2030 and health sector transformation goals to improve healthcare with safe and effective CPTED strategies for identified high-risk areas that are normally a top priority at every hospital, including infant and pediatric areas, the emergency department (ED), pharmacies, and behavioral health areas (Ahmad S. et al, 2021).

Figure 2. Google map View@Sehat Al Sharq Khobar

Al Habib Medical Group (HMG) is well positioned to minimize the risks and overcome challenges posed by macroeconomic changes. While safety is the foremost priority, HMG has developed quality improvement, patient safety, and risk management strategies to reinforce safety through continued attention to operational systems and by implementing policies and procedures that help avert errors and minimize risks. Sehat Al Sharq in Khobar has a capacity of 400 inpatient beds and approximately 300 outpatient clinics, with a total built-up area of 290,000 square meters. The facility enables patients to have access to medical consultations at work or home around the clock via visual communication services. There are 10 operating rooms, 2 equipped cardiac catheterization rooms, 17 labor, delivery, and recovery rooms, and 100 intensive care beds (Ahmad S. et al, 2022).

Figure 3. Overall site View@Sehat Al Sharq Khobar

4. Design Considerations

Designing the facility shall involve a series of general design strategies that can be applied in any situation to improve natural access control, natural surveillance, and adhere to local Civil Defense guidelines. The goal is to identify main risks, their implications, and mitigation implementations through a multilayer control system.

A. **Access, Safe Movement & Connections:** The access to any place needs to be clear, so there is no confusion or need to hunt for an entrance. Clear border definition of controlled space, in the context of minimizing the number of entry and exits used by visitors. Designated, specific entrances for public access allow for easier monitoring and secure visitor screening. Utilizing vegetation and various architectural elements can help direct people away from entrances a facility manager doesn't want them to use and toward the main entrance. With proper signage, alarms, camera monitoring, and even removing the entrance-side door hardware, a facility can better control which doors permit entry into the hospital. Also, provide a clearly marked transition from public to semi-public to private space. Additionally, pedestrian traffic needs to be protected from vehicular traffic, creating a clear separation between the two can minimize incidents.

Figure 4. Lobby Environment

B. **Clinical & Public Area Environment:** The floor layout of clinical and public areas should provide clear sightlines from control points, reception desks, Nurse Stations to entrances, waiting areas, and circulation routes. Consider using CCTV or mirrors to assist in achieving visibility. Lighting should be considered to provide sufficient illumination (avoiding shadows) to see all spaces in an area and meet users' needs. All departments have been designed to limit the risk of hanging, with special consideration for door handles, hooks, curtain rods, sprinkler heads, and other design features to limit hazards as shown in Figure 4.

Figure 5. Surveillance & Clear Sight

C. **Surveillance & Clear Sight:** To provide good lighting and maximum visibility, as shown in Figure 5, create ample opportunities for passers-by to see each other, thereby reducing the chance for criminal activity that relies on being undetected. All patient room doors in the center have windows so nurses can easily check on patients, as well as anti-ligature sensors to prevent anything from hanging on them.

Figure 6. Interior Finishes in NICU area

D. **Interior Finishes:** All materials that may cause harm are strongly discouraged. As shown in Figure 6, furniture shall be anchored down and heavy to lift. Window coverings used should be tamper-proof and designated to limit hazards. Also, consideration is to be given to the type of furniture, artwork, and other objects used throughout the area to limit the ability of furniture/objects to be thrown or used as potential weapons.

Figure 7. BMS and Integration Monitoring Screens

D. **Technical Integration:** This mainly includes communication with other respondents in emergency events, lockdown of site facility access, integration of various systems, and relevant elements including power outlets, cabling, and physical systems' impact on the security of electronic Building Management Systems and IT systems. As shown in Figure 7, in this high-rise HMG Sehat Al Sharq Khobar facility, anti-theft and emergency event provisions are implemented. Below is the delayed egress system used in the facility with details:

1. **Delayed Egress Timer and Relay Logic Board:** This board is UL Listed and specifically designed to perform all delayed egress functions in compliance with life safety codes, the Saudi Building Code, and NFPA. The board is the brain of the delayed egress operation. It has contacts to wire in switches for delayed egress initiation, fire alarm interface, IBMS interface, and system reset. It also includes timers to control nuisance and egress delay, as well as relays to control locks and notify external devices.
2. **Initiating Switch:** The switch that initiates the delayed egress process shares several characteristics with any request-to-exit switch. To comply with life safety regulations, it must require no prior knowledge to operate; it must require no more than one motion to operate; and it must be placed in relation to the door according to life safety standards. In a panic situation, it remains obvious that to get out, one must push on the bar, and because it is mechanical, it is unaffected by power outages.
3. **Audible Alarm:** The mandatory audible alarm sounds for 15 to 30 seconds before the delayed egress controller

releases the locking device to allow exit. Its loudness must be between 81 and 88 decibels. The alarm must be manually reset at the door; or it may be self-resetting via a timer or door position switch.

4. **Signage:** The wording on the mandatory sign complies with the life safety code.
5. **Reset Switch:** Any kind of momentary contact switch will do the reset switch job, but delayed egress system reset switches located at the door almost always require some kind of security to prevent unauthorized resetting. Standalone keypads or key switches are often used for this purpose. Delayed egress systems are integrated into existing fire alarm, access control, and IBMS systems
6. **Fire Alarm Interface:** The mandatory fire alarm interface enables the fire alarm panel to deactivate the delayed egress system immediately in the event of a fire alarm. This is installed as an integral part of the life safety code that allows a delayed egress system to exist.
7. **Power Supply:** Generally, delayed egress systems require regulated and filtered power at 12 or 24 volts. Delayed egress controllers draw very little current, but as with all electrically operated systems, the current draw of all attached devices must be taken into account when selecting a power supply.
8. **Locking Device:** The locking device must be electrically locked and fail-safe from the egress (interior) side. The most frequently used locking device in a component-based delayed egress system is the electromagnetic lock.

5. Conclusion

In a healthcare facility, the physical environment may affect the incidence of violence by patients or their family/relatives. That's why identifying risks, their implications, and their control can be managed by considering planning security, safety, and emergency management features into the building. Incorporating effective security concepts helps achieve improved staff and patient satisfaction, as well as increased safety. Mitigation steps will help reduce the potential for security breaches and emphasize the importance of appropriate planning for a safe and secure environment. Design and placement of physical features, along with provisions of access control, CCTV, ultrasonic occupancy sensors, public addressable systems, and duress alarms, can maximize visibility and surveillance. Criminal offenses decrease when there's a risk of being observed. Users feel safer when they can see and are confident about safety features.

6. Results and Discussion

The patient safety culture of any healthcare setting is not a simple prototype; applying system changes to healthcare systems remains vital to improving safety. This study was conducted in a limited geographic area, and it is important to build an environment that supports staff in speaking up freely about their concerns regarding any safety issues. Appropriate and constant education and training of healthcare staff are also crucial. Additionally, policy-makers in the Saudi healthcare system should pay attention to factors that may support the implementation of a positive patient safety culture, especially establishing a blame-free attitude, improving communication and leadership capacity, learning from errors, and involving patient perspectives in safety initiatives.

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