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A Quality Improvement Initiative to Improve Follow-up Time and Reduce Readmissions and Emergency Department Utilization for Oncology Patients

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A QUALITY IMPROVEMENT INITIATIVE TO IMPROVE FOLLOW-UP TIME AND REDUCE READMISSIONS/ EMERGENCY DEPARTMENT UTILIZATION FOR ONCOLOGY PATIENTS

BY

Delaney L. Serfling

A doctoral project submitted to the faculty of the Medical University of South Carolina
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Abstract

Hospitals across the nation are facing extreme challenges with overcrowding. Unplanned readmissions and emergency department use are two significant contributors to this urgent issue. Historically, oncology patients are high utilizers of emergency department services, and have elevated numbers of unplanned readmissions. This is especially true of gastrointestinal medical oncology patients. In an effort to move the needle in the right direction, an operational quality improvement initiative to decrease emergency department utilization and unplanned readmissions was conducted. This pilot project took place over a three-month period, and consisted of protecting time for advanced practice providers (APPs) and updating inefficient workflows. The primary goal was to reduce the number of days between discharge from the inpatient setting, and days to first follow up appointment in the outpatient setting. A secondary goal was to reduce readmissions and emergency department (ED) utilization. Results showed that to improve transitions of care, implementation of a Donabedian modeled APP structural change, in combination with optimizing workflow, can reduce the length of time between discharge from the inpatient (IP) setting to first follow up appointment. This change in return shows a correlation with a reduction in readmission rates and ED department utilization.

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EMERGENCY DEPARTMENT UTILIZATION FOR ONCOLOGY PATIENTS

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CHAPTER I INTRODUCTION

1.1 Background and Need

Transitions-of-care (ToC) refers to the set of actions taken to ensure coordination and continuity of health care as patients are transferred among various care settings (Brown, 2018). ToC interventions focus on reducing risks associated with potential complications. This includes reducing readmission rates and emergency department (ED) utilization. Readmissions and ED utilization within 30 days of discharge from inpatient (IP) care is used as a transition of care quality metric for oncology patients. Gaps in complex oncology coordination between care settings results in negative patient outcomes and satisfaction. As such, proper management of oncology patients between IP and OP settings is needed. One proposed way to manage this transition is by decreasing the length of time between discharge and follow up.

To evaluate a newly developed oncology discharge clinic, a retrospective pre-post comparative cohort study will be conducted at an Academic Medical Center (AMC) in the Western Region of the United States. The goal is to optimize the ToC between care settings by reducing the length of time between discharge first follow up appointment for gastrointestinal (GI) medical oncology (Med Onc) patients. Hypothesized outcomes of the discharge clinic includes decreasing unplanned readmission rates and ED visits. The belief is that by decreasing the amount of time between discharge and first follow up appointment for this patient population, there will be a reduction in unplanned readmission rates and ED utilization in the 30 days post discharge.

1.2 Problem Statement

GI cancer rates are increasing across the United States, and the Western Region where the AMC is located is not an exception. As cancer incidence increases in the local area, it would be expected that inpatient hospitalizations and ED utilization for this patient population would also increase. Patients with GI cancer who received medical oncology treatments have among the highest unplanned hospitalization rates and ED utilization of any cancer diagnosis (Manzano, 2018). The Advisory Board Oncology Market Estimator shows an anticipated 8% increase in outpatient GI volumes and a 16% increase in inpatient GI volumes for the local area over the next 10 years (Table 1).

Table 1. Oncology Market Estimator (Advisory Board, 2022)

Data and Analytics | Market Estimator - Oncology

Service Line	2020 Volume Estimate	2025 Volume Forecast	2030 Volume Forecast	5 Yr Growth	10 Yr Growth
GI- Inpatient	1,203	1,309	1,391	9%	16%
GI- Outpatient	1,994	2,080	2,147	4%	8%

According to a study by the Cleveland Clinic in 2016 that focused on reducing unplanned medical oncology readmissions by improving outpatient care transitions, there is wide variation in 30-day readmission rates across the United States (Montero et. al, 2016). This suggests that some health systems are more successful at providing "high-quality inpatient care and promoting smooth transitions to follow-up care." (Montero et. al., 2016). For GI oncology patients, the rate of readmissions after medical hospitalizations as compared to surgical hospitalizations is significantly higher; 21.6% compared to 13.4% (Manzano et. al., 2018). Additionally, with increasing rates of oncology patients being treated in the outpatient setting, urgent cares and EDs are becoming more common as the primary location to turn when a complication or unexpected condition arises (National Cancer Institute, 2022). The Division of Cancer Control & Population Sciences (2022) has stated that there is a knowledge gap in the identification, prevention, and management of cancer-related urgent and emergency care needs, which may lead to delays in life-saving care and avoidable hospital admissions.

A National Cancer Institute (NCI)-designated comprehensive cancer center that is part of an Academic Medical Center (AMC) in the Western Region of the United States has identified an area for improvement that consists of ensuring that patients have a follow up appointment with an oncology provider within 7 days or less of discharge from the IP setting. Current internal data shows this number to be on average 14 days, which is twice as long as the target. This AMC has resources and services available to potentially prevent unplanned readmissions and reduce ED utilization for oncology patients, but lacks the operational structure to ensure access. The proposed operational intervention to mitigate this is to establish a discharge clinic staffed with APPs. The APPs in this clinic will have protected time built into their scheduling templates that is specifically allocated to see recently discharged patients. Not all patients will be seen by an APP for their follow up appointment, as they may be deemed more appropriate to be scheduled with their attending oncologist. Patients will be triaged to assess if they are appropriate for a follow-up with an APP or if it will need to be with the attending oncologist. The purpose of the protected time is to ensure access is expanded as the primary oncologists tend to have more challenging schedules which pushes out the days to follow up appointment. This access concern has been exacerbated with increasing volumes. Analysis is needed to determine the effect of this operational process improvement intervention, and to measure the potential impact to unplanned re-admissions and ED utilization.

1.3 Research Questions and Research Hypotheses

The research question is: Can improving the ToC between IP and OP settings at an AMC, through the implementation of an APP discharge clinic, reduce time to first OP follow-up visit, unplanned readmissions, and ED utilization for GI Med Onc patients? This research project will focus on two primary aims. AIM 1: Reduce the time to outpatient follow up appointment for GI medical oncology patients. AIM 2: Reduce hospital unplanned readmissions and ED visits within the first 30 days of discharge from the IP setting. The hypotheses for these aims are as follows:

Hypothesis 1:

Ho: We believe there is no difference between times to outpatient follow-up for GI medical oncology patients after implementing the operational intervention

Ha: We do believe there is a difference between time to outpatient follow-up for

Hypothesis 2:

Ho: We believe there is no difference between ED utilization for GI medical oncology patients after implementing the operational intervention

Ha: We do believe there is a difference between ED utilization for GI medical oncology patients after implementing the operational intervention

Hypothesis 3:

Ho: We believe there is no difference between readmission rates for GI medical oncology patients after implementing the operational intervention

Ha: We do believe there is a difference between readmission rates for GI medical oncology patients after implementing the operational intervention

Study findings will provide evidence needed to assess the impact of implementing a ToC discharge clinic for GI Med Onc patients. Findings will also help establish structural resources and standardized workflows needed to improve outcomes.

2 CHAPTER II SCOPING LITERATURE REVIEW

2.1 Introduction

Examination of specific areas of literature is needed to provide a comprehensive, critical and objective assessment of the current knowledge related to the research topic. Literature will be focused on the key elements of the research question. The primary research topics include AMC's, the Donabedian Framework, readmissions, ED utilization, and ToC. The literature review will include nominal broad research on applicable topics, with more extensive research focused on specific areas including; medical oncology, gastrointestinal cancer, transitions of care, unplanned readmissions, and ED visits. This review is an essential part of research as it helps to establish a theoretical framework, focus and context. The literature review helped identify patterns and trends and identify gaps in the current body of knowledge. Journal articles, books, websites and other published materials have been included. Literature on oncology related topics dates back decades, so the portions of this review that pertain to oncology will only include modern literature not to exceed 10 years (2012 to current).

The literature review will begin with scoping research on AMC's. These are tertiary care hospitals that provide highly specialized care performed in state-of-the-art facilities. AMCs integrate with medical schools both structurally and administratively. These unique hospitals make up five percent of all hospitals in the United States, while accounting for twenty percent of the total hospital volume (Tikkanen, 2018). The characteristics of AMCs, as well as the demographics of the patients they serve, differ from other health systems. AMC's focus is on specialty medical care, biomedical research, education and training of health care professionals, and the provision of health care to uninsured and indigent populations. Additionally, rapid advances in molecular diagnostics, the initiation of targeted therapies and the introduction of precision medicine has amplified the differences between Community and AMC oncology practices (Melas, 2020). With AMC's providing this highly specialized care, and treating patients who often have multiple complex conditions and comorbidities, there are greater challenges associated with caring for their oncology patients. Literature pertaining to the characteristics of AMCs are traditionally retrospective in nature. Nearly all studies contain quantitative data gathered from either electronic health records and/ or national databases. Some studies were qualitative in nature and were conducted via survey. AMC characteristics typically include bed size, region, and profit status. Patient characteristics included patient severity, age, sex, race/ ethnicity, insurance status, medical diagnosis/ conditions and comorbidities. There is little information on oncology specific patient information at AMC's, especially when narrowing to medical oncology, and specifically gastrointestinal oncology.

To improve quality outcomes for oncology patients treated at AMCs, Donabedian's framework will be leveraged to evaluate the relationship between the proposed operational intervention and subsequent patient outcomes. The Donabedian model of quality has been applied for decades to frame the interrelationship between health care organization structures, processes, and outcomes of care (White, 2022). Measuring structure, process and outcomes of health care is the framework of the conceptual Donabedian model (White, 2022). With patient care transitions directly impacting quality and safety for patients, the Donabedian framework will be applied to establish an effective operational intervention. This framework and corresponding attributes have been included in numerous studies to show the correlation between operational improvement and patient outcomes.

The third and fourth areas of scoping research focus on readmissions and ED utilization. With cancer incidence rising and mortality declining, oncology patients ED utilization and readmissions are increasing as cancer becomes more of a chronic disease. Risk adjusted readmission rates account for patient age, clinical risk factors, and underlying risk of readmission based on the specialty (Centers for Medicare & Medicaid Services, 2015). There have been countless studies on readmission rates for oncology patients in the United States. Most of these studies use retrospective observational cohort designs or prospective consecutive cohort designs. The majority of these focus on readmissions after surgical oncology, rather than medical oncology interventions. The bulk of these studies focus on a single institution and rely on data collected from electronic health records (EHRs) while multiple-institution studies often utilize cancer registries (Bell et. al., 2017). The readmission time period is typically 30 days, with some studies also including 60 and 90-day readmissions.

ED utilization studies tended to use a retrospective observational cohort design, with some using prospective cohorts, and very few conducting a randomized control trial. The time frames in these studies were a wide range (from 30 days to 60 months). They also included a range of active treatments including chemotherapy, radiation, hormone, and/or surgery (Lash et.

al., 2017). The type of cancer spanned from specific cancer diagnosis to all cancer types. In a retrospective national probability sample survey of visits to hospital outpatient clinics and EDs in the United States, it was found that there were commonalities in the basic demographic data collected. This included age, sex, race, cancer type, disposition (admitted, discharged, died, or other), dates and times related to ED visit, insurance (private, government-paid, other/unknown), and method of arrival at ED (ambulance, clinic visit, walk) (Yang, 2018).

The final area of scoping literature will focus on transitions of care (ToC). According to Daaleman & Helton (2018) "well-executed transitions of care incorporate patient's individual goals, needs, and values. An ideal transition includes effective communication of information, patient education, enlisting the help of social and community supports, ensuring continuity of care, and coordinating care among team members, all done in a timely manner." Both unplanned readmissions and ED visits are indicators of poor ToC. Approximately twenty percent of Medicare patients are readmitted to the hospital setting within 30 days of discharge (Kansagara, 2016) and thirty percent within 90 days of discharge (Jencks, 2009). According to McCoy et. al. (2014), a sizable percentage of those were likely avoidable if ToC had been properly executed. These poorly executed care transitions impact the quality of care, patient satisfaction and health outcomes. Additionally, it often places a financial burden on the patient in the form of additional out-of-pocket expenses, and on the health system in terms of the excessive cost of providing inpatient care. As such, policymakers have a vested interest in ToC, focusing on improving care quality while reducing overall health care costs. For example, The Affordable Care Act (ACA) implemented a $10 billion incentive model in 2010 that specifically targeted developing innovative programs that include transitional care to prevent readmissions (Kamermayer, 2017). This type of program underscores the importance of ToC, and the value that seamless transitions provide to various healthcare stakeholders. It is essential for a thorough literature review to include an assessment of ToC as it contributes to the overarching objective of this project; to implement a quality improvement initiative for patients recently discharged from the inpatient setting with the goal of reducing unplanned readmissions and ED utilization.

2.2 Academic Medical Center's Role in Cancer Care

AMCs are often believed to disproportionately care for underserved populations. They are considered safety-net hospitals which refers to the collection of hospitals, clinics, and doctors who treat disadvantaged people. This includes those without insurance, regardless of their ability to pay (Bazzoli, 2012). A challenge of this is that despite health care reform in the United States, there are still over twenty million people who are underinsured or uninsured. These patients often face shortages of providers in their communities who are willing and able to serve them, especially when it comes to specialty care such as cancer treatment. As populations increase and the demand for healthcare grows, additional pressure is often placed on safety net hospitals. According to Melas (2020), compared to community cancer hospitals, AMCs focus on specialty medical care, biomedical research, education and training, and the delivery of stopgap care to uninsured and destitute populations. AMCs often face market-driven challenges as a result of health care reforms due to the nature of the services they provide and the populations they serve. Sustaining their academic missions of teaching, research, and care to vulnerable populations requires nuanced strategies for responding to market-driven challenges (Blumenthal, 1995). The value that AMCs provide is measured by their delivery of high-quality healthcare services to patients, as well as the provision of academic activities, research and teaching. This value carries over into the unique role that AMC's play in caring for oncology patients. According to Simone (2002) "Members of academic cancer centers develop most major advances in cancer research and care, and the academic cancer centers are often central to the vitality of academic medical centers as a whole." When it comes to cancer care, AMC's strengths include medical expertise, scientific innovations, and access to clinical trials. They also have access to unique resources such as libraries, specialized informatics infrastructure, and research laboratories (Melas, 2020). In a qualitative survey conducted by the City of Hope Comprehensive Cancer Center (COHCCC), patients recognized these strengths by calling out several key value elements associated with the academic cancer center. This included access to cancer disease specialists, the availability of clinical, translational and basic science researchers, potential for clinical trial participation and enhanced comprehensive care coordinated through multidisciplinary clinical teams (Melas, 2020).

There are varying articles that speak to the unique aspects of the patient populations that AMC's serve. A study by Moy (1996) was conducted to provide quantified data about the patients cared for at AMC's. This study used secondary data from the American Hospital Associations Annual Survey of Hospital Databases and differentiated between hospitals in urban vs. rural areas. The findings confirmed that AMCs provide a large and disproportionate share of care for the medically indigent and the underserved members of minority and poor populations and that members of these populations constituted the majority of patients cared for in many AMCs in recent years (Moy, 1996). The study also found that this proportion was rising at a faster rate at AMCs in urban areas compared to community hospitals in the same area.

An additional study conducted by Tikkanen (2017) analyzed racial/ ethnic and payer mix of inpatients discharged from AMCs in Boston and New York City (NYC). Retrospective discharge data was collected from NYC's Statewide Planning and Research Cooperative System (SPARCS) database, and from Boston Massachusetts Center for Health Information and

Analytics (CHIA). This study found adult hospital discharges indicate that minority patients were underrepresented at NYC's private AMCs, and overrepresented at AMCs in Boston. It was also found that Medicaid and uninsured patients were underrepresented in both regions (Tikkanen, 2017). The study did note that approximately twenty percent of the data collected was missing racial or ethnic classification and it did not control for the patient's diagnosis or severity of illness. This indicates that patient characteristics at AMC's need to be assessed on a regional or individual basis, particularly when it comes to high acuity oncology patients.

AMCs provide complementary and alternative care for vulnerable oncology patients that other non-AMCs are challenged with. Vulnerable populations "include the economically disadvantaged, racial and ethnic minorities, the uninsured, low-income children, the elderly, the homeless, those with human immunodeficiency virus (HIV), and those with other chronic health conditions, including severe mental illness" (Robert Wood Johnson Foundation, 2001). To support this statement, patients were surveyed in a cross-sectional study among medical oncology clinics at an academic cancer center (Bauml, 2015). This study collected clinical and demographic data by self-report and chart abstraction. It assessed the attitudes and beliefs towards the integrative care provided at AMCs. The domains included expected beliefs, perceived barriers and subjective norms. It found that at AMC's the attitudes and beliefs varied by key clinical and demographic characteristics. By developing tailored care programs based upon attitudes and beliefs, barriers faced by vulnerable populations can be removed. This may, in turn, lead to providing customized patient centered care for their unique populations (Bauml, 2015).

In further refinement of research into the care that AMCs provide to oncology patients, it is found that care delivered to gastrointestinal cancer patients is also unique. A retrospective study conducted by Veenstra et. al. (2015) focused on assessing the relationship between oncologic hospital academic status and the value of care for patient's diagnoses with certain GI cancers. The study found there were significant differences in patients treated by a medical oncologist at AMCs vs. non-AMCs for race, zip code, income, year of diagnosis and hospital teaching status (Veenstra, 2015). There was no statistically significant difference in median survival or risk of GI cancers death by hospital academic status.

2.3 Applying Donabedian's Framework to Cancer Care

First introduced in 1965, Avedis Donabedian's triad framework consisting of structure, process and outcomes is still used today to evaluate quality in healthcare (Donabedian, 1969). In the context of this framework, structure refers to the resources used, and environment provided in the delivery of care; process refers to the activities that constitute care, such as the actions of the healthcare professionals; and outcomes refers to the consequences or end results of the care provided (Mortenson, 2017). This framework is used by the Joint Commission, the National Quality Forum, and the National Committee for Quality Assurance. Additionally, Medicare publicly reports the performance of hospitals, nursing homes, and health plans based on this framework, and physician board certification programs use it to promote continuous learning and monitoring of performance measures (Ayanian, 2016).

The Donabedian quality framework has been used to show that improvements in the structure of care delivery leads to improvements in clinical processes and patient outcomes. An example of this is a multicenter retrospective cohort study conducted by Moore et. al. (2015) at a hospital in Canada. The study focused on assessing the performance of an integrated trauma system in terms of structure, process, and outcome. The quality of the hospital's structure was quantified by using data extracted from on-site accreditation surveys and reports. The weighted average scores from these sources were used to measure structural quality. Clinical process quality was measured based on compliance to the 15 clinical processes. These clinical processes included indicators such as transfer of patients with open/depressed skull fracture, airway secured in emergency department, stabilizing/ embolizing unstable pelvic fractures, no reintubation within 48 hrs., etc. (Moore, 2015). Outcome quality was measured based on in-hospital mortality, unplanned 30-day readmission, complications, and acute care length of stay. The study observed significant correlations between structure, process, and outcomes as it pertained to reducing readmissions, mortality, length of stay (LOS), and complications. The Donabedian model provided evidence that health care delivery areas which perform well in terms of structure, also perform well in clinical processes, which in turn resulted in improved quality outcomes (Moore, 2015).

Studies have demonstrated that quality of care and patient safety are negatively affected when transitions are implemented poorly, and that ineffective coordination of these transitions contributes to fragmentation of healthcare delivery (National Transitions of Care Coalition, 2008; Craig, 2011). The Donabedian framework has proven to be an effective model in improving transitions of care by providing guidance associated with planning and implementing care delivery changes. This was demonstrated through a performance improvement project initiated by Thompson et. al. (2105) which addressed the gaps in care and patient education during transitions in care settings. Evidence from the project demonstrated the impact of implementing a structure-process-outcome model on transitions in care (Thompson, 2015). The project included structurally outlining the operational dynamics of the care setting, the types of providers in that setting, the way providers interact within their own unit, and their discharge planning functions (Thompson, 2015). Providers and support staff made up a significant portion of the structural resources needed for cancer patients transitioning from one care setting to another. Process consisted of a series of events that included diagnosis, workup, treatment, recovery, and transition to the outpatient setting (Thompson, 2015). It was shown that when structure and process for ToC when addressed thoughtfully, led to improved quality outcomes. These outcomes were the project's main goal and included changes to health status, patient satisfaction and health-related quality of life.

This same framework has been applied to ED utilization for oncology patients. Numerous studies have documented ED utilization by oncology patients, but a particular study was conducted by Bryant et. al. in 2015 looking at the number of visits for patients with acute leukemia. This retrospective, longitudinal study focused on all visits to the ED, and/ or unplanned hospital admissions for the patient population. This study's main aims were to identify the primary reasons for ED use or unplanned admission, and to explore the social and demographic characteristics of the patients utilizing those services. In the context of the Donabedian framework, structure was defined as the setting of care (ED or inpatient hospital setting), process was defined as when the patient sought services at the ED, hospital, or both, and outcome referred to the number of visits to the ED or unplanned admission (Bryant, 2015). The study found that 81% of patients with acute leukemia had at least one unplanned visit to the ED or hospitalization within one year of their initial diagnosis. Age was a significant indicator of the number of visits, as was race. Findings from this study were used to help providers anticipate discharge needs based on diagnosis, social, and demographic factors. It also helped to refine the process of health service delivery, utilization, and follow-up care for those at higher risk for ED use and hospitalization (Bryant, 2015).

According to Duck et. al. (2017) employing the Donabedian framework and careful examination of the concept of healthcare quality, relationships can be found that inform quality improvement practices. This widely used framework allows health systems, physicians, researchers and policymakers to conceptualize the underlying mechanisms that may contribute to poor quality of care (Liu, 2011). Conversely, there are disadvantages of using Donabedian's framework. It is difficult to definitively establish the causational relationship between structure, process, and outcome (Donabedian, 2005). Because of the complex nature of health systems, and multiple changes related to structure and process constantly occurring, the connection between intervention and outcome can typically be correlated at best. Furthermore, it may be challenging to differentiate between which factors are strictly tied to structure, process or outcomes, and where there is an intersection between them. Lastly, given that this framework was created decades ago, there are limitations to its application in the modern era of healthcare. According to Don Berwick, Donabedian' s framework was as comprehensive as it could be when it was initially created, but there were three primary areas that were lacking compared to modern time quality. These include patient centeredness, the new information age, and scientific advances (Berwick, 2016).

2.4 Readmissions Among Cancer Patients

Readmission rates evaluate what happens to patients after they are discharged from the inpatient setting. According to the Centers for Medicare and Medicaid Services (CMS), readmission is defined as an admission within 30 days of discharge (Epstein et. al., 2015). The premise for this definition is the assumption that readmissions within 30 days are often preventable and the result of inadequate care management. Readmission rates are essential as they help make comparisons among hospitals regarding the quality of care they provide to patients (Hospital Care Data, 2021). The average hospital readmission rate for the United States is currently 15.2% (Hospital Care Data, 2021), and for cancer patients is 20.2% (DiBenedetto, 2022). Literature reviews show a high number of studies that focus on readmissions. This literature includes overall readmissions in the United States, as well as readmissions for patients linked to AMC's, oncology, and GI oncology.

Readmission rates at AMCs tend to be higher as they often care for significantly sicker patients with higher complexity of care. Published studies of cancer patients at academic cancer centers suggest that approximately 19% of 30-day readmissions are potentially preventable (Meisenberg et. al., 2016). In 2014 a study was conducted by Brooks et. al. that focused on patients with a primary or secondary diagnosis of cancer who were readmitted to the hospital for a cancer related diagnosis within 30 days of their last admission. The outcome of interest was potentially preventable readmissions and was in line with the CMS definition of potentially preventable diagnosis for any of 10 conditions (anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, and sepsis). The study reported readmission rates for patients with cancer discharged from medical services to be as high as 27% (Brooks, 2014). It also found that over half (53%) of the admissions were a result of cancer-related symptoms, with over a quarter (28%) of those admissions resulting from complications of the cancer treatment. The most common reasons for admission, whether related to cancer-related symptoms or treatment symptoms, were fever and infection.

A systematic review of hospital readmissions among patients 18 years or older with cancer in the United States was conducted in 2017 by Bell et. al. Studies were excluded if they focused solely on end of life care, and if the readmission rates were not exclusive to patients with cancer (Bell, 2017). There were 1,219 articles reviewed, and after assessing for exclusion criteria, 56 studies remained. The study found that readmission rates within 30 days of post discharged ranged from less than 3% to as high as 34%. Most of the studies, however, reported readmission rates from 10% to 19%. The highest rates were reported in studies of patients with bladder, pancreatic, hematologic, and ovarian cancers. (Bell, 2017). The wide range of readmission rates indicates there are variations among the definitions of cancer cases, care delivery settings, and the populations of patients they serve.

In a systematic review of the proportion of hospital readmissions that were deemed potentially preventable, the average proportion was 27.1% (Val Walraven, 2011). This study used national databases to identify all studies published in a 44-year span (between 1966 and 2011) which focused on readmissions and made efforts to spotlight those that may have been avoidable. In an alternative study focused on oncology readmissions, data from 72 hospitals was analyzed and findings showed that 31% of readmissions were potentially preventable (Meisenberg et. al., 2016). This study used predetermined definitions for preventability and articles were evaluated independently by two highly qualified oncology reviewers. The reviewers stated that "a substantial proportion of oncology readmissions could be prevented with better anticipation of symptoms in high-risk ambulatory patients and enhanced communication about symptom burden between patients and physicians before an escalation that leads to an emergency department visit" (Meisenberg et. al., 2016).

An exploratory retrospective cohort study at a large community cancer center was conducted between 2016 and 2018. This study focused on adults aged 60 or older who had a new cancer diagnosis and were actively undergoing chemotherapy (Loerzel et. al., 2021). This study's purpose was to identify the incidence and risk factors associated with unplanned ED visits and hospital admissions, emphasizing those related to nausea, vomiting and dehydration

(NVD). The study found that 18% of the study participants were admitted to the hospital while actively under treatment. The main reasons for the admission were infection and NVD. The study also included what cycle of chemotherapy these patients were currently undergoing. Results indicated that hospital admissions were more frequent when patients were in their first cycle (Loerzel et. al., 2021). This is consistent with other studies such as the studies by Extermann (2015) and Reed (2019) that reported hospital admissions during cycle 1 of chemotherapy were most likely to occur within the first 30 days of treatment and tend to taper off in future cycles.

Specific studies focused on readmissions for gastrointestinal medical oncology patients have also been conducted. In 2015, Epstein et. al. examined the readmission frequency, patient characteristics, and their potential preventability for GI medical oncology patients at an AMC. The study used medical record data to identify patients discharged from the IP setting and readmitted within 30 days or less. They found that 22% of the patients had one or more readmission within 30 days. The primary reason for readmission was infection or pain. Upon further investigation however, it was deemed that only 2% of these readmissions would have been considered potentially preventable (Epstein et. al., 2015). The generalizability of this study was limited as it was conducted on a specific population at only one institution and does not align with larger research studies such as those conducted by Val Walraven (2011) and Meisenberg (2016).

An additional retrospective study to identify avoidable hospitalizations in patients with GI cancer was conducted by Brooks et. al. in 2014. This study's purpose was to identify and characterize avoidable hospitalizations in patients with GI malignancies. It found that 28% of these readmissions were attributed to complications in cancer treatment. The hospitalizations were more likely to be deemed preventable in those over the age of 70 who were advised to consider hospice and had received three or more lines of chemotherapy. It concluded that hospitalizations are common in patients with advanced GI cancer, and that most hospitalizations occurred in patients with advanced systemic treatments and those who were near end of life (Brooks, 2014).

In the United Kingdom, a retrospective review was conducted assessing the most frequent cause of 90-day unplanned hospital readmissions for GI surgical oncology patients', and focused on those also actively undergoing chemotherapy. It found that there was a high number of readmissions (18.4%) for reasons related to chemotherapy complications within that timeframe (Ang, 2014). In most of these cases, the readmission related to chemotherapy complications occurred after 60 days. The implication of this study indicates that the CMS definition of readmission being within 30 days may not a large enough window to account for causes related to chemotherapy, which typically occur after 60 days.

2.5 Emergency Department Utilization Among Cancer Patients

Emergency Department utilization among cancer patients is a growing area of concern as more oncology care is being transferred from the inpatient to outpatient settings. As a result, there are more patients using the ED for symptom management. According to the National Cancer Institute (2022), when oncology patients arrive in the ED, the physicians must quickly evaluate the patients including clinical, laboratory, and radiographic tests. They must also navigate how to manage their complex critical conditions and coordinate post ED visit care with their primary oncologist. The knowledge gaps between ED physicians and Oncologists can often lead to delays in life saving care, cost effective treatments, and avoidable hospital admissions (National Cancer Institute, 2022).

A systematic review of ED visits for symptoms experienced by oncology patients was carried out by Vandyk et. al. (2011). There were 18 studies found, 12 of which were retrospective in nature and 6 were prospective. Half (55%) focused on specific symptoms while the remaining focused on multiple symptoms. In an analysis of all studies, approximately 20% of ED visits were related to multiple symptoms and not just one specific symptom. The majority of these included a combination of neutropenia, infection, pain, fever and dyspnea; all of which are considered potentially preventable (Vandyk, 2011). Findings of this systematic review concluded that patients diagnosed with cancer have high ED utilization rates during their treatment, and over half of the ED visits resulted in a subsequent admission to the IP setting.

To identify the characteristic differences between cancer patients and non-cancer patients utilizing ED services, a comparative population-based study was initiated. Yang et. al. (2018) analyzed ED visit data that included patient characteristics and diagnosis data. The data sources included a comprehensive cancer center, twenty-four general ED's and the National Hospital Ambulatory Medical Care Survey (NHAMCS). This large, comprehensive, data collection effort yielded over 3.4 million results and was the first of its size to compare the characteristics of cancer vs. non-cancer patients who visited the ED. Specific aims of the study were to compare the characteristics and diagnoses between the two groups. Findings showed that cancer patients tended to be older and stay longer in the ED. Lung, gastrointestinal and genitourinary cancers were the most common diagnoses related to ED visits. Cancer patients were also more likely than non-cancer patients to be admitted via the ED. The primary reasons for cancer patients admitted to the hospital via the ED were pneumonia, influenza, fluid disorders, and electrolyte disorders. Pain was the most common complaint leading to an ED visit, but this often did not result in a subsequent admission (Yang, 2018). Limitations of this study include the inability to identify patients that had more than one ED visit as the data was de-identified, as well as misclassification of some diagnosis codes in the large registry databases.

In 2018 a retrospective randomized cohort study conducted by Panattoni et. al. to evaluate the prevalence of ED utilization related to cancer patients undergoing chemotherapy or radiation treatments within the first year of their diagnosis. The study found that 50% of patients with a primary diagnosis had an ED visit. Of that, over a quarter were related to pain (Panattoni, 2018). Additional studies have found that up to 69% of Medicaid oncology patients use the ED within 6 months of diagnoses (Panattoni, 2018 & Subramanian, 2011). For commercially insured oncology patients actively undergoing chemotherapy treatments, the rate is 2 ED visits per year (Panattoni, 2018 & Kolodziej, 2011). These rates are higher than other comparable chronic disease ED visits such as pulmonary disease (36%), hypertension (21%) and diabetes (10%) (Panattoni, 2018).

As referenced in the assessment of literature pertaining to hospital admissions, the exploratory retrospective cohort study conducted by Loerzel (2021) also had significant findings associated with ED visits. It found that 20% of the study participants experienced an ED visit while actively under treatment. The main reasons for the ED visit were related to NVD and pain. The results of this study are consistent with similar studies assessing ED utilization; however, it provided a unique contribution to current literature. This study showed that ED visits for older populations are different than those from cancer populations of all ages. Patients who had been diagnosed with esophageal cancer, were receiving three or more chemotherapy drugs as part of their treatment, had received intravenous (IV) fluids between treatments, or had functional impairments while receiving treatment, had an increased risk of an ED visit (Loerzel, 2021). Other studies, such as one by Weinder (2018) focusing on ED utilization in patients with colorectal cancers found that increased risk factors included advanced age, ethnicity, and comorbidities. Yet another study found increased risk for ED visits to include cardiovascular disease and patient distress (Harrison, 2016). All these studies showed increased ED visits for oncology patients, but they also showed varying results in risk predictors/factors. This indicates that the type of cancer a patient has been diagnosed with, their specific sociodemographic characteristics, type of active treatment, and other factors all play an important role in identifying risk of ED utilization.

2.6 Transitions of Care

In a systematic review focused on the effectiveness of evidence-based ToC interventions and their subsequent impact on reducing 30-day readmission rates, ED visits and mortality rates, it was found that many ToC interventions are focused on the general medical or surgical patient population (Kramermayer, 2017). It was also suggested that providing a team-based care approach to ToC that incorporates a variety of interventions rather than a single intervention, was more likely to reduce readmissions. The systematic review showed that high risk patients benefited even more than lower risk patients when ToC were properly executed.

In a 2018 study by Rider et. al. conducted at an AMC in the Western Region of the United States had a primary goal of characterizing current practices in the ToC between the ED and primary care settings. It recognized that this is a highly vulnerable time for patients post discharge from the ED, and there is an increased level of importance towards provider communication during this transition. With few standardized forms of communication between ED physician and primary care providers, the research question centered on what the current communication practices and preferences in the ToC from the ED to the outpatient setting were. It emphasized the use of EMR's and the role they play in effective ToC (Rider, 2018). This study created and executed a survey that was administered to emergency physicians and primary care providers across the country. In total, over 100 physicians were surveyed. Major findings in the survey results indicated there were vast differences in the communication expectations and handoff preferences between ED physician and primary care physicians. The ED physicians preferred scheduled, synchronous telephone communication whereas PCPs (Primary Care Provider) preferred using the unscheduled asynchronous EMR messaging based communication. This study highlights the need to optimize technology for an effective ToC from the ED to the outpatient setting. The study concluded that, to overcome the barriers to effective communication, standardized systems should focus on EMR's as they serve as both record tools and communication platforms. Limitations of this study included the lack of representation from community sites without academic affiliations and the data being based on provider perceptions rather than objective measurements of communication (Rider, 2018).

2.7 Summary and Conclusions

AMCs provide a unique value in delivering high-quality healthcare services to patients and in providing academic activities, research and teaching. When it comes to cancer care, AMC's strengths include medical expertise, scientific innovations, and access to clinical trials. Their distinctive role in the market warrants the need to conduct specific research on the care they provide. The Donabedian framework is a widely used model in healthcare to improve quality outcomes through changes in structure and process. The framework has proven to be an effective model in improving ToC, readmissions and ED utilization by providing guidance associated with planning and implementing care delivery changes. Applying the tried-and-true Donabedian model to quality improvement initiative at a Comprehensive Cancer Center at an AMC will fill a gap in existing literature.

The wide range of studies pertaining to readmission rates indicates there are variations among the definitions of cancer cases, care delivery settings, and the populations of patients they serve. Future research is needed to describe readmission rates by cancer type, and to develop and assess the effectiveness of readmission reduction interventions among patients with cancer (Bell, 2017). There has been extensive research related to the cause of an initial admission for cancer patients, however detailing readmissions for this population has not been widely evaluated (Epstein et. al., 2015). Even less research has been conducted pertaining to whether these readmissions are preventable. This is similar to results yielded in research on ED utilization for Oncology patients. Whereas there has been much research on ED utilization, there is very little focused on the exact diagnosis and cancer type. ToC and operational interventions must be tailored to the specific cancer type, as there is a wide variation in structure, process, and care delivery depending on the type of cancer a patient has. Poorly executed transitions of care negatively impact quality and outcomes. While numerous studies have been conducted examining the importance of effective and efficient ToC, very few specifically center on oncology patients, and none were found that focused solely on GI medical oncology patients.

Literature gaps focusing on quality improvement interventions to better the outcomes for GI medical oncology patients exist in the Donabedian framework, ToC, readmissions and ED utilization. While research shows there has been work in these areas, there is no specific intervention that has been implemented where the Donabedian framework has been used to assess factors related to reductions in readmissions and ED utilization for GI medical oncology patients at AMCs and thus the study being undertaken here will contribute to an important addition to the literature.

Table 2. Literature Review Results

	Primary Category					Subcategory						
Source Ref Author (1st listed)	**AMC**	**Donabedian**	**Readmissions**	**ED Utilization**	**ToC**	**Oncology**	**Med Onc**	**GI Onc**	**QI**	**Op. Intervention**	**Total Yes (1)**	**Total No (0)**
Bell	0	0	1	0	1	1	1	1	1	1	7	3
Montero	1	0	1	0	1	1	1	0	1	1	7	3
Thompson	1	1	1	0	1	1	0	0	1	1	7	3
Brooks	1	0	1	1	0	1	1	1	1	0	7	3
Craig	0	1	1	0	1	1	1	0	1	1	7	3
Bryant	0	1	1	1	1	1	0	0	1	0	6	4
Daaleman	0	1	1	1	1	1	0	0	1	0	6	4
Hseuh	0	0	1	0	1	1	0	0	1	1	5	5
Ang	0	0	1	1	0	1	0	1	1	0	5	5
Rider	0	0	0	1	1	0	0	0	1	1	4	6
Veenstra	1	0	0	0	0	1	0	1	1	0	4	6
Kamermayer	0	0	1	1	1	0	0	0	1	0	4	6
Szekendi	1	0	1	1	0	0	0	0	1	0	4	6
Epstein	0	0	1	0	0	1	1	1	0	0	4	6
Bauml	1	0	0	0	0	1	1	1	0	0	4	6
Manzano	0	0	1	1	0	1	0	1	0	0	4	6
Meisenberg	0	0	1	1	0	1	0	0	0	0	3	7
Moore	0	1	0	0	0	0	0	0	1	1	3	7
Van Walraven	0	1	0	0	0	0	0	0	1	1	3	7
Solomon	0	0	1	0	0	1	0	0	1	0	3	7
Simone	1	0	0	0	0	1	0	0	1	0	3	7
Donabedian (1990)	0	1	0	0	1	0	0	0	1	0	3	7
Donabedian (1969)	0	1	1	0	0	0	0	0	1	0	3	7
Liu	0	1	0	0	0	0	0	0	1	0	2	8
Weinder	0	0	0	1	0	1	0	1	0	0	3	7
Extermann	0	0	1	1	0	0	1	0	0	0	3	7
Vandyk	0	0	1	1	0	1	0	0	0	0	3	7
Allen	0	1	0	0	0	0	0	0	1	0	2	8
Ayanian	0	1	0	0	0	0	0	0	1	0	2	8
Berwick	0	1	0	0	0	0	0	0	1	0	2	8
Donabedian (2005)	0	1	0	0	0	0	0	0	1	0	2	8
Mortenson	0	1	0	0	0	0	0	0	1	0	2	8
White	0	1	0	0	0	0	0	0	1	0	2	8
Blumenthal	1	0	0	0	0	0	0	0	1	0	2	8
Melas	1	0	0	0	0	1	1	1	0	0	4	6
Loerzel	0	0	1	0	0	0	1	0	0	0	2	8
Reed	0	0	1	0	0	0	1	0	0	0	2	8
Harrison	0	0	0	1	0	1	0	0	0	0	2	8
Lash	0	0	0	1	0	1	0	0	0	0	2	8
Yang	0	0	0	1	0	1	0	0	0	0	2	8
McCoy	0	0	1	0	1	0	0	0	0	0	2	8
Jencks	0	0	1	0	0	0	0	0	0	0	1	9
Kansagara	0	0	1	0	0	0	0	0	0	0	1	9
Bazzoli	1	0	0	0	0	0	0	0	0	0	1	9
Brown	1	0	0	0	0	0	0	0	0	0	1	9
Moy	1	0	0	0	0	0	0	0	0	0	1	9
Tikkanen	1	0	0	0	0	0	0	0	0	0	1	9
Total Yes (1)	13	15	23	15	11	22	10	9	27	8		
Total No (0)	34	32	24	32	36	25	37	38	20	39		

In total, the scoping literature review consisted of 47 articles (see Table 2). This included the primary research categories of Academic Medical Centers, Donabedian's Framework, Readmissions, Emergency Department Utilization and Transitions of Care. It also included sub-categories including oncology, medical oncology, gastrointestinal oncology, quality improvement, and operational interventions. Some of these articles were systematic reviews, meaning the authors conducted thorough reviews on the same or similar categories. It was found that no sources yielded results that addressed all 5 primary categories and all 5 subcategories, however one article did include all 5 subcategories. The primary categories with the highest scoping elements included readmissions (n=23) followed by the Donabedian Framework (n=15) and ED Utilization (n=15). The primary categories with the least scoping elements included AMC's (N= 13) and ToC (n=11). The sub-categories with the highest scoping elements included quality improvement (n= 27) and oncology (n=22). The sub-categories with the least scoping elements included medical oncology (n= 10), gastrointestinal oncology (n= 9) and operational interventions (n=8). The results of this scoping literature review show that the research topic for this project has not been studied in a way that includes applying the Donabedian framework to a ToC quality improvement intervention that specifically targets GI Med Onc patients at an AMC.

3 CHAPTER III METHODOLOGY

3.1 Research Design

This study is a prospective cohort analysis of post discharge medical oncology outcomes compared with historical and contemporaneous control groups.

3.2 Sample Selection

Purposive sampling was used to select patients. Patients were selected due to their characteristics, in this case diagnosis. Purposive sampling is used to select persons most likely to yield appropriate and useful information (Kelly, 2010). The population included GI Med Onc patients discharged from an AMC in the Western Region of the United States where this intervention took place.

The GI Oncology disease team accounts for 14.6% of the overall oncology discharges and 14.1% of the readmissions. Between July of 2022 and July of 2023, there were 627 GI oncology discharges and 140 readmissions for patients with an active diagnosis of any of the below 74 ICD-10 codes (see Table 3). Active cancer diagnosis is defined as having a cancer diagnosis and one or more of the following within the last 90 days: infusion visit, active antineoplastic medication order, or radiation treatment visit. Additionally, having more than 2 visits with an oncology disease team within the last 90 days constitutes an active diagnosis. Patients must have also been recently admitted to an inpatient setting at the same AMC that is providing their primary oncology care.

Patients excluded are as follows:

- Discharge and readmission data outside of the historic/ pilot timeframes was excluded
- Patients seeing providers from the GI Surgical team
- Patients with last OP oncology provider listed as an APP (unable to determine if primary oncologist was within the pilot or control group)
- Patients readmitted or with an ED visit unrelated to their cancer diagnosis
- Patients under the age of 18
- Patients admitted to a hospital other than the pilot hospital

Criteria for inclusion in the pilot includes all patients discharged from the inpatient setting who are actively being treated by a member of the GI Med Onc care team. Patients must have a primary or secondary discharge diagnosis of GI cancer (see Table 3 for diagnosis codes) between November 1, 2022, and January 30, 2023 (90 days).

Table 3. ICD-10 Gastrointestinal Cancer Diagnosis Codes

DX_ID	DX_NAME	ICD_CODE	CODE_GRP	DISEASE_GRP
1206173	Malignant neoplasm of cervical part of esophagus (CMS-HCC)	C15.3	ICD_10	GI
641569	Malignant neoplasm of thoracic part of esophagus (CMS-HCC)	C15.4	ICD_10	GI
1206169	Malignant neoplasm of abdominal part of esophagus (CMS-HCC)	C15.5	ICD_10	GI
723887	Malignant neoplasm of overlapping sites of esophagus (CMS-HCC)	C15.8	ICD_10	GI
1209478	Malignant melanoma of esophagus (CMS-HCC)	C15.9	ICD_10	GI
651199	Malignant neoplasm of stomach	C16	ICD_10	GI
651200	Malignant neoplasm of cardia (CMS-HCC)	C16.0	ICD_10	GI
651203	Malignant neoplasm of fundus of stomach (CMS-HCC)	C16.1	ICD_10	GI
651204	Malignant neoplasm of body of stomach (CMS-HCC)	C16.2	ICD_10	GI
651202	Malignant neoplasm of pyloric antrum (CMS-HCC)	C16.3	ICD_10	GI
651201	Malignant neoplasm of pylorus (CMS-HCC)	C16.4	ICD_10	GI
1206194	Primary malignant neoplasm of lesser curve of stomach (CMS-HCC)	C16.5	ICD_10	GI
646119	Malignant neoplasm of greater curve of stomach (CMS-HCC)	C16.6	ICD_10	GI
723898	Malignant neoplasm of overlapping sites of stomach (CMS-HCC)	C16.8	ICD_10	GI
298105	Primary malignant neoplasm of stomach (CMS-HCC)	C16.9	ICD_10	GI
652367	Malignant neoplasm of small intestine	C17	ICD_10	GI
651208	Malignant neoplasm of duodenum (CMS-HCC)	C17.0	ICD_10	GI
651209	Malignant neoplasm of jejunum (CMS-HCC)	C17.1	ICD_10	GI
651210	Malignant neoplasm of ileum (CMS-HCC)	C17.2	ICD_10	GI
712378	Meckel's diverticulum, malignant (CMS-HCC)	C17.3	ICD_10	GI

723897	Malignant neoplasm of overlapping sites of small intestine (CMS-HCC)	C17.8	ICD_10	GI
1205650	Mucocarcinoid tumor of small intestine (CMS-HCC)	C17.9	ICD_10	GI
300505	Recurrent squamous cell carcinoma of anus (CMS-HCC)	C21.0	ICD_10	GI
282302	Localized cancer of anal sphincter (CMS-HCC)	C21.1	ICD_10	GI
652687	Malignant neoplasm of cloacogenic zone (CMS-HCC)	C21.2	ICD_10	GI
1206171	Malignant neoplasm of anorectal junction (CMS-HCC)	C21.8	ICD_10	GI
1203698	Hepatocellular carcinoma metastatic to bone (CMS-HCC)	C22.0	ICD_10	GI
646768	Cholangiocarcinoma of liver (CMS-HCC)	C22.1	ICD_10	GI
652688	Hepatoblastoma (CMS-HCC)	C22.2	ICD_10	GI
302685	Primary angiosarcoma of liver (CMS-HCC)	C22.3	ICD_10	GI
656929	Other sarcomas of liver (CMS-HCC)	C22.4	ICD_10	GI
302683	Primary adenocarcinoma of liver (CMS-HCC)	C22.7	ICD_10	GI
719682	Malignant neoplasm of liver, primary, unspecified as to type (CMS-HCC)	C22.8	ICD_10	GI
1208906	Hepatic cancer not involving intrahepatic bile ducts (CMS-HCC)	C22.9	ICD_10	GI
1209471	Malignant melanoma of gallbladder (CMS-HCC)	C23	ICD_10	GI
282306	Localized cancer of common bile duct (CMS-HCC)	C24.0	ICD_10	GI
651228	Malignant neoplasm of ampulla of Vater (CMS-HCC)	C24.1	ICD_10	GI
722722	Malignant neoplasm of overlapping sites of biliary tract (CMS-HCC)	C24.8	ICD_10	GI
655300	Malignant neoplasm of biliary tract, unspecified (CMS-HCC)	C24.9	ICD_10	GI
651229	Malignant neoplasm of pancreas	C25	ICD_10	GI
652368	Malignant neoplasm of head of pancreas (CMS-HCC)	C25.0	ICD_10	GI
282465	Cancer, pancreas, body (CMS-HCC)	C25.1	ICD_10	GI
282868	Cancer of pancreas, tail (CMS-HCC)	C25.2	ICD_10	GI
642377	Primary malignant neoplasm of pancreatic duct (CMS-HCC)	C25.3	ICD_10	GI
285883	Malignant pancreatic islet cell tumors (CMS-HCC)	C25.4	ICD_10	GI
282972	Cancer of pancreas, other site	C25.7	ICD_10	GI

723895	Malignant neoplasm of overlapping sites of pancreas (CMS-HCC)	C25.8	ICD_10	GI
282339	Localized cancer of pancreas (CMS-HCC)	C25.9	ICD_10	GI
651237	Malignant neoplasm of intestinal tract, part unspecified (CMS-HCC)	C26.0	ICD_10	GI
282358	Localized cancer of spleen (CMS-HCC)	C26.1	ICD_10	GI
641034	Malignant neoplasm overlapping digestive system site (CMS-HCC)	C26.9	ICD_10	GI
704711	Malignant melanoma of anal skin (CMS-HCC)	C43.51	ICD_10	GI
640994	Primary malignant neoplasm of muscle of abdomen (CMS-HCC)	C49.4	ICD_10	GI
1203130	Malignant gastrointestinal stromal tumor of stomach (CMS-HCC)	C49.A2	ICD_10	GI
645467	Malignant GIST (gastrointestinal stromal tumor) of small intestine (CMS-HCC)	C49.A3	ICD_10	GI
1193905	Secondary malignant neoplasm of mediastinal lymph nodes with unknown primary site (CMS-HCC)	C77.1	ICD_10	GI
1193800	Secondary malignant neoplasm of retroperitoneal lymph nodes with unknown primary site (CMS-HCC)	C77.2	ICD_10	GI
1193805	Secondary malignant neoplasm of tibial lymph nodes with unknown primary site (CMS-HCC)	C77.4	ICD_10	GI
1193798	Secondary and malignant neoplasm of lymph nodes of multiple sites with unknown primary site (CMS-HCC)	C77.8	ICD_10	GI
1193922	Secondary malignant neoplasm of Meckel's diverticulum with unknown primary site (CMS-HCC)	C78.4	ICD_10	GI
1193797	Secondary malignant neoplasm of peritoneum with unknown primary site (CMS-HCC)	C78.6	ICD_10	GI
1193823	Secondary angiosarcoma of liver with unknown primary site (CMS-HCC)	C78.7	ICD_10	GI
1193801	Secondary carcinoma of gastrointestinal tract with unknown primary site (CMS-HCC)	C78.89	ICD_10	GI
1193924	Secondary malignant neoplasm of adrenal cortex with unknown primary site (CMS-HCC)	C79.70	ICD_10	GI
1212802	Metastasis to right adrenal gland with unknown primary site (CMS-HCC)	C79.71	ICD_10	GI

121345 2	Malignant neoplasm metastatic to left adrenal gland with unknown primary site (CMS-HCC)	C79.72	ICD_10	GI
654938	Malignant neoplasm associated with transplanted organ (CMS-HCC)	C80.2	ICD_10	GI
651412	Carcinoma in situ of esophagus	D00.1	ICD_10	GI
651413	Carcinoma in situ of stomach	D00.2	ICD_10	GI
704251	Carcinoma in situ of other parts of intestine	D01.49	ICD_10	GI
653368	Carcinoma in situ of liver, gallbladder and bile ducts	D01.5	ICD_10	GI
120630 8	Intraductal papillary mucinous carcinoma in situ of pancreas	D01.7	ICD_10	GI
643368	Gastrinoma in porta hepatis region	D37.6	ICD_10	GI
143981 4	Encounter for follow-up surveillance of pancreatic cancer	Z08	ICD_10	GI

3.3 Intervention

The intervention that took place followed the Donabedian model of structure-process-outcome. This model was applied to transitions of care in an effort to improve quality. The structural change involved blocking APP time slots in the EPIC scheduling templates. Each visit lasted 30 minutes, and there was a total of 6 slots blocked in the APPs templates per week (see Figure 1). Process consisted of documenting the current state workflow from admission through occurrence of first outpatient clinic visit post discharge (see Figure 2). Areas for improvement were identified in the current state workflow, and continuous changes were made throughout the pilot to ensure workflow optimization for the future state of transitions of care. Through mapping the current state workflow and breakdowns in the current process, areas for improvement were identified early on. These areas included the need to identify the persons/ roles responsible for each task, actions that are frequently not carried out, and the need for EPIC standardization. Lastly, outcomes are measured based upon the primary aims to reduce the amount of time to outpatient follow up appointment for GI Med patients, and to reduce the number of hospital unplanned readmissions and ED visits within the first 30 days of discharge from the IP setting. A secondary goal of the pilot project is to create an optimized future state workflow for the GI Med Onc team.

3.4 Data Set Description

Archival data was collected via the organizations EPIC Electronic Medical Record (EMR). Permission to use the data was obtained in advance of any data collection (see Appendix).

3.5 Data Collection/ Procedure

Data was extracted from the EPIC database. The report was created using the EPIC Custom Reporting Workbench. Inclusion and exclusion criteria were applied. A total of 12 data elements were collected as shown in Tables 4 and 5 below. The initial report collected data between July 1st, 2021 and August 31st, 2022. The report was set to automatically update on a monthly basis to include ongoing data collection.

Figure 1. APP Protected Time- EPIC Scheduling

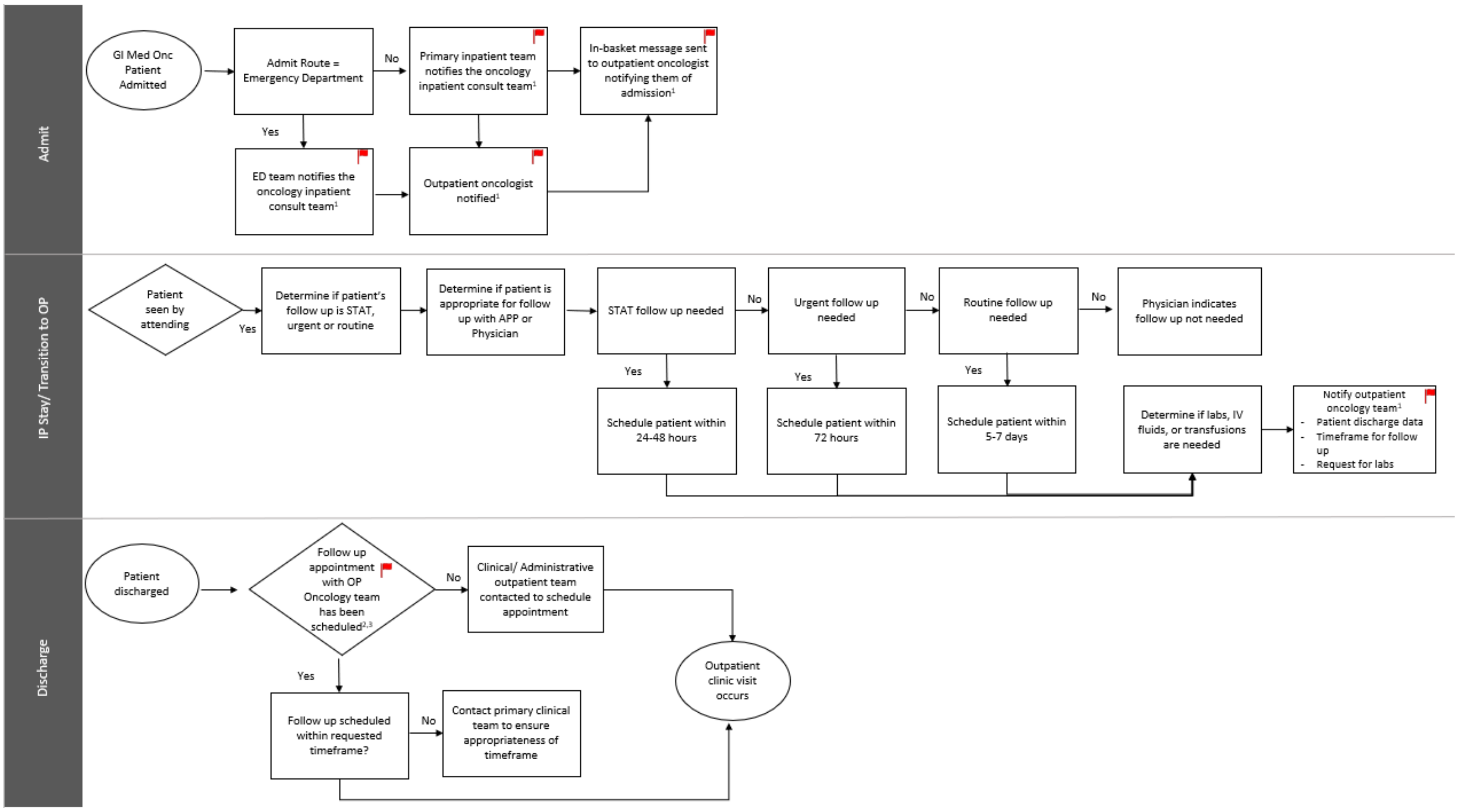
APP 1- Seeing patients for Physician 1

Thursday 11:30 am – 12:00 pm
Tuesday 11:30 am – 12:00 pm
Friday 10:30 am – 11:00 am

APP 2- Seeing patients for Physician 2

Monday 10:30 am – 11am
Monday 11:30 am – 12:00 pm
Tuesday 1:00 pm – 1:30 pm

Figure 2. Transitions of Care Workflow: GI Medical Oncology Current State (flags indicate a breakdown in the process)



3.6 Independent and Dependent Variables

Primary independent study variables include the pre versus post intervention time period and the pilot provider versus control providers. The time variable used to delineate the comparison versus intervention group are GI Onc patients discharge prior to pilot study start (November 1, 2021 through January 30, 2022) and the post intervention period will be the 90-day pilot study period (November 1, 2022 through January 30, 2023). The pilot providers used to define active intervention patients include the clinician A and clinician B who agreed to be part of the active pilot study. Patients seen by other GI Med Onc clinicians will be designated as the control group.

The primary dependent variable is the occurrence of an outpatient clinic visit less than or equal to 7 days from inpatient discharge. This variable is measured by the number of days between inpatient discharge and first follow up appointment with the primary oncology team. The two secondary dependent variables include whether the patient was readmitted to the inpatient setting, or if they had an ED visit within 30 days post discharge. "Readmission" includes patients returning to the hospital for an ED Visit or inpatient admission within 30 days of initial hospitalization (ED or IP) discharge. Dependent and independent variable definitions and measurements are listed in Table 4.

Table 4. Independent and Dependent Data Elements

Element	Definition	Measure	Measure	Dependent/ Independent
Readmission	Patient readmitted to the hospital within 30 days of discharge	1= Yes	0= No	Secondary Dependent
ED	Patient experienced an ED visit within 30 days of discharge	1= Yes	0= No	Secondary Dependent
OP clinic visits optimal	7 or less Days between discharge and first follow up appointment with primary oncology team	1= Yes	0= No	Primary Dependent
Post Pilot	Period of time in which the patient data was gathered	1= during intervention time	0= pre-intervention period	Independent
Pilot Provider	Provider included in the pilot initiative	1= Yes	0= No	Independent

Additional data elements include descriptive and risk adjustment control variables of interest. Descriptive data elements are used to describe characteristics of the patients' encounters during the data collection period. Control variables are used in outcome models to for risk adjustment. They include age, sex, race and primary language, active treatment, payor, and discharge destination. These variables are not of interest to the primary aim of the study, but are included as they could influence the outcomes.

Table 5: Control and Descriptive Data Elements

Element	Definition	Type
Age	Age of patient during data collection period	Control
Sex	Patients gender at birth	Control
Race	Patients self-identified race	Control
Asian		
Black or African American		
Hispanic/ Hispanic Latino		
Other		
White		
Primary Language	Patients self-identified primary language	Control
English		
Other		
Spanish		
Active Treatment	Patient actively under systemic treatment (chemotherapy)	Control
Payor	Patients insurance payor	Control
Commercial		
Medicaid		
Medicare		
Initial Discharge Destination	Site of care to which the patient was discharged to	Control
Home		
Hospice		
Other		
Skilled Nursing Facility		

3.7 Data Analysis: Statistical Approach

Descriptive statistics will be performed on all data elements. Means and standard deviations will be used to describe continuous variables, and frequencies and percentages will be used to describe categorical variables. Outcome effect sizes will be reported differences in means or proportions, and are tested with Wilcoxon signed-rank tests and chi-square (or fisher's exact for small cell sizes), respectively. Variables that will be tested for confounding (i.e. need for risk adjustment) to control for difference between comparison groups include: age, sex, race and primary language, active treatment, payor, and discharge destination. Multivariable models assessing confounding of potential risk adjusters did not indicate bias between groups, and thus unadjusted results are reported.

3.8 Protection of Human Subjects

The MUSC QI Evaluation Tool was used to determine that this study would be considered a quality improvement project and does not require IRB (Institutional Review Board) approval.

4 CHAPTER IV RESULTS

4.1 Pre-Intervention Data

Pre-pilot (historic) data was comprised of N=50 GI medical oncology patients who were discharged from the inpatient setting between November 1, 2021 and January 31st, 2022. Table 6 provides the descriptive statistics comparing patients who were seen by pilot (n=18) and control (n=32) providers during the pre-period. On average, patients seen by a pilot provider were 8.3 years younger (p=0.06) and distributed similarly by sex (p=0.96). They had a higher percentage of Asian (15.3% more) and Hispanic (13.9% more), with a lower percentage of Black or African American (8.7% less) and White (16% less), however this did not reach statistical significance (p=0.32). The pilot group included 61.1% who identify their primary language as English, which was less than the controls (81.3%) (p=0.10). Pilot provider patients were more likely to be in active treatment (94.4% versus 78.1%, p=0.23) and on commercial insurance (55.6% versus 40.6%, p=0.58). This would be expected as their patients tended to be younger. Lastly, all of the pilot provider patients were discharged to home compared with 90.6% of the patients of the control providers (p=.54). Generally, the patients seen by both the pilot and control providers during the pre-period were comparable.

Table 6. Demographics and characteristics of PILOT and CONTROL provider patients PRE intervention

Characteristic	Overall Pre n= 50	Pilot Provider n= 18	Control Provider n=32	P Value
	Mean (SD)	Mean (SD)	Mean (SD)	
Age	62.0 (15.1)	56.6 (12.9)	64.9 (15.7)	0.06
	n (%)	n (%)	n (%)	
Male	28 (56.0)	10 (55.6)	18 (56.3)	0.96
Race				0.32
Asian	9 (18.0)	5 (27.8)	4 (12.5)	
Black or African American	5 (10.0)	1 (5.6)	4 (12.5)	
Hispanic/ Hispanic Latino	15 (30.0)	7 (38.9)	8 (25.0)	
Other	2 (4.0)	0 (0.0)	2 (6.3)	
White	19 (38.0)	5 (27.8)	14 (43.8)	
Primary Language				0.10
English	37 (74.0)	11 (61.1)	26 (81.3)	
Other	5 (10.0)	4 (22.2)	1 (3.1)	
Spanish	8 (16.0)	3 (16.7)	5 (15.6)	
Active Treatment	42 (84.0)	17 (94.4)	25 (78.1)	0.23
Payor				0.58
Commercial	23 (46.0)	10 (55.6)	13 (40.6)	
Medicaid	6 (12.0)	2 (11.1)	4 (12.5)	
Medicare	21 (42.0)	6 (33.3)	15 (46.9)	
Other	0 (0)	0 (0)	0 (0)	
Initial Discharge Destination				0.54
Home	47 (94.0)	18 (100.0)	29 (90.6)	
Hospice	0 (0)	0 (0)	0 (0)	
Other	0 (0)	0 (0)	0 (0)	
Skilled Nursing Facility	3 (6.0)	0 (0)	3 (9.4)	

Table 7 below shows continuous and categorical variables pre-pilot. Figures 3 and 4 graphically show the comparative results. The pilot providers had 8.6 fewer days from discharge to readmission (p=.0741) and had 7.1 more days between discharge and first follow up appointment (p=.2388). For pilot providers, the percentage of patients with ED visit post discharge was 2% higher than the control providers (p=.8795) and readmission within 30 days was 1.1% higher (p=.9405). Control providers had a 15% higher rate of optimal clinic days (≤ 7 days) compared to pilot providers (0=.3093). None of the values were considered statistically significant.

Table 7. Outcome variables PILOT and CONTROL provider patients PRE intervention

Outcome	Overall Pre n= 50	Pilot Provider n= 18	Control Provider n=32	P Value
	Mean (SD)	Mean (SD)	Mean (SD)	.0741
Days from Discharge to Readmission	18 (8.8)	12.0 (12.9)	20.6 (7.9)	
Days from Discharge to OP Visit	14 (17.9)	18.1 (22.4)	11.0 (14.6)	.2388
Outcome	Overall Pre	Pilot Provider	Control Provider	P Value
	n (%)	n (%)	n (%)	
ED Visit Post Discharge	15 (30.0)	6 (33.3)	10 (31.3)	.8795
Readmission within 30 Days	17 (34.0)	6 (33.3)	11 (34.4)	.9405
Clinic Visit within ≤ 7 days	27 (54.0)	8 (44.4)	19 (59.4)	.3093

4.2 Post Intervention Data

Pilot data was comprised of N=87 GI medical oncology patients who were discharged from the inpatient setting between November 1, 2022 and January 31st, 2023. The overall sample size was 87, which is 74% higher than the comparative historic data. Table 8 provides the descriptive statistics comparing patients who were seen by pilot (n=26) and control (n=61) providers in the post pilot time period. On average, patients seen by a pilot provider were 2.7 years younger (p=0.34). They had a higher percentage of Asian (13.9% higher) and Hispanic

(6.2% higher), and a lower percentage of Black or African American (7.6% lower), however this did not reach statistical significance (p=0.7949). These patients had 6.2% a lower percentage identify their primary language as English, and 12.1% higher percentage identify their primary language as Spanish (p=0.3049). Pilot provider patients were more likely to be in active treatment, but this was not statistically significant (p=1.0). Their payor mix consisted of a 14.1% higher percentage of commercial payors and a 7.3% lower percentage of Medicare (p=0.2734). Lastly, all of the pilot provider patients were discharged to home, whereas 91.8% of the control provider patients were (p=0.5200).

Table 8. Demographics and characteristics of PILOT and CONTROL provider patients POST intervention

Characteristic	Overall Post n= 87	Pilot Provider n= 26	Control Provider n=61	P Value
	Mean (SD)	Mean (SD)	Mean (SD)	
Age	62.2 (12.0)	60.3 (11.0)	63.0 (12.4)	0.34
	n (%)	n (%)	n (%)	
Male	54 (62.1)	16 (61.5)	38 (62.3)	0.9469
Race				0.7949
Asian	11 (12.6)	4 (15.4)	7 (11.5)	
Black or African American	8 (9.2)	1 (3.9)	7 (11.5)	
Hispanic/ Hispanic Latino	23 (26.4)	8 (30.8)	15 (24.6)	
Other	11 (12.6)	3 (11.5)	8 (13.1)	
White	34 (39.1)	10 (38.5)	24 (39.3)	
Primary Language				0.3049
English	64 (73.6)	18 (69.2)	46 (75.4)	
Other	7 (8.1)	1 (3.9)	6 (9.8)	
Spanish	16 (18.4)	7 (26.9)	9 (14.8)	
Active Treatment	72 (82.8)	22 (84.6)	50 (82.0)	1.0
Payor				0.2734
Commercial	55 (63.2)	19 (73.1)	36 (59.0)	
Medicaid	0 (0)	0 (0)	0 (0)	
Medicare	28 (32.2)	7 (27.0)	21 (34.4)	
Other	4 (4.6)	0 (0)	4 (6.6)	
Initial Discharge Destination				0.5200
Home	82 (94.3)	26 (100.0)	56 (91.8)	
Hospice	1 (1.1)	0 (0)	1 (1.6)	

Other	1 (1.1)	0 (0)	1 (1.6)
Skilled Nursing Facility	3 (3.4)	0 (0)	3 (4.9)

Table 9 below shows continuous and categorical variables post pilot for pilot and control providers. Figures 3 and 4 graphically show the comparative results. During the pilot period, the pilot providers had fewer days from discharge to readmission (p=0.8899). They had 10 days less days between discharge and first follow up appointment compared to the control providers (p=0.0003). The average number of days from discharge to first follow up appointment was 6.1 days for pilot providers compared to 13.9 days for control providers (p=0.0157). This result was statistically significant. For pilot providers, patients with ED visit post discharge was 3.9 % higher than the control providers (p=.6919) and readmission within 30 days was 2% higher (p=.9280). Pilot providers had a 20.5% higher rate of optimal clinic days (≤ 7 days) compared to pilot providers (p=.0739).

Table 9. Outcome variables PILOT and CONTROL provider patients POST intervention

Outcome	Overall Post n= 87	Pilot Provider n= 26	Control Provider n=61	P Value
	Mean (SD)	Mean (SD)	Mean (SD)	
Days from Discharge to Readmission	14.0 (9.0)	13.6 (8.3)	14.6 (9.6)	0.8899
Days from Discharge to OP Visit	12 (12.9)	6.1 (4.3)	13.9 (14.7)	0.0157
Outcome	Overall Post	Pilot Provider	Control Provider	P Value
	n (%)	n (%)	n (%)	
ED Visit Post Discharge	21 (24.1)	7 (26.9)	14 (23.0)	0.6919
Readmission within 30 Days	24 (27.6)	7 (26.9)	17 (27.9)	0.9280
Clinic Visit within ≤ 7 days	51 (58.6)	19 (73.0)	32 (52.5)	0.0739

4.3 Pre vs. Post Intervention Results

In total, the pre versus post intervention data for pilot and control providers was comprised of N=137. Pre versus post intervention data for pilot providers only was comprised of N=44. Comparative analysis was run on patients seen by provider type pre and post intervention. Univariate analysis results are displayed in Table 10 below. Table 10 provides the descriptive statistics comparing patients who were seen by pilot providers pre and post intervention. There were no significant differences is any of the descriptive characteristics (age, sex, race, primary language, active treatment, payor, discharge destination). The populations remained relatively consistent and therefore do not show an impact to the outcomes of the operational intervention.

Table 10. Demographics and characteristics of PILOT provider patients PRE and POST

Characteristic	Overall n= 44	Pre n= 18	Post n= 26	P Value
	Mean (SD)	Mean (SD)	Mean (SD)	
Age	58.8 (11.8)	56.6 (12.9)	60.3 (11.0)	0.3181
	n (%)	n (%)	n (%)	
Male	26 (59.1)	10 (55.6)	16 (61.5)	0.6915
Race				0.4770
Asian	9 (20.4)	5 (27.8)	4 (15.4)	
Black or African American	2 (4.6)	1 (5.6)	1 (3.9)	
Hispanic/ Hispanic Latino	15 (34.1)	7 (38.9)	8 (30.8)	
Other	3 (6.8)	0 (0.0)	3 (11.5)	
White	15 (34.1)	5 (27.8)	10 (38.5)	
Primary Language				0.1526
English	29 (65.9)	11 (61.1)	18 (69.2)	
Other	5 (11.4)	4 (22.2)	1 (3.9)	
Spanish	10 (22.7)	3 (16.7)	7 (26.9)	
Active Treatment	39 (88.6)	17 (94.4)	22 (84.6)	0.6337
Payor				0.1701
Commercial	29 (65.9)	10 (55.6)	19 (73.1)	
Medicaid	2 (4.5)	2 (11.11)	0 (0)	
Medicare	13 (29.6)	6 (33.3)	7 (27.0)	
Other	0 (0)	0 (0)	0 (0)	
Initial Discharge Destination				1.0
Home	44 (100.0)	18 (100.0)	26 (100.0)	
Hospice	0 (0)	0 (0)	0 (0)	
Other	0 (0)	0 (0)	0 (0)	
Skilled Nursing Facility	0 (0)	0 (0)	0 (0)	

Pre versus post intervention data for control providers only was comprised of N=93. Comparative analysis was run on patients seen by provider type pre and post intervention. Univariate analysis results are displayed in Table 11 below. Table 11 provides the descriptive statistics comparing patients who were seen by control providers pre and post intervention. There were no significant differences is any of the descriptive characteristics (age, sex, race, primary language, active treatment, payor, discharge destination). The populations remained relatively consistent and therefore do not show an impact to the outcomes of the operational intervention.

Table 11. Demographics and characteristics of CONTROL provider patients PRE and POST

Characteristic		Overall	Pre	Post	P Value
		n= 93	n= 32	n= 61	
		Mean (SD)	Mean (SD)	Mean (SD)	
Age		62.1 (13.2)	64.9 (15.7)	63.0 (12.4)	0.3692
		n (%)	n (%)	n (%)	
Male		56 (60.2)	18 (56.3)	38 (62.3)	0.5715
Race					0.9008
	Asian	11 (11.8)	4 (12.5)	7 (11.5)	
	Black or African American	11 (11.8)	4 (12.5)	7 (11.5)	
	Hispanic/ Hispanic Latino	23 (24.7)	8 (25.0)	15 (24.6)	
	Other	10 (10.8)	2 (6.3)	8 (13.1)	
	White	38 (40.9)	14 (43.8)	24 (39.3)	
Primary Language					0.6559
	English	72 (77.4)	26 (81.3)	46 (75.4)	
	Other	7 (7.5)	1 (3.1)	6 (9.8)	
	Spanish	14 (15.1)	5 (15.6)	9 (14.8)	
Active Treatment		75 (80.6)	25 (78.1)	50 (82.0)	
Payor					0.4377
	Commercial	49 (52.7)	13 (40.6)	36 (59.0)	
	Medicaid	4 (4.3)	4 (12.5)	0 (0)	
	Medicare	36 (38.7)	15 (46.9)	21 (34.4)	
	Other	4 (4.3)	0 (0)	4 (6.6)	
Initial Discharge Destination					0.6372
	Home	85 (91.4)	29 (90.6)	56 (91.8)	
	Hospice	1 (1.1)	0 (0)	1 (1.6)	
	Other	1 (1.1)	0 (0)	1 (1.6)	

Table 12 shows continuous and categorical variables for pilot providers pre and post. Table 13 shows continuous and categorical variables for control providers pre and post. Figures 3 and 4 graphically show the comparative results. Pilot providers showed a 6.4% reduction in both ED utilization and readmission post discharge. All patients admit route was determined to be via the ED. There was a slight increase in the days between discharge and days to readmission (1.6 days longer). The number of days between discharge and first outpatient clinic visit decreased by 12 days, with an average length of 6.1 days. Lastly, the percentage of clinic days optimal (7 days or less) increased by 28.6%. A statistically significant value was found for the difference between days from discharge to first follow up appointment (p= 0.0384). No other values were considered statistically significant. Results show that both aims were achieved with the implementation of the operational intervention. The time to outpatient follow-up appointment for GI medical oncology patients was reduced, unplanned readmissions was reduced, and ED utilization was reduced.

Table 12 Outcome variables PILOT providers PRE and POST intervention

Outcome	Overall Pilot n= 44	Pilot Pre n= 18	Pilot Post n=26	P Value
	Mean (SD)	Mean (SD)	Mean (SD)	
Days from Discharge to Readmission	12.8 (7.9)	12.0 (12.9)	13.6 (8.3)	0.0097
Days from Discharge to OP Visit	11.0 (15.6)	18.1 (22.4)	6.1 (4.3)	0.0128
Outcome	Overall Pilot	Pilot Pre	Pilot Post	P Value
	n (%)	n (%)	n (%)	
ED Visit Post Discharge	13 (29.5)	6 (33.3)	7 (26.9)	0.6468
Readmission within 30 Days	13 (29.5)	6 (33.3)	7 (26.9)	0.6468
Clinic Visit within ≤ 7 Days	27 (61.4)	8 (44.4)	19 (73.0)	0.0551

Table 13. Outcome variables CONTROL providers PRE and POST intervention				
Outcome	Overall Control n= 93	Control Pre n= 32	Control Post n=61	P Value
	Mean (SD)	Mean (SD)	Mean (SD)	0.7797
Days from Discharge to Readmission	16.9 (9.3)	20.5 (7.94)	14.6 (9.6)	0.1157
Days from Discharge to OP Visit	12.9 (14.6)	11.0 (14.6)	13.9 (14.7)	0.2559
Outcome	Overall Control	Control Pre	Control Post	P Value
	n (%)	n (%)	n (%)	
ED Visit Post Discharge	24 (25.8)	10 (31.3)	14 (23.0)	0.6468
Readmission within 30 Days	28 (30.1)	11 (34.4)	17 (27.9)	0.6468
Clinic Visit within ≤ 7 Days	59 (63.4)	19 (59.4)	32 (52.5)	0.0551

Hypothesis results are as follows:

Hypothesis 1: In this instance we reject the null hypothesis in favor of the alternative. There is a statistically significant difference between mean days to outpatient follow-up pre v. post operational intervention for pilot provider patients.

Hypothesis 2: In this instance we are not able to reject the null hypothesis in favor of the alternative. There is not a statistically significant difference between ED utilization pre v. post operational intervention for pilot providers patients.

Hypothesis 3: In this instance we are not able to reject the null hypothesis in favor of the alternative. There is not a statistically significant difference between readmission rates pre v. post operational intervention for pilot provider patients.

Figure 3. Pre and post pilot proportion of patients with an ED visit post discharge and readmission within 30 days

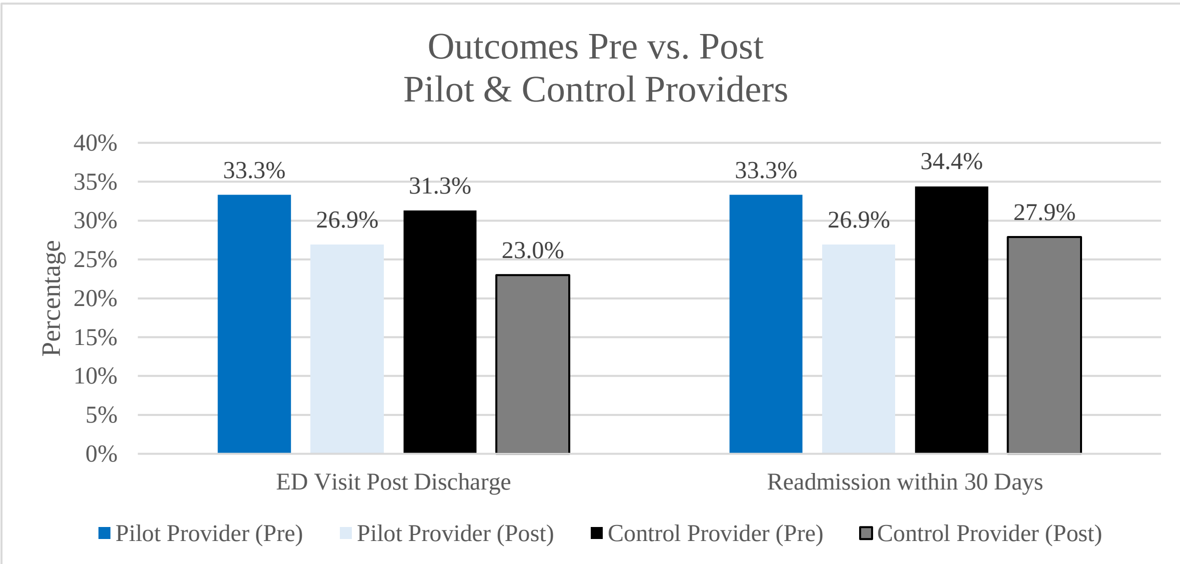
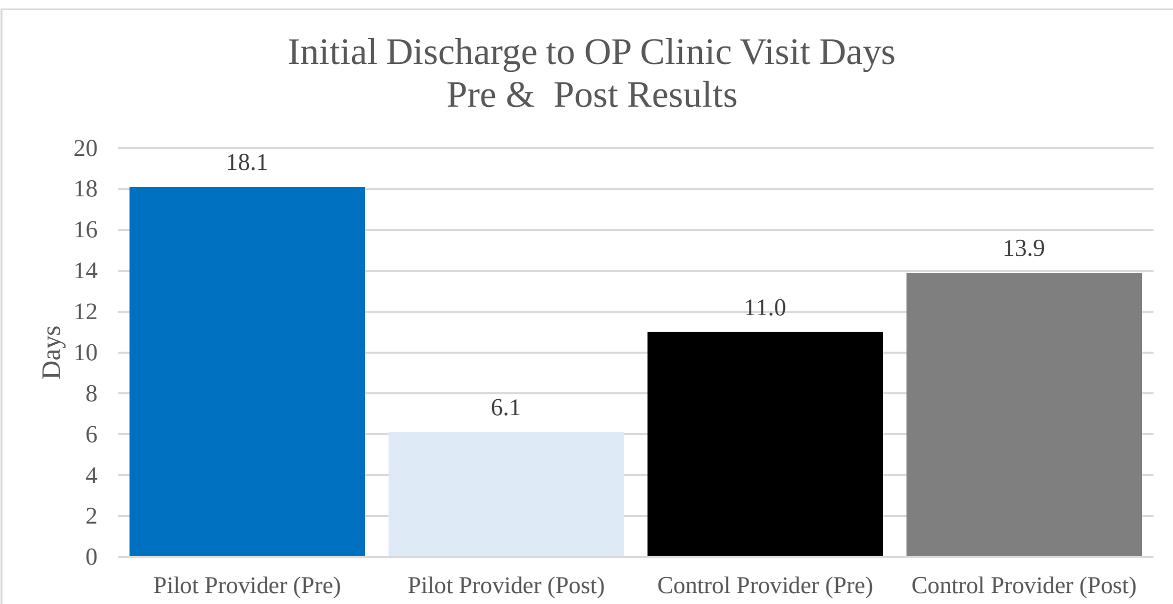


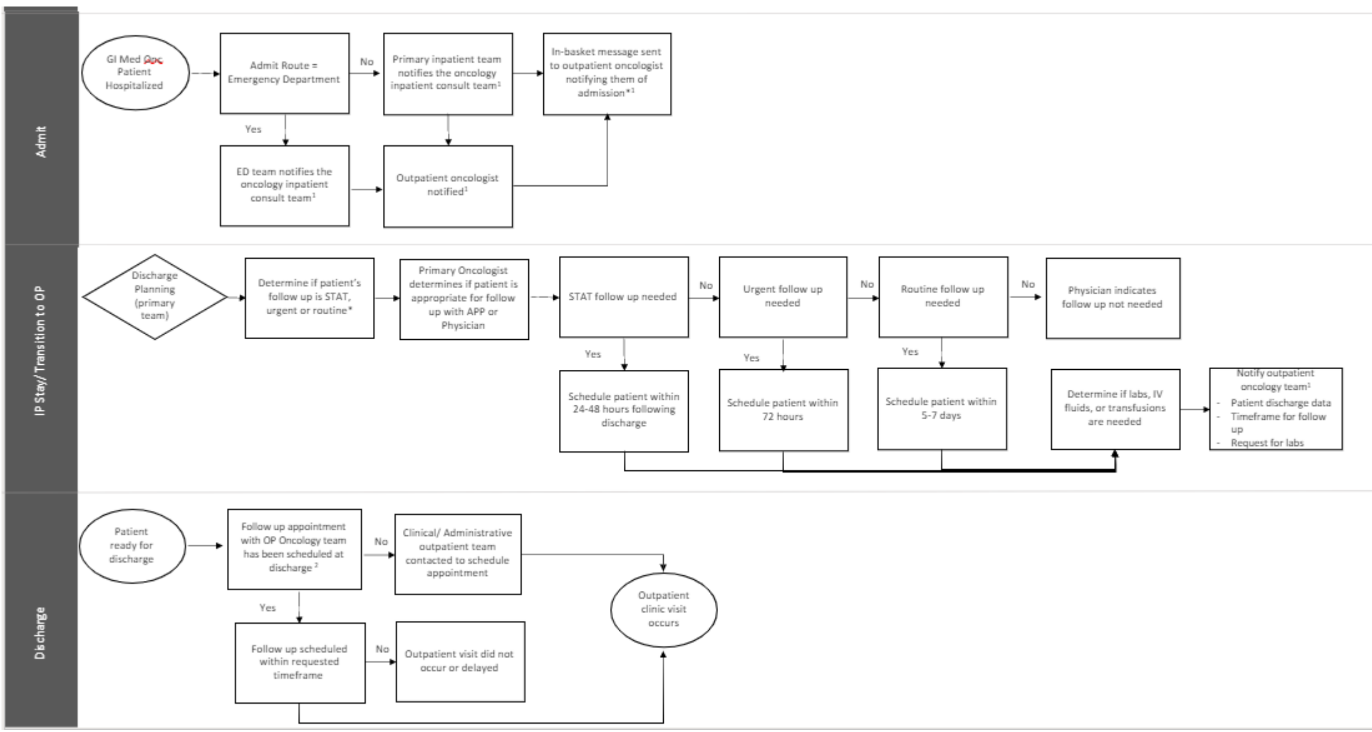
Figure 4. Pre and post pilot mean days from discharge for pilot and control providers.



4.4 Updated Workflow Post Pilot

In addition to the primary intervention of protecting APP time to increase access and decrease time to first follow up appointment, an updated workflow was created to streamline this process. The workflow was continuously modified throughout the pilot based on feedback from the pilot team. The result of this process is shown in Figure 5. Changes to the pre-pilot workflow include; identification of person(s) responsible to carry out actions, optimal messaging forum, indication of urgency for appointment needed (STAT, urgent, routine), specification on allowable amount of time to schedule patient for follow up (24-48 hours, 72 hours, 5-7 days), and process for notification of outpatient oncology team.

Figure 5. Updated transitions of care workflow: GI Medical Oncology



5 CHAPTER V DISCUSSION

5.1 Discussion of Results

ToC between the IP and OP setting is crucial element in providing quality care. Gaps in care during this vulnerable time often result in negative patient outcomes. This is especially true for patients seen at AMC's, as they frequently treat patients with multiple complex conditions and comorbidities, which is associated with greater challenges. Oncology patients have high rates of readmission and ED utilization, requiring timely and efficient ToC. Historically, there has been little research conducted on oncology specific ToC at AMC's, especially when narrowing to medical oncology and gastrointestinal oncology. The Donabedian model of quality improvement has been applied for decades to frame the interrelationship between health systems structures and processes as it relates to quality outcomes. Furthermore, this model has been used to establish effective operational interventions for ToC in the past. As such, this model was deemed appropriate in the implementation of the operational intervention that was conducted.

Similar studies found in the literature review support the need for assessing an operational intervention such as the one conducted in this study. As noted in the retrospective study conducted by Veenstra et. al. (2015), there are substantial differences in patients treated by a medical oncologist at AMCs vs. non-AMCs. The Donabedian model, which is used by entities such as the Joint Commission and the National Quality Forum, has shown that improvements in the structure of care delivery leads to improvements in clinical processes and patient outcomes. This was emphasized in the Moore et. al (2015) study which observed significant correlations between structure, process, and outcomes as it pertained to reducing readmissions, mortality, length of stay, and complications. An additional study using the Donabedian model showed that this framework can be used to help providers to refine the process of health service delivery, utilization, and follow-up care for those at higher risk for ED use and hospitalization (Bryant, 2015).

There are numerous publications on readmissions and ED utilization for oncology patients which highlight the need to reduce these numbers. Brooks (2014) reported readmission rates for patients with cancer discharged from the IP setting to be as high as 27% with more than half of those being as a result to cancer-related symptoms, and a quarter resulting from complications related to their active treatment. In the Epstein (2015) study, it was found that 22% of GI medical oncology patients at AMC's are readmitted within 30 days. Comparatively, the readmission rate for the overall pre-intervention group studied in this research was 34% (see Table 7). This is higher than nearly all of the studies conducted on readmissions for oncology patients in the literature review. ED utilization was also found to be extremely high in oncology patients, which was supported by the Panattoni (2018) cohort study that evaluated ED utilization for patients under active treatment. That study found that 50% of patients with a primary cancer diagnosis had an ED visit within 6 months of diagnosis. Comparatively, in the overall pre-intervention group ED utilization within 30 days post discharge was 30% (see Table 7). It would be logical to assume this number would be significantly higher if expanded to ED visit within 6 months. With these high numbers of readmissions and ED utilization, effective and efficient ToC has been proven to be essential. This is supported by the 2018 study by Rider et. al., emphasizing that the transition between the ED and outpatient care settings is a highly vulnerable time for patients. All of these studies supported the need to interweave the concepts and develop an operational intervention at an AMC that used the Donabedian model to decrease readmissions and ED utilization through improved ToC.

Initial results from this retrospective pre-post comparative study indicate that by reducing the number of days between discharge and follow up appointment through the implementation of an APP discharge clinic and improved workflows, readmissions and ED utilization also decrease. Demographics and characteristics of the patient populations for both control and pilot providers pre and post intervention were generally comparable and did not yield statistically significant results. The majority of the outcome variables for both pilot and control providers pre and post intervention also did not yield statistically significant results with the exception of the days from initial discharge to OP clinic visit which did. While many of the outcome variables did not present with statistically significant findings, this is likely due to the relatively low sample size. All outcome variables post intervention showed a promising improvement compared to the historic data for the providers who participated in the operational intervention. It is recommended that this pilot initiative continues for a longer period of time, allowing for a larger sample size and an anticipated statistical significance to be reached.

5.2 Limitations

The following limitations were present in this study. First, the study looked at all reasons for readmission and ED utilization for the identified patient population. This made it challenging to determine if these visits were linked to the patient's cancer diagnosis or an alternative underlying condition. Manual scrubbing of the data was needed to parse out the patients who were readmitted for a reason unrelated to their cancer diagnosis. The inclusion of all diagnosis also made it challenging to determine if the visit could have been potentially preventable. Second, the demographics of patients in this study were all relatively similar (age, race, sex, payor, language and active treatment). In many studies these are considered risk factors and serve as predictors for readmissions and ED utilization. Third, by not including comorbidities, a significant risk factor was missing. Comorbidities are associated with worse health outcomes and more complex clinical management (Valderas, 2009), and thus is likely to impact readmission rates and ED utilization. Fourth, the workflow that was identified is not sustainable without the addition of a dedicated discharge coordinator. As the pilot continues, and eventually expands beyond the pilot providers, the ability to manage the coordination of patient's transitions of care will become too great for the medical oncology team to absorb. In order to sustain progress, a new position must be created. Fifth, the population size was too small to produce many statistically significant outcomes. Lastly, the APPs that served the pilot providers also serve the control providers. It is possible that the improved processes implemented in the pilot also impacted the control providers due to this.

5.3 Future Research

Next steps in the research process include the continuation of the operational intervention in order to obtain a larger sample size and further demonstrate statistically significant results. Additionally, the expansion of the operational intervention beyond pilot providers to the entire GI Med Onc team should occur. In order to do this, the AMC is recommended to invest in a dedicated discharge coordinator to oversee the transitions of care from the IP to OP setting. Once significant quality and process improvements have been realized within this group, it is recommended that the intervention be expanded to other oncology disease teams.

Further research should also look at the potentially preventable readmissions and ED utilization for patients actively receiving systemic treatment (chemotherapy). This is part of the CMS OP 35 metric which measure calculates two mutually exclusive outcomes (qualitynet.cms.gov, 2023):

- One or more inpatient admissions for anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, or sepsis within 30 days of chemotherapy treatment.
- One or more ED visits for any of the same 10 diagnoses within 30 days of chemotherapy treatment.

With the medical oncology teams serving a high number of patients receiving chemotherapy (over 90% on average), this CMS measure is particularly of interest when it comes to reducing readmissions and ED utilization.

Further research should also consider potential implications for the Enhancing Oncology Model (EOM) proposed by CMS. According to CMS (2023) "The Enhancing Oncology Model (EOM) aims to drive transformation and improve care coordination in oncology care by preserving and enhancing the quality of care furnished to beneficiaries undergoing treatment for cancer while reducing program spending under Medicare fee-for-service." This is currently a 5-year voluntary model, beginning on July 1, 2023. Transitions of care for oncology patients ties in with this model as it aims to improve coordination of care across all of a cancer patient's health care providers, which includes the bi-directional IP to OP and OP to IP transitions..

5.4 Conclusions

Preliminary results indicate that reducing the length of time between discharge from the IP setting and first follow up appointment with a patient's oncology team reduced readmissions and ED utilization. This study has shown that one way of reducing these numbers is to apply the Donabedian model to operational interventions aimed at quality improvement. This kind of quality improvement is important not only for improving patient's care, but also to unburden health systems who are experiencing high ED volumes and bed shortages. Literature has shown that oncology patients have high rates of ED utilization and readmissions, especially at AMCs. Expanding this initiative beyond GI Med Onc to other disease teams is likely to provide similar results and further decrease inpatient and ED volumes. While the readmission rate for this pilot group is still above the national average for cancer patients, the operational intervention has moved the needle in the right direction.

6 Appendix

Figure 3. Request/ Approval of Organizational Property Use

Requestor's Name & Title:	Delaney L. Serfling, MAS, Director, Program Planning & Development
Organization Name:	[redacted]
Organization Address:	[redacted]
Authorizing Individual's Name & Title:	[redacted]
Authorizing Individual's Email:	[redacted]
Authorizing Individual's Phone:	[redacted]
Course Name & (Semester Hours):	DHA-990 Doctoral Project (9)
Title of Doctoral Project:	A Quality Improvement Initiative to Reduce Readmissions and Emergency Department Utilization for Oncology Patients
Anticipated Semester of Completion:	Spring, 2023
Brief Description of Project (250 words):	See below
This project focuses on a quality improvement initiative aimed at decreasing the length of time between inpatient discharge and first follow up appointment for gastrointestinal medical oncology patients actively undergoing systemic treatments (chemotherapy). The implementation of an APP discharge clinic will be used as the QI intervention, and internal EPIC data will be needed to conduct a pre/ post assessment. This information will be de-identified and the [redacted] name will not be named in the paper. The organization will be referred to simply as an "Academic Medical Center" or "AMC".	
Requested Information:	
☒ Quantitative Data	

Data Description and date range: EPIC data collected on medical oncology patients actively under treatment for chemotherapy will be assessed pre/ post. Date ranges should include August of 2021 through May of 2023. ☐ Qualitative Data Data Description and date range: ☒ Organizational Policies and Procedures Data Description and date range: There will potentially be an update to internal policies/ procedures for the APP discharge clinic. As such, existing organizational policies and updated policies may be referred to. This would cover currently active policies as of 8.29.2022 and potential updates through 5.31.2022.
Plans for dissemination and publication: As part of Doctoral Project requirements for MUSC. No further dissemination or publication

7 References

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