How Hospital Interior Design Can Be Curated to Reduce Depression, Anxiety, and Stress of Cancer Patients

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Isha Bhatia

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Advisor

Bryn E. Seabrook, Department of Engineering and Society

Hospitals as Healing Environments

Bleak grey walls, tiled white floors, and an aura of negativity engulf patients and families who await necessary care in hospitals. Across the United States, many hospitals share similar characteristics in that these facilities often fail to put efforts into improving their interior design to meet the needs of patients and their mental wellbeing. Adverse environments that are perceived as unpleasant to humans, lack of green spaces, and negative noise or air pollution can induce depressive mood disorder in individuals (Rautio et al., 2017). As healing environments, it is necessary for hospitals to consider changes in facility interior design so as to combat mental health disorders in addition to treating physical ailments, such as cancer. Upgrading hospital interior design is an especially important consideration for cancer patients, as in many cancer patients, depression presents itself as a common, additional diagnosis (Smith, 2015). For this reason, active interior design changes are necessary to avoid exacerbating depressive effects in cancer patients to improve cancer prognoses.

To analyze the need for widespread changes in hospital interior design and the effects of such changes, the Social Construction of Technology, or SCOT, will be used to investigate how perceptions of interior design components are related to physical effects. Additionally, SCOT will be used to reveal what types of technologies would be beneficial to include in hospital interior design, based on established studies that provide background information on how patients are affected by changes in specific interior design components. Through extensive research intertwined with SCOT framework analysis, the following research question is to be answered: How can hospital designs be curated to reduce depression, anxiety, and stress of cancer patients to ultimately improve cancer outcomes and patient quality-of-life (QOL)?

Research Question and Methods

How can hospital designs be curated to reduce depression, anxiety, and stress of cancer patients to ultimately improve cancer outcomes and patient quality-of-life (QOL)?

Through the use of documentary research methods, including articles and case studies, the importance of a positive mental state for improved prognoses of cancer patients is analyzed. Certain keywords that are specific to this research include *interior design, hospital, cancer, Social Construction of Technology,* and *mental health.* Established case studies are utilized to highlight widespread perceptions of hospitals based on current hospital interior design. The information gleaned from these resources is organized into subheadings detailing each element that should be factored into the creation of hospital design. The significance of each element is shown through evidence-based research that highlights that the presence of an element in question indeed has a positive effect towards patient mental health. Ultimately, the information collected from the bulk of this research paper is integral in helping designers construct potential novel design plans for the modern hospital.

The Life of Cancer Patients

There are several debilitating diseases that can change a patient's life, yet there is one diagnosis that instills a universal fear in patients and families all across the world: cancer. A cancer diagnosis may elicit several initial negative emotions including shock and denial. The initial emotional impact of such a diagnosis may be followed by long term stresses including financial strains revolving around how an individual is going to accommodate for exorbitant out-of-pocket costs to compensate for recurring hospital visits. Additionally, social impacts such as the fact that an individual may not be able to work as their disease progresses adds to the mental

toll of a cancer diagnosis. On top of the already significant mental strain, cancer patients may have to face complications from their disease, handle physical effects of debilitating treatments such as chemotherapy, and grapple with the knowledge that their cancer may be terminal. As such, comorbidities such as depression and anxiety are common among cancer patients due to the impact that a cancer diagnosis has on their lives; in fact, about a third of all cancer patients suffer from these comorbidities, which may require additional services from psycho-oncologists (Singer, 2018).

Depression-induced stress in cancer patients can translate into major depressive disorder and a poorer QOL which can compromise patient outcomes. Clinical studies have shown that major depression can increase mortality rates by up to 39%, and that patients with even minimal depressive symptoms exhibit an increased risk of mortality by about 25% (Smith, 2015). Thus, it is important to acknowledge the impact of mood and mental wellbeing on cancer progression; this relation is already considered significant by more than 70% of oncologists and 85% of patients (Smith, 2015). These mental health considerations also apply to pediatric cancer patients, as young patients with cancer are at an increased risk of psychological difficulty (Reed-Berendt, 2019). It is shown that a cancer diagnosis in children presents itself as a significant childhood stressor, as most children perceive medical procedures and the social impacts of having cancer as the most stressful events in their prognosis (Sharp et al., 2017). Based on the large potential for cancer-related stressors to translate into negative mental health states for both adult and cancer patients, it is necessary to find ways to lessen the mental burden on cancer patients in the hospital.

Cancer patients tend to spend a significant amount of time in hospitals due to the nature of their disease and the necessity of frequent checkups and medical procedures. Some may

remain hospitalized for a long period of time, whilst others may have to be hospitalized several times albeit for a shorter amount of time (Silva, 2020). Regardless, the hospital environment becomes all too familiar to the cancer patient due to the high frequency or long duration of hospital visits. As such, hospital interior design plays a major role in patient mentality, since hospitals are commonly viewed as bleak environments associated with sickness and even death (Edvardsson et al., 2006). Rautio et al. describe how an adverse environment, sparse green spaces, or unpleasant noise or air pollution contributes to depressive mood disorder, further confirming the significant impact of environments on patient mental wellbeing (Rautio et al., 2017). The additional stress of a negative hospital environment contributes to the mental toll of cancer patients, which can subsequently impact recovery and healing.

Hospital Perceptions through the Social Construction of Technology

The Social Construction of Technology framework, or SCOT, emphasizes that the development of certain technological entities and systems are shaped by human perceptions and human action (Pinch and Bijker, 1984). SCOT, as a framework, has been used by scholars to analyze many cases where human action has been integral in shaping technology. For example, Pinch and Bijker argue that the modern bicycle was shaped by social forces to become what it looks like today. Different social groups had distinct opinions on the best features to include on bikes, which resulted in the emergence of a variety of new bicycles which matched up with different societal needs (Pinch and Bijker, 1984). The shift in bicycle design speaks to the significant impact that humans have on shaping technological design, in that humans will always prefer technological design to be in accordance with their likings and preferences to induce feelings of happiness and satisfaction. For this reason, the close relationship between human

preferences and technology can be used to conduct further analysis about how human preferences about their environment have the potential to elicit certain physical effects.

Analysis of medical environments and hospital interior design has not yet been done using SCOT. To account for this gap in research, SCOT is used in this research paper to explore widely held perceptions of hospital environments, especially negative perceptions of certain elements of hospital design. Furthermore, SCOT is used to analyze elements of interior design that have been shown to universally induce positive mental states, which is subsequently incorporated into an analysis of how such elements can be meshed into the hospital space.

Rather than conduct this analysis through the initial definition of SCOT by Pinch and Bijker, the forthcoming analysis accounts for the critique of SCOT by Hans K. Klein and Daniel Lee Kleinman. Klein and Kleinman argue that a central critique of SCOT is "SCOT's view of society composed as groups," indicating that the original definition of SCOT failed to consider power asymmetry between groups in influencing technology (Klein & Kleinman, 2002). Thus, recommendations made regarding ideal hospital designs account for the fact that certain interior designs are heavily influenced by environments where mental health is a priority; in other words, recommendations about hospital designs will not be made solely based on aesthetic preferences used for interior design. Ultimately, the goal of this research is to address a societal problem in that interior designers are not viewing patients as the central priority when coming up with design plans for hospitals.

Results and Discussion

This portion of the paper highlights the significance of incorporating elements such as greenery, music, art and other elements within hospital interior design. The significance of the

aforementioned elements lies in the fact that these design additions are relatively easy to incorporate within hospitals whilst having a notable impact on patients. With evidence revealing the importance of each element on the mental wellbeing of cancer patients, it is hoped that hospital designers will take on a new perspective prior to creating a design plan for hospitals, given that the elements detailed have the potential to improve patient prognosis. By shifting the objective with which designers use to develop hospital interiors, more value will be given to improving patient experiences in subtle, yet creative ways. Ultimately, the goal is to show how even small changes outside of medications and treatments positively impact patients.

To fully shed light on the elements that hospital designers ought to take into consideration during the design phase, it is first necessary to reiterate the relevant social groups involved and affected by the aforementioned design considerations. The most pertinent group that is affected by changes in design are cancer patients, both adult and pediatric. Interior design changes in hospitals are meant to directly improve the mental wellbeing of such patients in an effort to facilitate their recovery. The proposed considerations also impact another relevant social group: healthcare workers such as nurses and physicians. Healthcare professions are known to be among the first six most stressful jobs given that workers within this space often have to work long days and face events such as patient death and emergencies surrounding critical care, among other difficult situations (Koinis et al., 2015). Thus, it is important to examine the effect of attitudes held by physicians and nurses towards their work environment and how these attitudes may impact patients under their care.

The significance of the following elements is seen through established case studies and whether or not these elements are currently being partially or fully incorporated within hospitals, speaking to the closure and stabilization component within the SCOT framework. In this

analysis, SCOT is used to illustrate current societal perceptions of hospitals while also being used to reveal how people perceive specific components of interior design. Analysis within the SCOT framework is utilized to reveal situations in which new social groups emerge and ultimately, how all social groups impact each other to create a unified network of different perspectives and in turn, potential solutions. In addition, the interconnectedness between patient perceptions and tangible design elements will provide insight into incorporating new, positively perceived elements within hospitals.

Greenery and Landscaping

Green foliage, growing plants and vegetation are all considered forms of greenery. On a multiscale, it has been established that spaces that mimic nature and incorporate elements such as flowers and greenery are shown to reduce stress and play a part in attention restoration (Maas et al., 2006). Based on the fact that inclusion of greenery in spaces can counteract stress, it is helpful to consider how incorporating greenery within hospitals specifically impacts the mental health of patients. In a study by Park, patients recovering from a surgical procedure known as a hemorrhoidectomy were randomly assigned to control rooms or rooms with plants. The results showed that patients assigned to hospital rooms containing plants showed improved physical effects, such as lower systolic blood pressure and lower pain ratings. Such patients also reported experiencing less anxiety and fatigue as compared to patients in control rooms. Additionally, direct patient comments confirmed that the presence of plants lightens up the hospital environment and conveys better impressions of employee care, all of which points to the therapeutic effect that plants have on patient healing (Park & Mattson, 2009). Fortunately, there has been recent attention focused on the planning and design of healing environments as many

healthcare professionals acknowledge the positive effects of outdoor landscapes in the psychological recovery of patients (Chang & Chien, 2017). For example, tangible landscape features such as water bodies, trails and plants stimulate the senses and encourage curiosity within patients; these elements offer patients a comfortable, naturalistic environment in which they can temporarily 'get away' from a stressful hospital environment (Chang & Chien, 2017). These results are further applied to oncology wards, as adding plants and landscapes within the environments of cancer patients gives such patients the opportunity to get in touch with nature.

In the context of SCOT, interpretive flexibility also upholds the idea that the inclusion of greenery strongly impacts patient wellbeing based on certain perceptions towards plants and nature. To further clarify, it is apt to consider a comparison of different perceptions towards greenery and how specific groups may react to such point of views. As an illustration, groups such as farmers or gardeners are accustomed to being surrounded by greenery on a daily basis and thus may view greenery as a mere part of their day. However, to patients that are required to make several hospital visits or stay at hospitals for prolonged periods of time, a glimpse of nature has the power to shift a patient's perception towards their environment. Thus, based on the aforementioned evidence and analysis, including greenery and landscaping in design plans has the potential to improve cancer patient mental wellbeing and recovery.

Interior Lighting

The lighting in an environment is a crucial factor to consider during the creation of any interior design plan. Proper lighting is necessary both to regulate bodily functions such as sleep cycles and to exert therapeutic effects such as reducing symptoms of seasonal depressive

disorder through both natural and artificial light therapy (Osibona et al., 2021). Typical hospital lighting is usually rich in blue-wavelength emission, which disrupts circadian rhythms in patients and leads to poor sleep quality (Albala et al., 2019). A study conducted by Vethe et. al examines the effect of incorporating blue-depleted lighting in hospital wards based on the effect of such lighting on melatonin release (Vethe et al., 2021). Melatonin is a hormone in the body that is released by the pineal gland at night and is vital in improving sleep quality (Costello et al., 2014). The results from the study by Vethe et. al show that the inclusion of blue-depleted lighting reduces melatonin suppression in patients by 15%, which contributes to increased sleep duration and longer rapid eye movement periods (REM) (Vethe et al., 2021). Thus, it is important for hospital units to consider changing design principles to better accommodate for chronobiological principles such as natural circadian rhythms in humans to positively impact sleep patterns. Furthermore, sleep is directly related to mental health in that disturbances in sleep patterns can lead to adverse health effects and a greater propensity for an individual to experience major depression (Roberts & Duong, 2014). Here, another possible relevant social group emerges: scientists and researchers that study physiological effects in patients in response to environmental cues such as light. By conducting this research, scientists are able to convey these results to hospital designers which in turn impacts the way designers approach the design process. It is beneficial for hospital designers to understand why and how certain design components induce physiological effects in patients in order to configure such elements correctly and effectively within hospitals.

Despite the growing evidence surrounding the effects of poor sleep quality on patient health outcomes, technologies such as blue-depleted lighting have not been widely instituted in the US hospitals and medical facilities (Albala et al., 2019). Widespread implementation of such

technologies is necessary especially for cancer patients so as to avoid the worsening of cancer-related afflictions and to improve the course of recovery.

Windows

Windows are commonly incorporated as an aesthetic addition to homes, workplaces, apartments, and schools among other facilities. The addition of windows offers a way for individuals to capture the outdoor environment within the comfort of being indoors. In addition to aesthetic purposes, the presence of windows has been scientifically shown to benefit human wellbeing. The transparency of windows allows for sunlight to pass through which is extremely beneficial as it is established that sunlight boosts the body's vitamin D supply and increases serotonin levels – increased serotonin levels result in more positive moods and calm yet focused mental outlooks (Mead, 2008). Boubekri et. al published innovative research results that focused on the impact of windows and daylight exposure on employee well-being and productivity (Boubekri et al., 2014). The results surrounding this study show that office workers with more natural light exposure exhibited better sleep patterns and subsequently had better moods throughout the workday, which also translated into more productive workdays (Boubekri et al., 2014). Consequently, it is important to consider incorporating properly placed windows within medical facilities for the wellbeing of nurses and physicians to ensure that these workers can ultimately provide their best care to critical patients such as those suffering from cancer. Physician and nurse attitudes do have a profound effect on patient perceptions towards their quality of care, and as a result it is vital to uphold perceptions of doctors and healthcare workers as compassionate, knowledgeable and respectful to their patients (Ayoub et al., 2015). The addition of windows not only affects the wellbeing of healthcare workers, but also the wellbeing

and QOL of patients in recovery. A study conducted by Wang highlights the importance of sunlight exposure therapy on post-stroke patients and confirms that sunlight therapy improves the mental health of patients in recovery who experience depressed moods (Wang & Chen, 2020). Based on the aforementioned evidence, windows should be considered as an important element within hospital design to counteract depressive symptoms in cancer patients and to ensure that such patients are treated with the best quality of care from their nurses and physicians. Windows should be strategically placed in employee (e.g. physician) offices, areas where nurses tend to visit around the hospital frequently, and of course, patient care areas.

Referring back to SCOT, the effect of artifacts such as interior lighting on all relevant social groups is principal in conducting a thorough analysis of the relationship between each relevant social group. Although the key focus of this paper involves cancer patients, SCOT's focus on the attitudes of each relevant social group in response to hospital environment positions the argument such that it gives the reader insight into how one relevant social group's perception (i.e. healthcare workers) affects the mental health of another relevant social group (i.e. cancer patients). By considering the effect of windows on both patient populations *and* healthcare workers, designers will be able to pinpoint a comprehensive objective in fabricating design plans that are suited for both relevant social groups, especially given the interconnectedness between each group.

Interior wall colors

Color is a powerful environmental cue that influences people's moods and feelings. The human brain detects color as a stimulus in the form of light which is further processed in the

brain to evoke certain feelings, emotions or memories (Yildirim et al., 2011). What determines the visibility of a color is its specific wavelength, with longer wavelengths translating into "warmer" colors such as red and orange, and shorter wavelengths translating into "cooler" colors such as blue and green (Holmes & Regier, 2017). Past experimental research has put forth that colors such as red or orange exert stimulating effects and result in higher arousal levels. Thus, "warmer" colors are associated with "active feelings" such as anger or sadness, while colors like blue and lavender are reported to evoke calm and peaceful emotions (Yildirim et al., 2011). Due to such ingrained societal perceptions of different colors, it is rather painless to take advantage of color in the context of hospital design through the SCOT framework. Building off of this framework, since hospitals are already stimulating and stressful environments, it would not be wise to paint walls stimulating colors such as red; rather, it is essential to counteract the fast-paced nature of hospitals for cancer patients by focusing on relaxing wall colors. Designers should take into account that cooler, peaceful colors evoke calmer mental states which is especially crucial for patients that are living through cancer. Painting recovery rooms with cooler colors allows patients to relax especially after intensive procedures such as chemotherapy or surgery due to the strong impact that perceptions of colors have on individuals. Some hospitals around the United States have preferred to use the color green on machines and walls to shift patient focus away from the environment to more of an "inward" awareness, and also because of its calming effect as opposed to bright, glaring colors such as white (Pantalony, 2009). However, it would still be extremely beneficial for designers to consider combinations of "cool" colors such as blue and lavender in addition to the use of green for an even more peaceful and calming experience at the hospital. Based on the SCOT framework, further research about how certain interior design elements such as color differently impact the relevant social groups (i.e.

physicians, adult cancer patients and pediatric cancer patients) is beneficial in reshaping rooms best suited towards each group's preference to improve mental health as an overall qualitative measure.

Music and Sound

Music has been a universal element in society across the world, especially as people create and listen to music as a way to express their identities, cultures and inner feelings. The benefits of music, however, extend beyond just the immediate feelings elicited upon listening to music; scientifically, it has been shown that music exerts positive effects on the brain. In fact, music provides a non-invasive technique to stimulate the brain and create new neural pathways (Trimble & Hesdorffer, 2017). Furthermore, music therapy has been accepted by individuals with depression and it is observed that the use of music is linked to improvements in mood disorders (Trimble & Hesdorffer, 2017). In a review authored by Timothy Iyendo, it appeared that the presence of music in healthcare settings brought about positive changes in patient mental wellbeing along with physical effects such as reductions in blood pressure. Soothing music and soft sounds such as light winds, bird twitter and calm ocean waves primarily elicited the aforementioned changes in patients (Iyendo, 2016). It is evident that the presence of music and soft, soothing sounds in healthcare settings has the potential to offset stressful feelings associated with being at the hospital, both by-way-of emotional and physical effects. To delve into a deeper analysis, however, it is important to consider how music affects cancer patients specifically, given the severity of a cancer diagnosis. It is not uncommon for cancer patients to experience side effects such as difficulty breathing, nausea, and flu-like symptoms during chemotherapy, and feel stressed, apprehensive, or lonely during radiotherapy. Listening to music during these

procedures helps in diverting patients' attention away from the discomfort caused by the procedure itself and the side effects experienced later on (Stanczyk, 2011). Currently, music therapy has not been widely integrated into modern cancer care despite the benefits associated with music. It is advantageous for designers to consider configuring advanced sound systems within rooms where chemotherapy or other cancer-related therapies or surgeries occur, with options for soft sounds or music based on patient preference. Allowing cancer patients to choose between different melodies or sounds during intense procedures gives patients a sense of control over their own treatment environment, which is helpful in offsetting the fear related to the treatment.

In the context of SCOT, by adding softer elements such as music within hospitals, designers have the potential to alter the way cancer patients perceive hospitals and ultimately transform hospitals into a more positive environment for patients. The lack of creative solutions in incorporating music that noticeably impacts patients within hospitals speaks to the concept of rhetorical closure in the designers' perspective. Rhetorical closure emphasizes that the need for better solutions is reduced when social groups believe that the problem is solved (Pinch and Bijker, 1984). Since background music already exists in certain waiting rooms, designers may feel that music is not an important enough element to give weight to during the design process. However, there are many factors still left for designers to think about, including the type of music that is considered soothing by relevant social groups, ways in which music can be incorporated in areas where music is not necessarily played, among other design considerations. Thus, it is crucial for designers to recognize that it is necessary to elevate music as an important design consideration when working towards redesigning hospitals.

Art

Art is often used as a medium to allow individuals to express themselves and connect with their viewers through many forms. Paintings, sculptures, drawings, photography and other forms of visual art are commonly used as aesthetic additions in workplaces and other facilities. The mixture of arts and medicine is a rather new concept, as hospitals are only recently starting to incorporate elements of art in recovery rooms, waiting areas and patient rooms (Lankston et al., 2010). There is mounting evidence that the presence of visual art, specifically art that portrays naturalistic elements, has a positive effect on patient mental wellbeing, decreases anxiety and shortens the length of stay in hospitals (Lankston et al., 2010). A notable example of a hospital that strives to incorporate artistic elements is the New Stobhill Hospital in Glasgow, UK. The waiting rooms of this hospital are configured with monitors that play videos displaying slow passing of clouds, soft ripples in rivers and gently waving branches of trees in response to a breeze. Furthermore, walls in clinical areas include paintings, and areas with no windows have landscapes depicting natural scenery (Lankston et al., 2010). Additionally, it was found that depression and anxiety levels were lower in patients undergoing chemotherapy who were exposed to visual art as compared to those not exposed to visual art (Lankston et al., 2010). It is crucial for designers to start meshing medical areas and art in order to strike the perfect balance of peace and calmness in a medical setting. Art offers patients, especially cancer patients, with a distraction to any apprehension prior to a major treatment or to the pain after undergoing a treatment.

When examining relevant social groups through the SCOT framework in terms of incorporating art in hospitals, another social group emerges. The work of artists included in hospitals clearly has an impact on the relevant social group in question: cancer patients.

Indirectly, the thought process of artists translates into the effect that their art has on the patient. In the context of hospital design, interior designers could directly collaborate with artists by providing artists with their vision on what feelings specific pieces of art should evoke in patients. The connection between relevant social groups responsible for developing certain technologies or artifacts shows that the joint effort between these two groups will translate into the best output for the 'receiving' relevant social groups, which include cancer patients and healthcare workers.

Pediatric Design

In addition to tailoring design specifications to improve the mental wellbeing of adult cancer patients, it is necessary to consider interior design changes specific to pediatric oncology wards. A cancer diagnosis in children presents itself as a significant childhood stressor, with tedious medical procedures and the social impacts of having cancer as the most stressful events in their prognosis (Sharp et al., 2017). Based on the evidence from previous subheadings, the addition of greenery, windows, music, art and appropriate wall colors are helpful to consider incorporating within pediatric oncology wards as a baseline. Additional design aspects that could improve children's perceptions of oncology wards include integrating playful strategies within waiting rooms and hospital rooms. Tonetto et. al describes how elements such as toys, gamification and virtual reality stations within healthcare environments can be used as a way to improve the subjective well-being of pediatric cancer patients (Tonetto et al., 2021). Subjective well-being is a term utilized to represent patients' self-perceptions and experiences with care provided by hospitals; by altering elements within a healthcare environment, it is hoped that children begin to view hospitals as more positive environments. Volunteers from the study by Tonetto et. al felt less isolated with playful technological elements (i.e. virtual reality) within the

healthcare space and enjoyed playing with physical artifacts that allowed children to visualize

any medical procedure they were to undergo, which reduced apprehension (Tonetto et al., 2021).

Based on the principle of SCOT, blending advanced technology such as virtual reality and

creating a lighthearted environment for children in oncology wards has the potential to transform

children's perception of their hospital visits. This example embodies SCOT's core concept of

design flexibility, where advanced technologies including kiosks with games or other fun

solutions can be tailored towards children as a relevant social group. In other words, design

flexibility lies in adding components to pediatric wards that children perceive as entertaining;

incorporating these technologies within hospitals can be further customized based on the relevant

social group in question, meaning that the way these solutions are designed may be different

based on what factors adult cancer patients perceive as positive or gratifying.

The design solutions mentioned influence children's perception of their environment.

Perception shifts make the process of going to the hospital easier, reduce parental stress and

overall contribute to happier mental states, which is the ultimate goal of universal hospital design

changes. Currently, many universities are to take on this project of gamifying pediatric oncology

wards and it is hoped that these elements can be seen in many hospitals across the world.

Limitations and Future Work

Transforming hospital design is not an easy task. Several architects are often reluctant to

participate in the process of altering hospital design due to the complexity of the job (de Grey,

2015). Although there are many beneficial elements that could be incorporated within hospital

design, it is crucial to balance creativity with seamless operations at the hospital. The goal is to

avoid adding any elements that may interfere with important operations at the hospital, such as urgent surgeries, triage decisions and other time-intensive situations. Additionally, building modern and technologically advanced hospitals from scratch takes time and valuable resources, such as workers and scientists that are committed to the project. This process would most likely require more studies to be done on elements that do indeed have a considerable positive effect on patient mental wellbeing and perceptions in order to ensure that resources are not wasted. Furthermore, altering patient perceptions takes time, and it could be a long while before society starts to view hospitals as more positive environments.

There are several opportunities for future research on the topic of hospital interior design. For one, the focus of interior design could be shifted to more technological solutions rather than simple design solutions such as changing wall colors. In other words, advancements in technology could translate into the development of 'smart' hospitals in which elements such as virtual reality and AI are integrated for specific purposes. Another area of research that is useful in hospital settings is related to the addition of exercise stations within hospitals. Exercise is an important part of daily life, and patients in hospitals should have the opportunity to maintain their physical activity levels in different ways if they are able to.

Conclusion

The rigidness and uniformity of hospital design needs to be transformed in a way to allow for the incorporation of new elements that are scientifically shown to have a positive effect on human health. It is evident that environments do indeed have an effect on human mental states; thus, it is necessary to take advantage of this relationship and alter hospital environments to make for a better in-hospital experience. There is a strong association between mental states and physical health, so any strides focused on improving mental health facilitate the betterment of

patient physical health, even in dire cases such as those suffering from cancer. By prompting designers to broaden their focus in incorporating certain elements of hospital design, prognoses of cancer patients can be improved along with QOL as patients start to live with more positivity and happiness in their lives.

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