

Patient Access in Clinical Cancer Center
(Technical Topic)

Effect of Use of Nature in Hospitals on Cancer Patient Recovery
(STS Topic)

A Thesis Project Prospectus Submitted to the

Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements of the Degree
Bachelor of Science, School of Engineering

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Fall, 2023

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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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Overall Introduction

At the start of 2022, 18 million of America alive had been affected by cancer (Miller et al., 2022, p. 409), and the number of active cancer cases is projected to increase from 2015 to 2050 by 49% (Weir et al., 2021, p. 1). One of the most common cancer treatments in use today involves outpatient chemotherapy infusions, a time consuming and varied treatment (*Cancer Facts & Figures 2023*, 2023, pp. 12-29). Patients are required to go to the clinic from daily to monthly, often for several hours per appointment, with wait times and treatment times varying greatly among patients and centers (*Chemo Infusion / Getting IV or Injectable Chemotherapy*, 2019, p. 1).

The rate of cancer diagnoses has been increasing and is projected to continue to do so, necessitating an increase in capacity for cancer treatment (Weir et al., 2021, p. 1). Increases in demand and projected demand often push cancer centers to increase their physical capacity (*Outpatient Infusion Centers Expand with Growing Demand*, 2017). In the cases where increased capacity is infeasible or out of budget, centers are left to increase the amount of time patients must wait before beginning treatment or forcing patients to travel long distances to clinics with capacity. However, there may be ways to allow more people to be treated more effectively and quickly outside of increasing the physical capacity of the centers themselves.

This paper will explore two routes to this goal: one by improving patient access through identifying bottlenecks in the hospital's flow and two by reaping the benefits of nature to speed cancer patient healing. The latter has the potential to support the former both by improving patient experience while in the hospital, as well as promoting quicker healing which would allow more patients to be treated at the hospital in a shorter time frame.

Technical Topic

The Emily Couric Cancer Infusion Center at UVA provides outpatient chemotherapy treatment. Patient access flow in a cancer center tends to work differently and be measured by different standards than other kinds of medical facilities, such as general practitioners. This is largely because of the nature of a cancer diagnosis and the effect such a diagnosis has on a patient mentally. Typically, cancer centers aim to see patients within two weeks of being diagnosed as it can be quite a shocking event and patients usually want to be seen and start treatment as soon as possible. Thus, patient access is particularly critical in this setting. After the first visit, it is also a priority to ensure patients are receiving treatments at appropriate intervals with few delays, as well as ensuring their time spent at the clinic is used efficiently and as little downtime occurs as possible without compromising the quality of care and experience of healthcare professionals.

Our team aims to identify bottlenecks and other inefficiencies within the current patient flow and provide recommendations to the hospital to make improvements. The cancer center consists of five floors that operate semi-independently with different clinics throughout and patients often having appointments on multiple floors in one day. Our first step toward improving the flow in the clinic, then, is to come up with a clear picture of what is going on in each of those floors. Through this better understanding, our goal is to find ways to optimize the patient flow among floors in the hospital. This will ideally result in a more efficient infusion center with a higher chair utilization rate, allowing more patients to be served without wasting money on hospital expansion prematurely (*Outpatient Infusion Centers Expand with Growing Demand*, 2017).

We are starting by assessing the completeness of the data collected, in part to provide recommendations on which departments can improve data collection methods. Additionally, we

will use the current data to find insights on patient flow revolving around three primary timestamps: the time the appointment is made, the time the patient checks in, and the time the appointment ends. This will allow management to gain a clearer understanding of how many people to expect in the hospital at any given time, thus they will see if x patients are scheduled at a particular time, when they can expect those patients to arrive at the hospital and how long they can expect each patient to stay at the hospital, based on department, floor, appointment type, and procedure type, culminating in a visualization of patient flow (Kang & Haswell, 2020, pp. 1472-1475). This will help give hospital management an idea of when to expect patients based on appointment times and identify any potentially useful scheduling shifts.

Going forward, we will use employee interviews and data analysis to identify appropriate next steps, potentially building a discrete event simulation model, a common technique within patient flow studies in healthcare broadly as well as in cancer centers specifically (Suss et al., 2017, p. 134). It allows for a realistic model of the current flow based on relatively few data points, as well as the ability to model alternative approaches to identify suggestions for improvement.

Our deliverable will include a collection of visualizations that draw a clear picture of flow in the hospital, a list of bottlenecks and inefficiencies, and several suggestions for improvements along with their anticipated pros and cons. Potential challenges include lack of complete data in the modeling phase and potential lack of support within the hospital to make changes as well as the challenge of changing routine.

STS Topic

The approach to healing and recovery has shifted massively over time. New advancements in technology and medicine often bring great benefits to patients fighting

conditions and diseases such as cancer. However, as these new technologies arise, society has in many ways turned from what people once primarily looked to for support in healing. One of these now often-overlooked aids to recovery is nature (Marcus & Sachs, 2013). While it is easy to overlook the seemingly peripheral sights and sounds of nature in favor of the modernity of medicine and hospital treatments, recent studies confirm a relationship between nature and recovery. The idea of incorporating nature as a component of a treatment plan is one that many are quick to reject, lumping it into the vague category of alternative medicine. This term, however, is not so clearly defined. And as some argue, there is no such thing as conventional or alternative medicine, only that which is substantiated by sufficient evidence and that which is not (Fontanarosa & Lundberg, 1998, p. 1618). My work will in part argue that what has been studied of exposure to nature warrants its consideration in hospital setting.

The STS portion of my work aims to explore the effect of nature on cancer patient healing and the limits to that effect. The goal of my work is to define the extent of contact a person must have with nature to reap its benefits with the intention of understanding what hospitals can realistically do to take advantage of this source of healing. The effects of time in nature on cancer and health have been demonstrated in various studies and its benefit has been noted in multiple stages, from prevention to reversal of disease to psychological support. I will focus on nature's role in two main capacities: to improve physical health and support cancer patients psychologically.

Some of the research coming out about nature's support of physical health includes studies that indicate that those who spend more time in nature as children tend to get less sick throughout their lives. It has also been shown, in clinical studies, that spending 120 minutes a week in nature improves health (*Ecopsychology*, n.d.). Additionally, having nature present in a

hospital setting, whether through nature-facing windows (Ulrich, 1984, p. 224), gardens, or indoor atriums, has been linked to such effects as quicker recoveries, lowered use of pain medications, and improved patient experience (Yamaguchi, 2015). While the goal of my work is not to explain the physical mechanisms by which these improvements occur, it can be useful in understanding nature's efficacy to understanding some of the mechanisms that may be at play. In one study, for example, it was found that cancer patients who spent time in a forest as opposed to in a city developed an increased NK cell activity level- white blood cells whose immune response attacks cancerous cells in tumors (*What Are Natural Killer Cells (NK Cells)?*, n.d.). This increase was observed after just three days in a forest setting (Li et al., 2008, p. 117), and demonstrates the quantifiable nature of the available benefits.

Secondarily, research has shown that cancer patients are drawn to nature and want to be in a natural environment as they heal. One survey showed that cancer patients' top three coping strategies involve nature, from being in nature to listening to birdsong (Ahmadi & Ahmadi, 2015, p. 1177). One explanation for the role nature can play psychologically for cancer patients compares nature as a secure base. As defined in developmental psychology, this is the figure or place that a person returns to for grounding and to feel prepared to go out into the world to face the unknown. In this context, the idea is that going into nature gives patients a sense of comfort and stability that helps them to cope with the reality of their diagnosis and bolsters their mental strength to continue to fight their illness (Blaschke, 2017, p. 10).

I aim to continue to explore the ways hospitals can use this information to the benefit of their patients. This includes both understanding the limits to how nature can be beneficial, as well as understanding the unique needs of cancer patients as opposed to other hospital patients that could affect what is needed (Marcus & Barnes, 1999, pp. 220-231).

If the hospital's goal is to help as many patients as possible become cancer-free as quickly as possible, as well as ensuring as positive a patient experience as possible, increasing their interactions with nature may be an effective route to take. Previous work has established the efficacy of nature as an aid to physical healing (Repke et al., 2018, p. 2). My work will go further by exploring the outer bounds to this: how much interaction with nature will make a meaningful impact on healing, and what kind of interactions are most effective?

Overall conclusion

My technical project will likely result in a discrete-event simulation model, a list of bottlenecks and inefficiencies, and a list of potential improvements along with their benefits and challenges. However, our focus is to speak with hospital staff and stakeholders to gain a clear understanding of the hospital's working to understand what we can do to be most useful to the Infusion Center management team. The first phase of this work will involve data analysis. The most basic level of analysis we plan to present is a summary of the completeness of the data. This will allow management to see which departments and floor are keeping the most complete and accurate data to see how to improve data collection methods. The next level of analysis will be to provide a snapshot of patient volume at any time in the hospital. My STS project will result in a clearer understanding of the ways time spent in nature affects cancer patients and what hospitals might be able to do to use nature to improve recovery rates and patient experience.

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