

Integration of Nature into Hospital Design for Cancer Patient Recovery

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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

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STS Research Paper

Intro

Spending time in nature was once among the first defenses people would use in recovering from illness, and the intuitive association between nature and healing has endured. Evidence that people have used nature to cope with illness is present across time and cultures, with intentionally designed healing gardens spanning at least as far back as 6th century BC Greece (Din et al., 2023). Time in nature was once the first step people would take when ailments struck, but various factors have diminished the cultural acceptance of this as a legitimate method for recovery (Marcus & Sachs, 2013). However, despite the now ubiquitous use of hospitals and modern medicine to treat, particularly such illnesses as cancer, people have retained the association of the sights and sounds of nature, not of hospitals, with healing (Ahmadi & Ahmadi, 2015, p. 1177). While those in the medical field may see the concept of using nature in healing as alternative medicine and a competitor to the conventional route, there are ways to take advantage of the benefits of nature exposure to complement the results patients gain through conventional treatments.

Methods

How can hospitals incorporate nature into their treatment plans and hospital design to support their current methods and further their goal to treat cancer patients as efficiently and effectively as possible?

This paper uses a case-study approach to come to a suggestion of what can be changed in hospital design to extend the benefits of nature to the recovery process of their cancer patients. The analysis includes experiments from 1980 to 2023 on a variety of participant types, including healthy participants, non-cancer postoperative patients, cancerous postoperative patients, cancer

survivors, and chemotherapy patients. Key words that aided in finding the studies presented include cancer, nature, postoperative, stress, pain, hospital design, sleep, and recovery. In the cases where cancer patients are not the primary focus, other papers that link the interventions to cancer patients are examined. Each case study is described along with its limitations, and other papers are brought in as support to bolster the areas where the case is lacking or where it needs to be more tightly connected to cancer patients. Any studies that take place outside of hospitals and with non-cancer patients are supported by others that link them to that setting and group. This paper then identifies approaches hospitals can take into consideration to implement the takeaways from the studies in a cost-effective way.

Background

Though the way people use nature in support of healing has shifted, the practice has not disappeared. Studies in support of nature's efficacy in supporting healing continue to surface. Of these studies, two primary categories emerge: one, nature's effect on quality of life and comfort from a psychological and emotional perspective (Blaschke, 2017) and two, the effect nature has on biological healing and processes (Li et al., 2008).

Present day, there exists a split in schools of thought surrounding medicine, with some methods of treatment referred to as conventional and others as alternative or complementary. The division between the two can be delineated in multiple ways. One way to differentiate the two is that conventional medicine includes what is typically taught in medical school in the US and administered in US hospitals (Dalen, 1998). Another perspective is that conventional medicine directly treats symptoms and illness while alternative medicine tends toward supporting the body's natural ability to heal itself (Whorton, 2002). Another perspective entirely, and perhaps a more precise one, is that the divide between alternative and conventional medicine is arbitrary,

and that rather what should be considered in any form of treatment is whether there is enough evidence to substantiate a particular treatment (Fontanarosa & Lundberg, 1998, p. 1618).

Regardless of the definition, spending time in nature as a treatment, as it is not often a line of treatment a GP would provide, tends to be seen as alternative rather than conventional medicine. Despite the practitioners, the amount of evidence supporting the beneficial effects and lack of negative consequences on patients has begun to make an impact. Some hospitals are implementing healing gardens for the use of their patients (Marcus & Barnes, 1999). Due to the support for the beneficial role of nature in the quality of life of patients and the lack of negative effects on patients, providing such support to patients allows hospitals to take advantage of what alternative treatments have to offer and improve the effects of other treatments and services.

Considering patient perceptions

This paper does not employ a specific STS framework, but rather explores hospital design and technology through the lens of patient perceptions. Technological developments can be analyzed on a strictly technological basis, particularly in the medical field where scientifically sound patient safety is of the utmost importance. However, this kind of strictly technical analysis can be bolstered by analyzing the perceptions and attitudes of the people using the technology in question. This paper aims to address this gap in analysis of cancer care and hospital design. It explores the perceptions patients have toward healing and the technology used to promote it and investigates the potential for valid methods of recovery that these intuitions and attitudes suggest.

One critique of this approach, in the context of medical decisions, relates to the potential to encourage harmful pseudo-medical practices. Placing too heavy an emphasis on patient attitudes may be misconstrued as encouraging patients to make decisions against the recommendation of licensed medical practitioners, inviting the potential for physical harm

(Morreim, 2003). Rather than promoting a do-what-feel-right approach, this paper explores the cross-cultural and cross-temporal assumption that contact with nature is beneficial to humans, sometimes referred to as the “nature benefit assumption,” along with scientifically rigorous studies to substantiate this intuitive link and provide recommendations for its employment (Ulrich, 1981).

Results and Discussion

There are several evidence-supported ways to implement the benefits of nature into a hospital setting for improvements to cancer patient health and wellbeing. While many people intuitively connect nature to the idea of healing (Ahmadi & Ahmadi, 2015), nature is not often part of a hospital’s approach to promote recovery in cancer patients. The term “nature benefit assumption” describes the widely observed phenomenon that people assume that contact with nature is good for them (Ulrich 1981). This assumption is seen in the medical context in a few ways, from patients associating nature scenes with the idea of healing to cancer patients leaning on nature as a personal coping strategy (Ahmadi & Ahmadi, 2015). The following studies illustrate ways that hospitals can tap into this intuitive association with healing that many people have with nature to supplement traditional therapies. Encouraging trips to forests for patients that are able, planting of trees in and around hospitals, as well as the use of tree-derived essential oils containing phytocides in aromatherapy rooms can all encourage higher level of NK-cell activity in cancer patients as well as lower stress levels. Making nature imagery available, whether in the form of indoor plants, nature-facing views, or nature photos can aid patients in lowering pain levels and potentially shortening postoperative stays (Ulrich, 1984). Water-focused imagery can be particularly impactful on pain and stress levels (Ulrich et al., 1991). To improve cancer patients’ sleep length and sleep quality, which can promote quicker postoperative recovery as

well as directly improve cancer patient quality of life, nature sounds in hospital rooms can be employed.

Biological anti-cancer effects of forest bathing and phytoncides

People suffering from physical health conditions, such as exhaustion disorder, have demonstrated a belief that time in a forest can allow a space for recuperation and a desire to connect to that capacity (Sonntag-Öström et al., 2015). While an association between forests and healing exists for many, it is often at the level of general wellbeing rather than direct physiological healing (Hartwig, 2020). A 2007 study goes further to explore the potential for just this sort of direct physiological effects by investigating the impacts of time in a forest versus time in a city, with similar amounts of physical activity, on several anti-cancer proteins and white blood cells required to fight cancer growth (Li et al., 2008, p. 117). The study found that levels of five of these biomarkers important in cancer recovery were significantly improved for at least seven days following a three-day forest trip and not after a similar city trip. Though this study used healthy participants, it is directly related to cancer patients as it describes known contributors to cancer prevention and recovery, including the white blood cells known as NK cells that destroy diseased and cancerous cells (*What Are Natural Killer Cells (NK Cells)?*, n.d.).

As a forest trip is a complex experience, it is challenging to tease out which element of the trip was likely ultimately responsible for the biological changes. One potential contributor is the presence of phytoncides in the air in the forest that is not present in the city (Li et al., 2006). Phytoncides are an oil present in trees that is available to be inhaled from forest air and that can also be extracted into the form of an essential oil. The study presented above hypothesizes that the presence of phytoncides in the forest air may contribute to the increased NK cell activity observed. Another study that takes this into the hospital setting uses such essential oils. In this

2023 study, gynecological cancer survivors were sorted into two meditation groups. Both groups meditated for an hour a day, five days a week for eight weeks, including a control group with no scent and an experimental group that meditated in a room scented with phytoncide-containing oil. The experimental group experienced lowered stress levels and increased NK cell activity at the end of the study and the control group did not (Heo et al., 2023). This supports the idea that the phytoncides could be responsible for NK levels in the forest bathing study. Furthermore, it suggests an intervention that could be implemented in a hospital setting as well as something that patients could do at home. From these studies, hospital design can be encouraged to promote time in forests for patients who are able to do so, encourage the planting of trees in and around hospitals for the phytoncide benefits available, as well as potentially establish a phytoncide oil-scented meditation room to promote lowered stress levels and higher NK cell activity among its patients.

Views of nature, pain, and recovery time

The idea that a view outside a window can help with recovery was expressed by Florence Nightingale in 1863, who believed that views of nature along with sunlight aided not only the mental wellbeing of patients but their physical health as well (Nightingale, 1863). A study that has since inspired much research and replication is Ulrich's 1984 paper documenting a hospital that tracked postoperative recovery for patients in rooms with nature-facing windows versus wall-facing windows, as in Nightingale's commentary (Ulrich, 1984, p. 224). This study found that patients with a view of a tree outside their window took less strong pain medication, had shorter post-operative hospital stays, and had more positive notes regarding their recovery in their records. While this study does not look at cancer patients specifically, it looks at markers that are applicable to cancer patients (pain management needs, postoperative recovery time,

general recovery) and further generalizes particularly well in the cases where cancer patients require surgery.

In Ulrich's study, there could be some debate regarding whether the benefits the tree-facing patients see are because of nature views or if a non-nature, but equally interesting view would produce the same result, as a brick wall may simply not have been distracting or interesting enough. Several studies look further into this potential limitation. For example, one study found that people are willing to leave their hand in ice water for a longer time in a room with live plants than a room with other colorful and potentially distracting objects, showing the positive effects of pain perception reduction by nature itself rather than distractors more generally (Lohr & Pearson-Mims, 2000). A question then may arise regarding whether the plant itself has some effect or whether a view or photo of a plant would suffice. Another study looks at photos rather than live plants while controlling for rate of information. Although not conducted in a hospital environment, it does show an increased level of psychological wellbeing, measured by survey data, heart rate, and alpha amplitude for participants after being exposed to images of nature as opposed to urban landscapes. Interestingly, this study also observes the difference between effects of vegetation-dominated natural views and water-dominated natural views and finds that water-dominated views have a more pronounced impact on participant psychological wellbeing than do the vegetation-dominated ones (Ulrich et al., 1991). This study then supports the notion that the positive findings in the Ulrich hospital study are due to the type of view more so than the amount of information and goes further to suggest the potential of a water-dominated view to do even more for the patient than the tree-facing view in the hospital study.

From this line of research, hospitals can conclude that benefits such as reduced pain perception, positive mood, and potentially shorter postoperative stays could result from nature

views, nature imagery, and indoor plants, as well as potential added benefits of water-focused nature imagery in patient rooms. Depending on how this is implemented, and particularly in the case of using natural imagery, these could be low-cost interventions with virtually no risks to patients or the hospital.

Nature sounds and sleep

The sounds of nature are less of a focus than the sights of nature when it comes to their healing properties; however, research has repeatedly found that people have positive associations with quiet environments with natural sounds (Franco et al., 2017). People find natural sounds preferable to technological or urban ones (Fisher, 1999), and rural sounds more restorative than urban park sounds, which are preferred to other urban sounds (Payne, 2013). One study investigates the effects of listening to nature sounds on the quality of patients' sleep in a hospital coronary unit (Nasari et al., 2018). The study had three groups, a control group with no intervention, a silence group with noise cancelling headphones without music or sounds, and a nature sounds group that wore headphones with various nature sounds playing. The study found that both the silence group and the nature sounds group experienced significantly better sleep quality than the control group, with the nature sounds group faring even better than the silent group. This study generalizes well to cancer patients as it takes place in a hospital setting and its participant group is one that is undergoing intensive treatments.

Sleep is of particular importance for cancer patients for a couple of reasons: sleep is an important factor in any sort of physiological recovery (Sipilä & Kalso, 2021) and cancer patients in particular experience worsened sleep quality as a primary side effect of chemotherapy (Härtl et al., 2010). Adequate sleep is necessary for optimal health. Even a two hour decrease to the recommended seven hours of sleep for a short period of time has been linked to increased

inflammatory responses, cognitive impairment, and affected mood (Hillman, 2021). The immune system has been shown to be compromised after just one night of inadequate sleep (Faraut et al., 2012). This is of particular concern to a person undergoing intensive treatments, such as chemotherapy or surgical procedures, as the immune system plays a vital role in fighting infection and promoting recovery. Not only does sleep affect patients' ability to properly recover and for treatments to work effectively, but diminished sleep the night before a patient undergoes surgery appears to increase patient postoperative pain levels (Wright et al., 2009). This is adequately supported in varied postoperative scenarios (Sipilä & Kalso, 2021), including a study that tracks postoperative pain levels in women after breast cancer tumor surgeries (Wright et al., 2009). This indicates that even one night of diminished sleep has negative effects on cancer patients. Furthermore, as the study detailed the effects of diminished sleep the night before surgery, this means that the findings of the study can be directly applied to the hospital setting. It does not require life-long improved sleep quality but indicates that simply ensuring that a hospital puts measures in place the night before an operation, when the patient is likely in the hospital already, to optimize sleep quality will have a direct and measurable impact on the patient directly following their procedure.

Improving cancer patients' sleep is of benefit both to their cancer and immediate postoperative wellbeing directly as well as to the quality-of-life cancer and its treatments affect. There is a higher-than-normal proportion of cancer patients suffering from insomnia syndrome and insomnia symptoms, particularly during chemotherapy treatment but extending into their post-treatment lives as well (Palesh et al., 2012). Therefore, improving sleep in cancer patients should be a focus not only to hasten their recovery and improve their immediate postoperative wellbeing, but as a focus of its own to improve patients' quality of life. Considering that

diminished sleep levels have a marked effect on mood, cognitive function, inflammation levels, and immune responses (Hillman, 2021), if a hospital intends to help cancer patients return to pre-cancer levels of health and well-being, the effect their treatments have on long-term sleep quality should be considered. Given this, implementing something like nature sounds may be helpful not only in the hospital, but if a patient finds it helpful it is something they could easily implement at home. This way, the hospital helps the patient on site while modeling an easily replicable strategy for patients to use at home to deal with the lingering effects on sleep that chemotherapy may bring (Palesh et al., 2012).

Incorporating nature sounds for patient use while sleeping, as discussed in the case study above, is a low-cost and effective way for hospitals to improve patient quality of sleep, and thus their postoperative pain, postoperative recovery, inflammation levels, and mood. Furthermore, if the patient experiences improved sleep quality because of nature sounds, this can encourage them to play such sounds at home, whether they are in outpatient care or cancer free, to deal with the long-term effects cancer treatment can have on sleep levels (Palesh et al., 2012).

Limitations and future research

Much of the research described is circuitously related to cancer patients. Though many of the studies show promise in benefiting cancer patients, and some did involve cancer patients at various stages of their illness, more research is needed to confirm the direct effects of these interventions on cancer patients' wellbeing as well as on their recovery times. Future research should include controlled experimental studies with interventions occurring in hospitals and that follow up with patients long after their interventions to track long-term effects on the patients. For hospitals that are willing to implement some of these strategies, as many of them are low cost and low risk to patients, even simple data analysis and surveys of patient and provider

perceptions, even if not full controlled experiments, would help in understanding the effects of such interventions when implemented in hospitals with cancer patients.

Conclusion

Nature is mentally associated with the notion of healing for many people, and various aspects of nature are shown to be beneficial to physical health as well as psychological well-being. Using nature-focused imagery, indoor plants, nearby trees, phytoncide aromatherapy, and nature sounds, hospitals can improve cancer patient biomarkers, manage patient pain levels, improve patient sleep duration and sleep quality, and improve stress and mood. Supporting patient physical and psychological well-being through these interventions is a cost-effective, low risk way to complement the conventional therapies used to treat cancer patients that may help patients associate hospitals with healing more directly.

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