

Thesis Project Portfolio

Optimizing Outpatient Cancer Infusion Center Throughput Using a Systems-Based Approach

(Technical Report)

The Prevalence of Health Literacy in Cancer Care

(STS Research Paper)

An Undergraduate Thesis

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Bachelor of Science, School of Engineering

Anna M. Bustamante

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Department of Systems and Information Engineering

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Introduction

Cancer is a deadly disease that, due to increasing risk factors, has been affecting increasingly more of the population. Due to this growth, there has been an increased demand for health system resources so that the individual affected can get the best possible outcome from their treatment as possible. The two parts of my thesis work together to understand the resources that must be accessible to cancer patients to have the best treatment outcomes possible. My Technical Project works to understand how access to infusion centers can be improved to increase throughput numbers, as infusions are very commonly used treatments for cancer. My STS Research Paper however, works to tackle cancer from a health literacy (HL) angle. It investigates how resources can be improved to reach and affect populations that may have different access to or comprehension of their cancer treatment more effectively.

Project Summaries

Through a systems-based approach, the technical portion of my thesis was completed as a capstone project that focused on improving an outpatient infusion center. We first conducted observations, interviews and created a process map to understand the current state of a Central Virginian infusion center and through this discovered a significant potential for increased efficiency. Themes including buffer time scheduling, idle time issues, pharmacy efficiency, and data quality were identified as well as improvement areas like unscheduled time, waiting time, and idle time. After investigating these areas as well as a plethora of timestamp data from the electronic health system, several strategies were identified to increase workflow efficiency. Linear regression helped us model and predict utilization hours, idle chair time, and if appointments go significantly over than expected. Through this, increased idle chair time was found to negatively affect utilization hours and previous literature identified drug preparation to reduce these times. A pilot study was developed by our team and identified several drug candidates based on various variables. Overall, a holistic framework for understanding throughput issues

and suggesting potential improvements was produced by this iterative technical work in close engagement with our stakeholders.

Through my STS research, I came to the conclusion that because cancer health literacy directly impacts a patient's outcome and it varies by social group, HL must be improved from an organizational approach. This means promotion and good cancer HL practices starts with the healthcare system as they are the best equipped to feasibly and equitably position the individual to receive the proper resources. The first step to systematically improve cancer HL is to assess the patient's HL levels so that interactions and resources can be more tailored to the patient's needs. Proper materials can then be disseminated to mitigate the issues of poor cancer HL as well as the disparities that exist within it. This research was completed mainly through literature review and the integration of the Social Construction of Technology (SCOT) framework.

Conclusion

By completing both my Capstone Project and my Research Paper, I was able to understand the various responsibilities of the cancer health system more clearly and how they directly and indirectly affect a cancer patient's treatment. I am now able to draw insights into how the system must supplement their services for equitable access and care. A multidimensional approach is necessary for this as patients should be able to receive infusions when they need them, no matter the overall circumstances and patients should be positioned by this same health system to fully understand their treatments and decisions, no matter their social group. The two projects work together to help understand the holistic cancer care system and how they are in control of what resources the cancer patients are getting and how.

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