Improving Wait Times in the Infusion Center for Head and Neck Cancer

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Abstract

Problem: Head and neck cancer accounts for only 4% of all cancers in the United States but utilizes significant health care costs and resources due to prevalent treatment side effects and complications. Most patient appointments are lengthy due to the process of laboratory evaluation, clinic visit, and chemoradiation occurring on the same day. The wait time at one infusion center is one of the six lowest Press Ganey Hospital Consumer Assessment of Healthcare Providers and Systems survey scores. Purpose: A quality improvement project was conducted to reduce infusion center wait times for head and neck cancer patients undergoing concurrent chemoradiation by 50%. Methods: A multidisciplinary team approach including brainstorming sessions, fishbone diagrams, chart audits, time studies, process mapping, and run chart monitoring was used to identify factors contributing to delays and to strategize improvement interventions. The Oncology Nursing Society/American Society of Clinical Oncology 2016 Chemotherapy Administration Safety Standards served as evidence for the practice changes. Interventions included advanced laboratory evaluation and clinic visits, prior verification of laboratory studies and orders, communication with patients, and advanced chemotherapy preparation. The project outcome measure was time from patient check-in to initiation of chemotherapy. Results: The mean check-in to initiation of chemotherapy decreased from 3 hours 36 minutes (n=14) to 1 hour 45 minutes (n=57) demonstrating a 51% reduction in wait-time. Conclusions: This work is consistent with previous research that shows reduced wait times are achieved by scheduling clinic visits and laboratory evaluation prior to the treatment date and preparing chemotherapy in advance.

Improving Wait Times in the Infusion Center for Head and Neck Cancer

In the field of Oncology care, treatment time is highly sensitive and delays are a key driver of poor oncologic outcomes associated with tumor progression and upstaging (Graboyes, et al., 2019). Delays are seen in infusion centers across the nation; nationally, an average of 18% of infusion times are used for active treatment while most of the remaining 82% is used waiting for chemotherapy preparation, waiting for pretreatment medications to work, locating a second independent chemotherapy checker, and communication between nurses and providers (Association of Community Cancer Centers, 2015). One of the biggest challenges faced at the infusion center of interest is the delay in treatment due to extensive wait times. Wait times in this infusion center were reported to be one the six lowest scored Press Ganey Hospital Consumer Assessment of Healthcare Providers and Systems survey (HCAHPs).

Prior to this initiative, the practice at the project site began with patient check in for a same day laboratory appointment and chemotherapy treatment. The patient waited for the laboratory studies to return, followed by an oncology provider's evaluation and medical clearance for treatment. Once cleared, the treatment nurse ensured that the patient's laboratory results were within treatment parameters. If so, the nurse released the chemotherapy order from the Beacon order set; Beacon is Epic's medical oncology module which allows providers to manage chemotherapy by creating treatment plans and supportive care regimens based on standard oncology protocols. The release of the order set alerted the pharmacist to review the orders, laboratory results, correctness of the chemotherapy order, and then make the chemotherapy. If everything went as scheduled, a patient appointment lasted approximately three hours (figure 1a). The majority of the time the process did not go as expected and the patient experienced a delay in treatment and prolonged wait time (figure 1b). The most common contributor to delay was laboratory processing and abnormal results in need of correction. The purpose of this DNP project was to implement the evidence-based practice change using the Oncology Nursing Society (ONS)/American Society of Clinical Oncology (ASCO) 2016 Chemotherapy Administration Safety Standards (Figure 2a, 2b). The anticipated outcomes included a 50% reduction in infusion center wait times, increased adherence to weekly chemotherapy treatments, and decreased drug waste.

Evidence Review

The need for improved wait times in the infusion center, with emphasis on changes to the work-flow process was the focus of this evidence review. The review highlights important aspects communication with patients, through pre-appointment telephone calls, and between all staff members in the cancer center with the use of electronic health records (EHR). It also highlights the importance of changing the schedule of appointments for laboratory evaluation, provider visits, cancer treatments, and the preparation of chemotherapy by pharmacy in advance of patient appointments. The review of evidence showed that the combination of real-time, direct communication and changes to the existing work-flow process, reduce wait times in the infusion center for patients with head and neck cancer.

Kallen et al. (2012) conducted a randomized controlled trial at six ambulatory treatment centers of the MD Anderson Cancer Center incorporating three intervention strategies, all related to communication, to promote efficiency and timeliness and determined that decreased wait times were achieved from check-in to treatment with improved communication. Neuss et al. (2016) conducted a systematic literature review, along with interviews with expert opinions, to update the ONS/ASCO Chemotherapy Administration Safety Standards, originally established in 2009. Recommendations regarding time interval for regimen-specific laboratory tests were made to help hospitals create policies that are based on evidence and national guidelines when available. Chemotherapy preparation was recommended to be completed by specially trained pharmacy staff, and can be made in advance to improve efficiency, with administration completed by licensed nurses. ONS recommended increased use of integrated oncology-focused EHR systems for chemotherapy ordering, verifying, preparing, administering, and documenting.

Plourde et al. (2020) conducted a quality improvement (QI) project to decrease outpatient infusion clinic wait times by at least 20% using the Model for Improvement, QI tools, and Plan-Do-Study-Act cycles. A “fast-track” clinic signaled for those patients, who had laboratory tests drawn prior to arrival, to have priority for vital sign collection and earlier notification to pharmacy to begin preparing medications. This intervention decreased the average wait time by 21 minutes, a 23% decrease. Wait times for patients requiring same day laboratory tests as treatment did not change significantly.

Soh et al. (2014) also conducted a QI project to decrease outpatient infusion wait time using the Plan-Do-Study-Act cycles focusing on a new workflow that centered around pre-preparation of chemotherapy and effective patient telephone triaging prior to arrival. Average wait time for chemotherapy was significantly improved by 66% from 65.7 (median, 60; range, 5 to 301) to 22.4 minutes (median, 20; range, 0 to 80 minutes; $P < .001$). Not only did this intervention decrease wait times, there additionally were no drug wastages reported during this period(Table 1 and Table 2).

Evidence demonstrated frequent delays in execution resulted in delays in patient treatment, increased hospital costs, and patient and staff frustration and dissatisfaction. The revision of the ONS/ASCO 2016 Chemotherapy Administration Safety Standards suggest that individual hospitals can determine the appropriate time interval for laboratory testing, and some chemotherapy can be made in advance to improve efficiency. Prior studies, as noted above, showed that decreasing wait times, through implementation of several different interventions, all improved patient experience and wait times.

Theoretical Framework

Theory of Reasoned Action (Fishbein & Ajzen,1975) is a cognitive theory that offers a conceptual framework for understanding the relationship between attitudes and behaviors of humans by examining the underlying motivation to perform an action (Figure 3). The concept of positive regard for the change was cultivated among the stakeholders by engaging administration and the head and oncology providers early on to gain buy-in. Strong project champions helped motivate staff to accept and adhere to the new workflow. Expectations of all cancer center staff remained the same regarding their job functions; only the workflow changed. The majority of the data collection, education, and auditing were conducted by the DNP project lead to minimize interruptions. Through this positive behavior and group norm it was expected that the stakeholders would develop an intention to perform the new workflow.

Conceptual Framework of Complex Innovation Implementation (Helfich, 2007) reflects values, policies, practices, and champions, which impacts effectiveness, which in turn loops back to impact climate (Figure 4). Determinants of policies and practices were managed through support and availability of financial resources. Strong buy-in from individuals from every department was essential to be successful as the cancer center relies entirely on a multidisciplinary model. To achieve this, baseline data was collected and presented to show recent delays. Champions were identified based on interest and motivation to change the existing workflow. Financially, the goal was to only use the available resources without accruing additional cost. Successful implementation served as a positive feedback loop, and gaps in implementation effectiveness were monitored and adjustments were made (including changes in appointment days to prevent weekend phone calls).

Methods

This QI project was implemented over 12 weeks in a 35-chair outpatient oncology infusion center in a large academic medical center. All patients ages 18 and older with head and neck cancer receiving weekly concurrent chemoradiation were included. All patients were screened for eligibility, educated on the new treatment flow, and their Beacon protocols were changed on the day of chemotherapy consent. A total of 62 staff members and 53 patients in the cancer center were directly impacted by the project through education and changes in treatment flow (Figure A2).

A multidisciplinary team approach was taken to strategize an intervention that would best meet the needs of the patient without affecting safety or increasing cost of care. When underperforming HCAHPs scores were published, a Press Ganey Work Group was assembled to identify causes and solutions. Through brainstorm sessions, fishbone diagrams, chart audits, time studies, process mapping, and run chart monitoring, contributing factors to delays were identified. Theory of Reasoned Action and Conceptual Framework of Complex Innovation Implementation frameworks were used to guide the practice change beginning with staff education regarding the new practice change using the ONS/ASCO 2016 Chemotherapy Administration Safety Standards. Members involved in the project initiative included physicians, nurse practitioners, a nurse coordinator, schedulers, infusion charge nurse, a nurse champion in the infusion center, a pharmacy champion, and a Chemotherapy Order Review Expert (CORE) champion. Chemotherapy Order Review Experts are designated registered nurses who are responsible for reviewing chemotherapy orders and associated consents, laboratory testing, and ensuring everything is within treatment parameters. Staff education on the new treatment flow was completed by the DNP PL via in-person and virtual sessions with a sign in sheet for tracking attendance (Figure A2).

Once the physician consented a patient for concurrent chemotherapy and placed the initial Beacon orders, the nurse coordinator was notified to complete the patient education and the DNP PL was notified to modify the Beacon order set. Patient education regarding the new workflow by the nurse coordinator was conducted during the initial chemotherapy education day (Figure A1). The changes in Beacon order set included unlinking appointments for laboratory testing and clinic provider visit, to be scheduled for Fridays, from patient treatment day appointment, to be scheduled for Mondays or Tuesdays. The order set also added a hydration day to the Friday appointment, which allowed for patients to have their laboratory tests and chemotherapy orders reviewed by the physician, CORE, and pharmacy to begin advance preparation of chemotherapy. The hydration day allowed for correction of any abnormal laboratory values.

All patients were contacted by telephone on Sundays or Mondays for any symptoms of concern using a prechemotherapy symptom checklist, by either the DNP PL or CORE. If all safety and clearance requirements were met, pharmacy was notified via phone call and email, and advance chemotherapy preparations were completed for infusion treatment. A completed documentation of the prechemotherapy symptom checklist was filed in the patient’s chart as a telephone encounter. The pharmacy champion oversaw the advance chemotherapy preparation. On the day of treatment, patients who were confirmed for treatment were marked by the charge nurse on a master patient list, so the assigned infusion nurses were aware of the advance chemotherapy preparation. Communication of this was also noted by pharmacy in Epic. The infusion nurse champion facilitated in assigning patients to available infusion chairs upon patient arrival and assisted as the chemotherapy independent second checker.

The process measure of interest for the project was the full adherence to all workflow changes and was measured by weekly chart audits and documented as percentages (Figure A3, A4, A5). The outcome measure of interest for the project was total time from patient check-in to initiation of chemotherapy and was measured by weekly chart audits and analyzed using a run chart (Figure B). To protect human subjects and data confidentiality, all access and recording of data, storage, and retrieval was conducted by the DNP PL. Access to the electronic medical charts was through a secure, remote access, with multifactor authentication. All project data was stored in a One Drive that required log-in to remote access. The patients' names were initially written only as initials with their corresponding medical record numbers; however, every week the initials and MRNs were replaced by numbers in numeric order based on date and time of treatment.

Results

The results of the education sessions revealed that all 62 eligible staff members were educated regarding the new workflow associated with the project (6 clinic staff, 6 CORE, 20 infusion RN, 6 medical assistant/scheduler, 8 pharmacy, and 12 phlebotomy). Providing flexible times was key to achieving 100% staff education on the new treatment process. Implementation of a standardized education for every patient, by the nurse coordinator, on the same day as the patient chemotherapy consent, enabled 100% patient education.

All eligible patients for the project were included. Beacon orders were successfully adjusted for 98% (56/57) of patients and 91% (52/57) had laboratory testing completed in advance (Figure A1, A3). Chemotherapy was made in advance for 51/57 patients, 89% of the time. The mean time from check-in to initiation of chemotherapy at the end of the project was 1 hour 45 minutes compared to 3 hours 36 minutes prior to the project. The average wait time was decreased by 51% except for weeks 1 and 5 of the project. There was no evidence of a sustained shift in the data or runs outside of expected but there was a positive downward trend at the onset of the project suggesting special cause variation.

The results indicate that successful changes were made to structures and processes as planned to achieve the outcome goal. Key interventions associated with success were understanding the needs of the patients and staff, gaining strong buy-in from stakeholders, providing sufficient education, motivation, and support during the project implementation through strong project champions.

Advanced laboratory testing was a challenge encountered during the project due to patient preference and scheduling conflict/issues. This barrier was resolved by coordinating with the radiation oncology for patients to have laboratory testing completed in the cancer center, followed by radiation treatment while waiting for laboratory results. The patient would the return to the clinic for their medical evaluation and treatment to resolve any laboratory abnormalities such as dehydration.

One instance occurred when a patient's Beacon order was not adjusted to the new workflow due to miscommunication of which radiation treatment this patient would undergo. This was an isolated incident and was addressed during the multidisciplinary rounds between medical, radiation, and surgical oncology. Six patients did not have chemotherapy made in advance, and 5 of these patients had laboratory results outside of treatment parameters. The remaining patient cancelled the treatment appointment; therefore, chemotherapy was rightfully not made in advance.

Discussion

Prior to the QI project implementation, wait times in the infusion center for head/neck oncology patients were heavily influenced by laboratory results, as abnormalities would require time-consuming correction and delay the chemotherapy preparation and infusion. Advance laboratory testing prior to the day of treatment allowed a window of time in advance of the scheduled infusion appointment to correct abnormalities, which resulted in fewer delays on the day of treatment. This finding is consistent with findings by Plourde et al. (2020). Changes to the infusion workflow, including adjustments to Beacon orders, hydration therapy in advance, and advance chemotherapy preparation were all consequential changes that reduce chemotherapy wait times, as noted by Soh et al. (2014). While cost and safety were a consideration with advanced preparation of chemotherapy, the practice is recognized by ASCO/ONS Chemotherapy Administration Safety Standards as safe and efficacious which was also the finding in this project.

Factors that accounted for differences between observed and anticipated outcomes included staffing shortages and limitations on Beacon order changes. Because of staffing shortages, infusion nurses were unable to bring patients back into the infusion center promptly after the patients' arrival without staff to initiate and provide care. Despite the staffing barrier, the outcome goal was still achieved suggesting that delays are more attributable to other factors such the added time need to correct laboratory abnormalities and the waiting time associated with the pharmacy preparation of the chemotherapy.

One persistent issue throughout the project centered around the prechemotherapy phone calls made to patients on the weekends to evaluate their status and readiness to come into the clinic. Limited staffing and budget constraints made this tactic less than feasible to be conducted on the weekends and was changed to an assessment completed when the patient was in the clinical for their pre-appointment laboratory evaluation. While this was more feasible, it posed the possibility that patients would become symptomatic between the time of their laboratory appointment and infusion appointment three days later. It was permissible to make manual changes to Beacon orders for each patient; however, a system wide permanent change was denied. This created tedious work for the DNP PL who had to manually unlink orders or create a hydration therapy plan for each patient.

A factor that might have limited internal validity is the small and specific sample size. Selection of patients with head and neck cancer undergoing concurrent chemoradiation may have created bias in the success of the QI implementation as they are already required to come to radiation oncology to complete daily radiation. Another limitation was the inability to permanently change Beacon order sets, an imprecision in the project design, but creating hydration therapy plans with laboratory orders correctly dated for each week minimized the overall work for providers and infusion nurses. Measurement of wait times using check-in to start of chemotherapy was an imprecision in the project design because it is a broad finding. Despite the decrease in overall wait times, additional measurements, such as time of when patient was seated in the infusion chair, when pre-medications were administered, and time between first independent chemotherapy checker and second independent chemotherapy checker may have established delays in wait times within the infusion center.

Regarding the special cause variation, there was a positive downward trend consistent with intervention success and statistically meaningful change. With multiple processes being changed at once, even when one of the process changes [advance laboratory testing, oncology clinic visit, and hydration treatment, advance preparation of chemotherapy, and prechemotherapy symptom checklist phone call] was not completed, the implementation continued to improve overall wait times. The implementation requires all aspects of the process changes to decrease wait times and reduce drug wastage; however, individual changes may be implemented with positive outcomes. This may be recommended for sites seeking changes with less change burden.

Conclusion

This project demonstrated that a coordinated change in workflow in an organization for a highly specialized population, without requiring significant changes in job responsibilities, can favorably impact how an infusion center functions. This initiative demonstrated that advance evaluation and preparation are both feasible and effective to improve quality of care delivered and patient outcomes. This is significant because for patients with head and neck cancer - who are especially vulnerable to abnormal laboratory values due to cancer and treatment related dysphagia - electrolytes, renal function, and other essential laboratory values must be corrected prior to clearance for chemotherapy. Many of the patients are in considerable pain from treatment side effects and prolonging the center visit only compounds their hardship. Most patients are also prescribed opioids for the side effects and rely on companions for rides. Wait times can cause inconvenience and dissatisfaction to both patients and their companions.

Future initiatives involving this population and setting should include consideration of the economic impact of the change measured in terms of finances and productivity. If one patient is occupying an infusion chair for half the time as previous, that would suggest that half of the system resources are needed to provide the same care. Reducing wait times in half also suggest that twice as many patients could be treated as the result of this project which has significant revenue implications for the organization.

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Soh, T. I. P., Tan, Y. S., Hairom, Z., Ibrahim, M., Yao, Y., Wong, Y. P., Lim, S. W., Lim, S. E., Goh, B. C., & Tan, C. S. (2014). *Improving wait times for elective chemotherapy through pre-preparation: A quality-improvement project at the national university cancer institute of Singapore.* Journal of Oncology Practice, 11(2), e89-e92. 10.1200/JOP.2014.000356

Table 1.

Evidence Review Table

Citation: Kallen, M., A., Terrerll, J. A., Lewis-Patterson, P., & Hwang, J. P. (2012). *Improving wait times for chemotherapy in an outpatient clinic at a comprehensive cancer center.* Journal of Oncology Practice 8(1): e1-e7.https://ascopubs.org/doi/10.1200/JOP.2011.000281					Level II
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
"We aimed to decrease mean patient wait time from check-in to treatment in one Ambulatory Treatment Center (ATC) unit in MD Anderson by 25%"	A randomized controlled trial (RCT)	Sampling Technique: convenience Eligible: all patients with prescheduled (no finalized treatment orders) and scheduled (finalized treatment orders) who received chemotherapy treatment at the ATC Green unit Accepted: all patients who checked in for treatment and received treatment were included. Exclusion included patients who were not being treated. Control: data was collected between July 15, 2010 through August 15, 2010 on an average of 42 patients a day Intervention: data was collected between August 16, 2010 through September 17, 2010 on an average of 42 patients a day Power analysis: this study did not display confidence intervals or power analysis; however, a decrease of 25% would have had to been achieved in order to be considered clinically significant. Group Homogeneity: control and intervention groups were randomly selected based on pre and post intervention days. Treatment population were identical in terms of the range of chemotherapies being	Control: current scheduling model using TETRIS with interspersed chemotherapy timing, dual signature chemotherapy signing, and using Omninote to communicate with pharmacy once patients are physically seated in a treatment room. Intervention: a three-part plan to reduce wait time: increase process efficiency within ATC Green, enhance communications with MD Anderson clinics and centers, and incorporate information technology applications. Intervention fidelity: the intervention was based on feedback from staff regarding most important areas of change to reduce overall patient wait time for chemotherapy. The three intervention strategies include: 1) increasing appointment process efficiency within the ATC by Short-treatment-duration patients were to a quick-turnaround area in another ATC unit to increase the general processing speed of all appointments and decrease overall wait time; 2) enhancing communications between clinics and ATC by having patient service coordinators directly page GI medical oncologists whose patient treatment orders had not been fully signed; 3) employing an information technology-based communications application in the pharmacy by implementing a pharmacy whiteboard, an electronic communications tool to alert pharmacy staff when a patient	DV: the dependent variable was reduced wait time in ATC. The independent variables included creating a separate treatment space for short treatments, having direct communication with oncologists regarding incomplete orders, and an electronic communication tool for pharmacy. Measurement tool (reliability), time, procedure: the dependent variable was measured by time. A combination of the three interventions were all considered when determining the overall decrease.	Statistical Procedures(s) and Results: The control and intervention data were collected over one month and it was calculated that a 15% decrease was noted for prescheduled appointments (89.2 *v* 104.7 minutes) and a 29% decrease in the mean wait time for patients with scheduled appointments (48.9 *v* 69.1 minutes). Overall, there was an observed 26.8% reduction in patient wait time for chemotherapy in the ATC Green Unit (53.3 *v* 72.7 minutes), which exceeded the 25% reduction in overall patient wait time determined to be clinically significant. Innovative Solution: currently the infusion center has a fast track that treats short treatment patients and service coordinators (and infusion nurses) can directly contact oncologists. The innovation will be having an electronic communication board to signal pharmacy when a patient checks in so that chemotherapy can be made and ready by the time

		administered each day.	had arrived in an ATC unit and was seeking treatment in real time.		patient is seated for treatment.
Citation: Neuss, M. N., Gilmore. T. R., Belderson K. M., Billett, A. L., Conti-Kalchik, T., Harvey, B. E., Hendricks, C., LeFebvre, K., B., Mangu, P. B., McNiff, K., Olsen, M., Schulmeister, L., Von Gehr, A., & Polovich, M. (2016). *2016 Updated American society of clinical oncology/oncology nursing society chemotherapy administration safety standards, including standards for pediatric oncology.* Journal of Oncology Practice 12(12): 1262-1271. https://ascopubs.org/doi/10.1200/JOP.2016.017905					Level I
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
"To update the ASCO/Oncology Nursing Society (ONS) Chemotherapy Administration Safety Standards and to highlight standards for pediatric oncology"	Systematic review of randomized controlled trials	Sampling Technique: literature review of relevant articles from MEDLINE and public comments were included to revising the 2013 guidelines. Eligible: A formal systematic review of the literature was performed by using MEDLINE. More information about the search was said to be given in the Data Supplement; however, this attachment could not be found. A total of Ninety-seven articles were used to create this updated guideline. Included/Excluded: Interventional trials of sequential rates of administration error were given first priority—that is, any reports of a series of events, including identification of errors before and after a change in practice, were included; case series that examined errors were included if they originated in settings in developed countries with more than 50 patient treatments per month—US, Canadian, European, and Australian trials were given priority; and single case reports were included if a life-threatening event occurred and the authors demonstrated that a clear cause-and-effect relationship existed. Power analysis: not applicable to SR PRISMA: not attached for review	Control: 2013 standards/protocol Intervention: 2016 standards/protocol that touches on four major topics: environment and routine procedures, treatment planning and patient education before the start of treatment, standards for ordering, preparing (including labeling), and administering chemotherapy, and monitoring adherence to, and toxicity from, chemotherapy to promote safety both while on treatment and subsequent to therapy.	DV: improved outcomes of chemotherapy administration Measurement tool (reliability), time, procedure: time and scales	Statistical Procedures(s) and Results: The standards represent minimum expectations for ordering, preparing, and administering chemotherapy. The standards were created with applicability in mind; from small practice settings to a comprehensive cancer center. Innovative solution: the standards were created to guide day-to-day practice, evaluate care delivery, and support the revision of institutional policies and procedures. Domain three, in particular, can help improve the wait times by streamlining chemotherapy preparation.

Citation: Plourde, C. L., Varnado, W. T., Gleaton, B. J., & Das, D. G. (2020). Reducing infusion clinic wait times using quality improvement. *JCO Oncology Practice, 16*(8), e807–e813. https://doi.org/10.1200/JOP.19.00643					Level IV
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
Long wait times are a common occurrence for chemotherapy infusion patients and are a source of decreased patient satisfaction. Our facility sought to decrease outpatient infusion clinic wait times by 20% using the Model for Improvement, quality improvement tools, and Plan-Do-Study-Act cycles.	Quality Improvement project to decrease outpatient infusion clinic wait times by using the Model for Improvement, quality improvement tools, and Plan-Do-Study-Act cycles.	Sampling Technique: convenience Eligible: all patients receiving chemotherapy treatment in the Birmingham Veterans Affairs Medical Center Accepted: all patients receiving chemotherapy treatment who were getting laboratory values in advance (at least one day prior); n=51 Control: data was collected between November 11, 2018 through March 18, 2019 of all patients coming in for treatment with pre-drawn laboratory tests Intervention: data was collected between March 19, 2019 through June 17, 2019 of all patients with pre-drawn laboratory tests with color coded charts (Fast Track) Power analysis: this study did not display confidence intervals or power analysis; however, a decrease of 20% wait time was the goal Group Homogeneity: control and intervention groups were the same people before and after implementation of color coded charts	Control: pre-drawn laboratory tests without color coded indicator that patients had laboratory testing Intervention: Fast Track clinic: color coded charts to notify all staff that patient has pre-drawn laboratory tests and can bypass the que for check in and notifies pharmacy to make drug	DV: improved wait times for patients in the infusion center Measurement tool (reliability), time, procedure: time	The control and intervention data were collected over six months and it was calculated that a 23% decrease was noted for patients using the fast track clinic (93 minutes vs 72 minutes), which exceeded the 20% reduction goal in overall patient wait time. Innovative Solution: currently the infusion center has a fast track that treats patients with pre-drawn laboratory tests and has established a communication method to alert all staff of patient's eligibility for fast track. The innovation will be having pharmacy make the chemotherapy in advance, prior to patient's arrival.
Citation: Soh, T. I. P., Tan, Y. S., Hairom, Z., Ibrahim, M., Yao, Y., Wong, Y. P., Lim, S. W., Lim, S. E., Goh, B. C., & Tan, C. S. (2014). *Improving wait times for elective chemotherapy through pre-preparation: A quality-improvement project at the national university cancer institute of Singapore.* Journal of Oncology Practice, 11(2), e89-e92. 10.1200/JOP.2014.000356					Level IV
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
"Cancer	A quality	Sampling Technique: convenience	Control:	DV: improved wait	Average wait time for

treatment occurs predominantly in the outpatient setting. Long wait times for chemotherapy lead to increased dissatisfaction, inefficient use of chemotherapy chairs, and compromised safety when delays result in treatment beyond operation hours. For patients who have undergone review with the necessary investigations by their oncologists on a prior day, a long wait time is more frustrating, because the sole purpose of their visit is for chemotherapy (termed elective chemotherapy)."	improvement project was implemented using Plan-Do-Study-Act cycles to reduce wait times for elective chemotherapy by preparing drugs in advance.	Eligible: all patients receiving chemotherapy treatment at the National University Cancer Institute of Singapore Accepted: all patients receiving chemotherapy treatment who had undergone review by their physicians on a separate day before their treatment Control: Baseline wait times collected over a 2-month period from September to October 2012 showed a mean wait time of 70 minutes (median, 68; range, 5 to 270 minutes). Intervention: The project was implemented March 2013, and the wait times for elective patients who followed the new workflowwere measured until September 2013. Power analysis: this study did not display confidence intervals or power analysis. The intended goal for wait time reduction was 30 minutes. Group Homogeneity: In Singapore, majority of patients are responsible for their own expenses and the government will subsidize. This study included all people, regardless of socioeconomic background. Control and intervention groups were the same people before and after implementation of the new pharmacy workflow.	Chemotherapy orders are then submitted to the pharmacy, and patients wait as the drugs are prepared. When the pharmacy receives the orders, final review and reconciliation are performed. When the chemotherapy orders are ready, patients proceed to the chemotherapy chairs and start their treatment. Intervention: Pre-preparation of medication in advance thereby reducing chemotherapy wait times.	times for patients in the infusion center from patient appointment until hanging of first drug. Secondary DV was drug wastage. Measurement tool (reliability), time, procedure: time, percentage	chemotherapy was significantly improved by 66% from 65.7 (median, 60; range, 5 to 301) to 22.4 minutes (median, 20; range, 0 to 80 minutes; *P* < .001). There were no wastages during this period. Innovative Solution: Pre-preparation of chemotherapy, together with effective phone triaging, can not only reduce chemotherapy wait time but can also reduce drug wastage.

Table 2.

Synthesis Table

Level of Evidence	# of Studies	Summary of Findings	Overall Quality
I	**1**	A systematic literature review was conducted, along with interviews with expert opinions, to update the American Society of Clinical Oncology (ASCO)/Oncology Nursing Society (ONS) Chemotherapy Administration Safety Standards, established in 2009; most recently updated in 2013. The revision of the ASCO/ONS chemotherapy safety standards include four domains that represent minimum expectations to ensure patient and staff safety when dealing with chemotherapy. These domains include 1) standards, 2) treatment planning, ordering, consenting, and education, 3) preparing and dispensing by pharmacy, and administering by nurses, and 4) monitoring chemotherapy administration, adherence, toxicity, and complications. Recommendations regarding the appropriate time interval for regimen-specific laboratory tests were made to help individual hospitals create policies that are based on evidence and national guidelines when available. Chemotherapy preparation is highly recommended to be completed by specially trained pharmacy staff, and some can be made in advance to improve efficiency, and administration be completed by licensed nurses. With technology innovations it is recommended to use integrated oncology-focused electronic health record systems for chemotherapy ordering, verifying, preparing, administering, and documenting.	The strengths of the systematic reviews include extensive literature review, innovative recommendations based on results, and applicability to the current hospital policy at University of Maryland. ASCO and ONS are the leading organizations in cancer treatment standards which makes the updated guidelines the strongest evidence for policy change.
II	**1**	A randomized controlled trial (RCT) conducted at six ambulatory treatment centers (ATC) of the MD Anderson Cancer Center determined that decreased wait times from check-in to treatment increased patient and staff satisfaction. A multifaceted plan incorporating three intervention strategies were used to promote efficiency and timeliness: 1) create an efficient process for scheduling appointments within the ATC, 2) enhance communications within the MD Anderson clinics, and 3) use of information technology-based communications application in the pharmacy. Two electronic measurement systems were used to measure patient appointment tracking and treatment time management.	The strengths of the trial include credibility (as MD Anderson is a world renown cancer center), significance of their findings in improving patient care and satisfaction and focus on efficiency and satisfaction of nursing staff.
IV	**2**	Twos quality improvement projects were conducted to decrease outpatient infusion clinic wait times. Plourde et al. (2020) achieved this by using the Model for Improvement, quality improvement tools, and Plan-Do-Study-Act cycles. A "fasttrack" clinic signaled for those patients, who had laboratory tests drawn prior to arrival, to have priority for vital sign collection and earlier notification to pharmacy to begin preparing medications. This intervention decreased the average wait time by 21 minutes, a 23% decrease. Wait times for patients requiring same day laboratory testing as treatment did not change significantly. Soh et al. (2014) used the same Plan-Do-Study-Act cycles to implement pre-preparation of chemotherapy, together with effective telephone triaging, to strategize an effective way to reduce chemotherapy wait times. Average wait time for chemotherapy was significantly improved by 66% from 65.7 (median, 60; range, 5 to 301) to 22.4 minutes (median, 20; range, 0 to 80 minutes; $P < .001$). There were no wastages during this period.	Strengths of the two quality improvement projects are the simplicity of the intervention, that did not require significant cost or resources, and its ability to sustain the decreased wait times. Regarding Soh et al. (2014), the article mentioned possibly having patients be responsible for the drug wastage to ensure commitment to treatment; however, given the circumstances of head and neck cancer, it would be difficult to implement that change.

Figure 1a.

Initial Practice Workflow

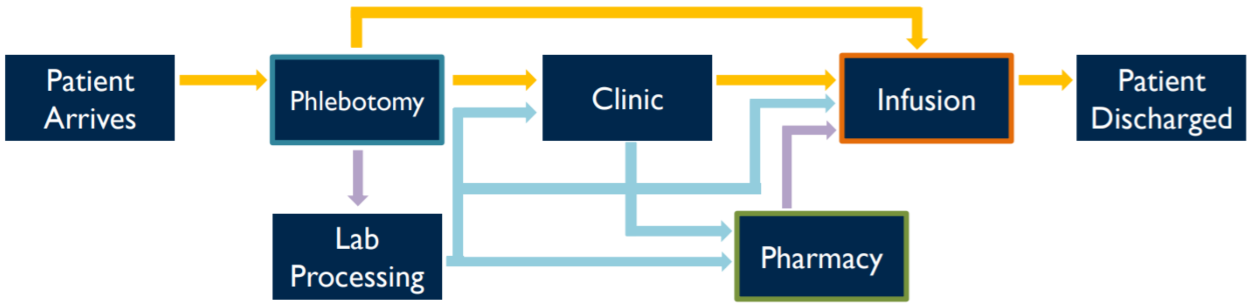


Figure 1b.

Initial Practice Workflow Areas of Possible Delays

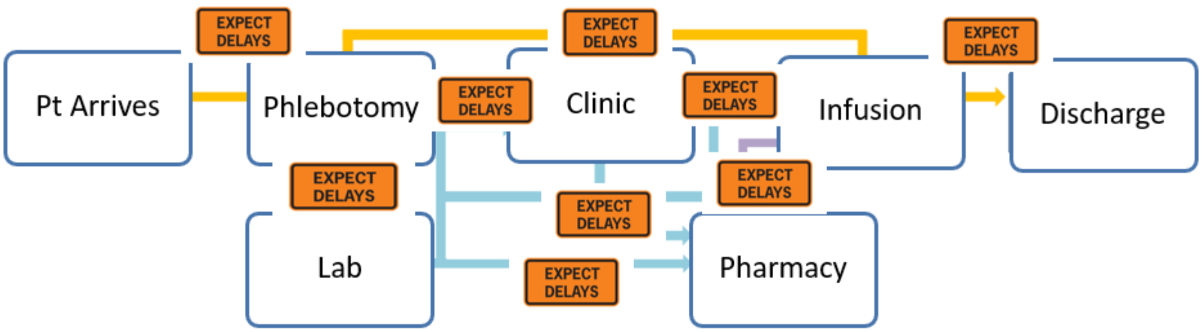


Figure 2a.

New Practice Workflow vs Previous Practice Workflow

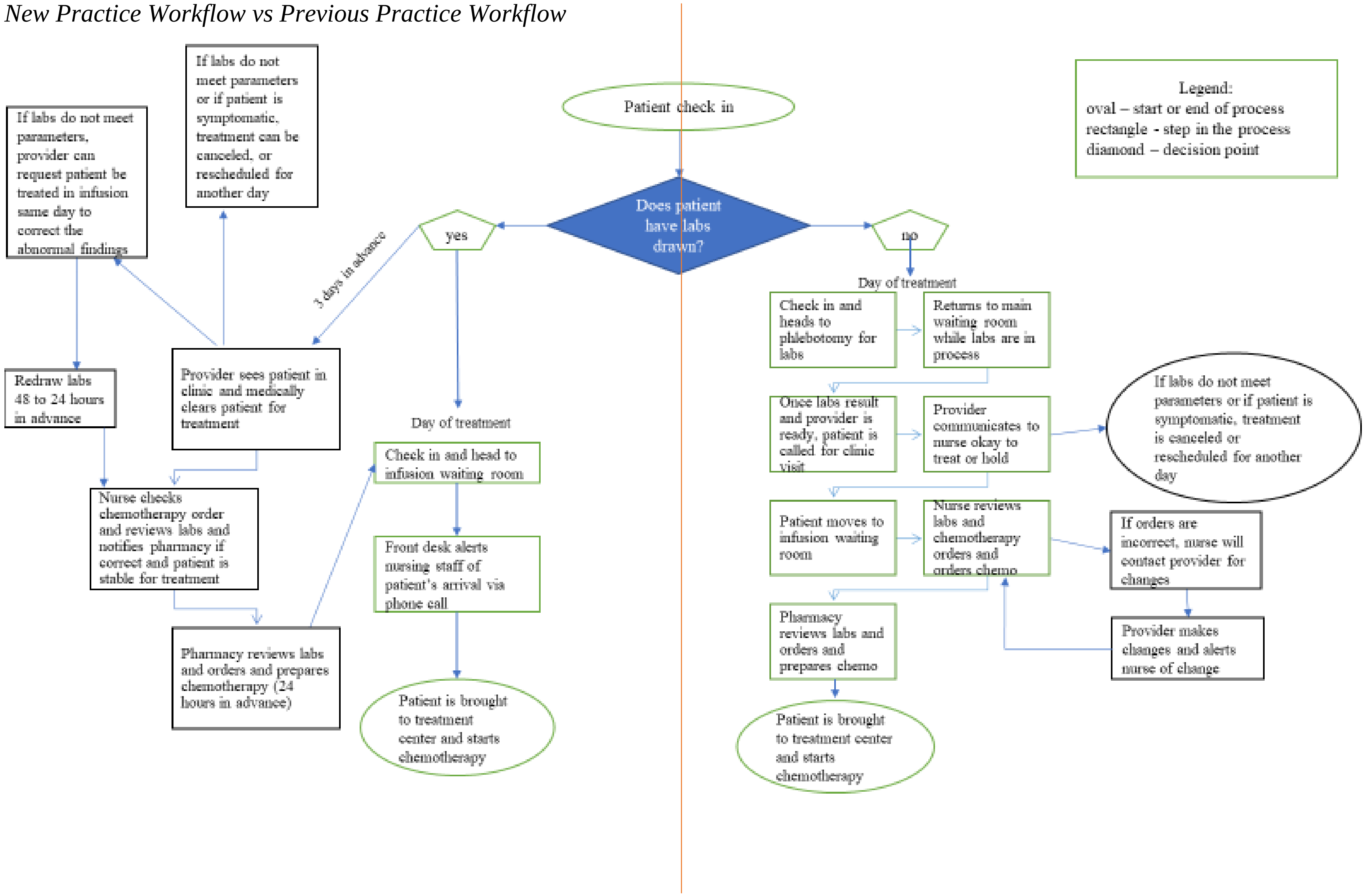


Figure 2b.

New Practice Flowsheet

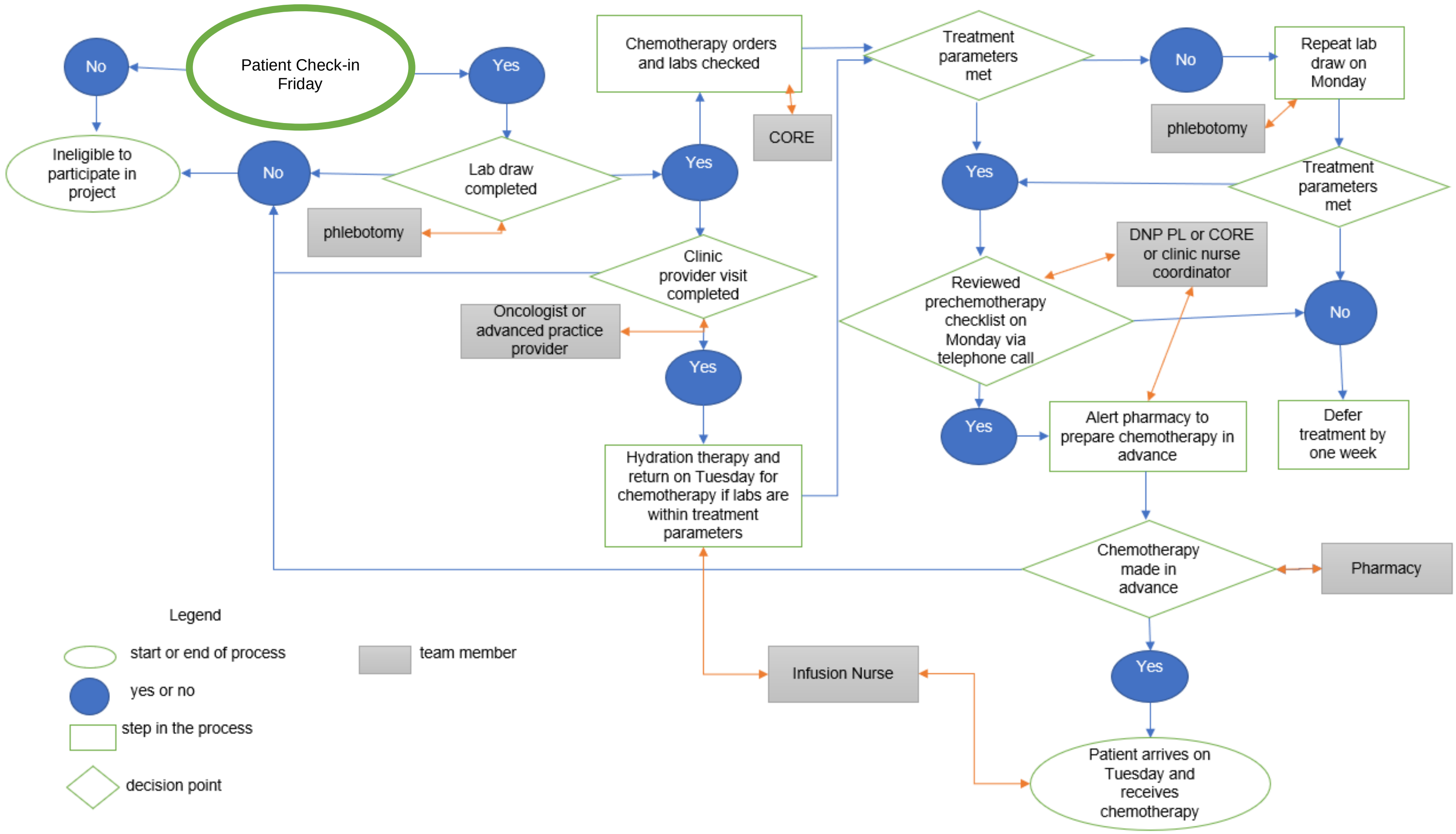


Figure 3.

Theory of Reasoned Action (TRA) by Fishbein & Ajzen (1975)

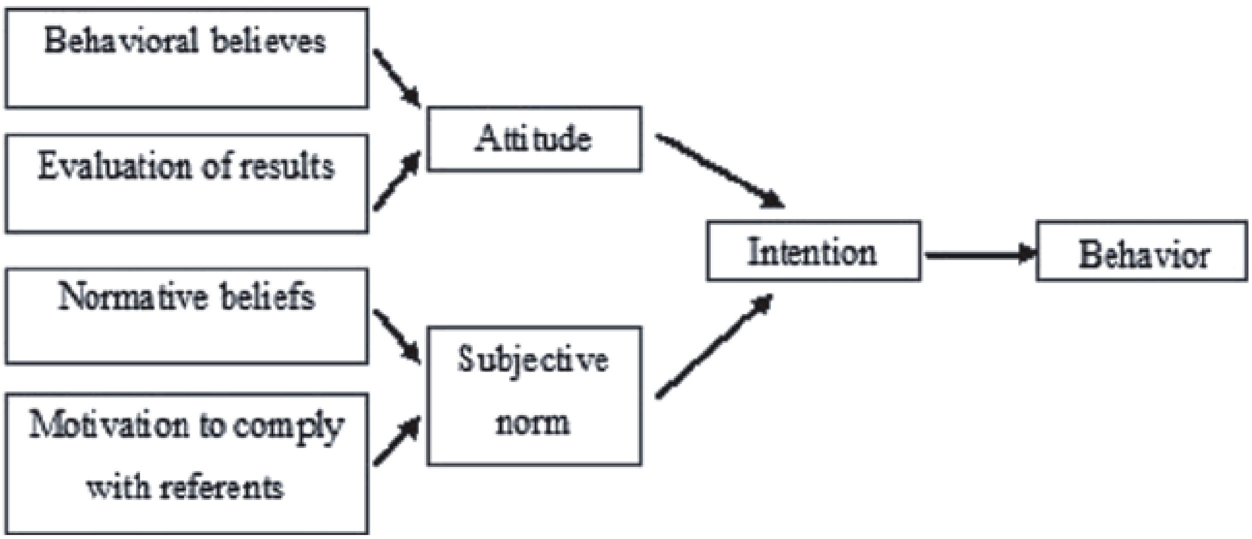


Figure 4.

Conceptual Framework of Complex Innovation Implementation

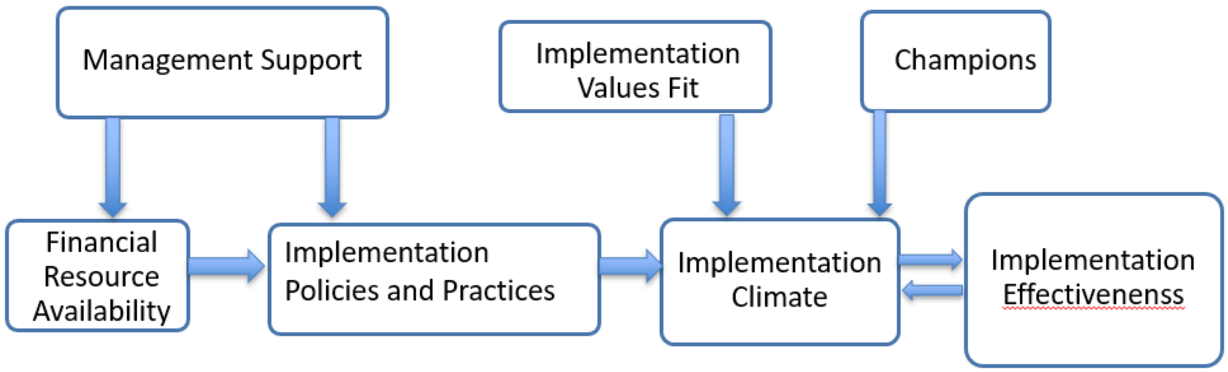


Figure A1.

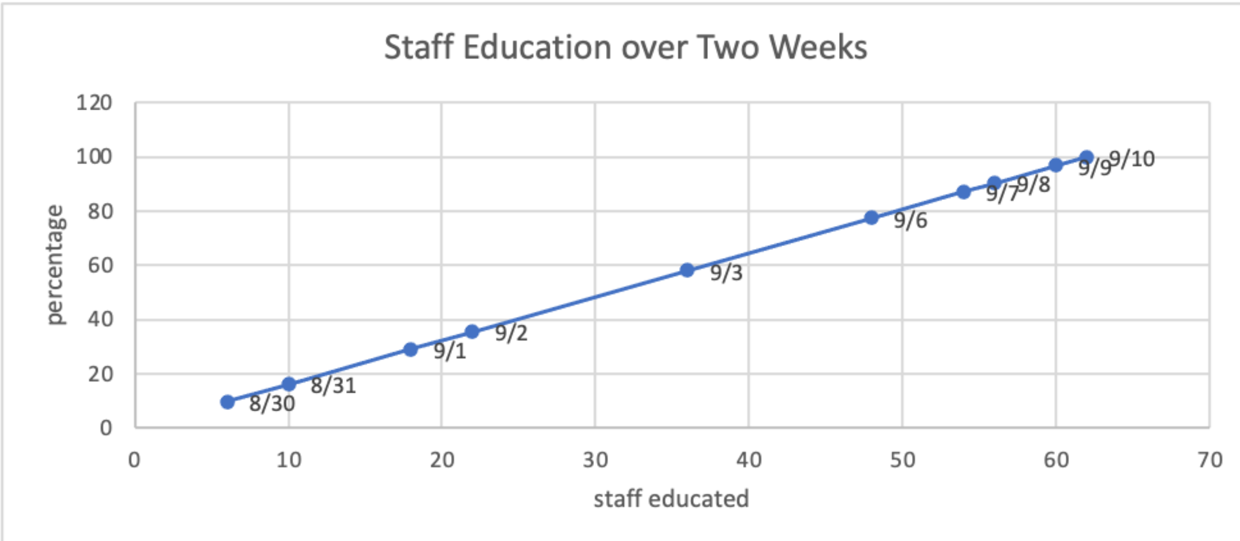
Data of Patient Enrollment, Screening, Beacon Changes, and Education Completed

Week	patients	enrollment screen	percentage screen	beacon change	percentage changed	pt ED reviewed	percentage reviewed
week 1	3	3	100	3	100	3	100
week 2	3	3	100	3	100	3	100
week 3	7	7	100	3	100	7	100
week 4	6	6	100	6	100	6	100
week 5	5	5	100	5	100	5	100
week 6	4	4	100	4	100	4	100
week 7	5	5	100	5	100	5	100
week 8	7	7	100	6	86	7	100
week 9	6	6	100	6	100	6	100
week 10	3	3	100	3	100	3	100
week 11	4	4	100	4	100	4	100
week 12	4	4	100	4	100	4	100

100% of patients were screened, 98% (56 of 57) patients had Beacon orders changed, and 100% receive education by the nurse coordinator. N=57

Figure A2.

Cancer Center Staff Education Over Two Weeks



Dates of education was from August 30 – September 10, 2021. Total staff members educated n=62; 6 clinic staff, 6 CORE, 20 infusion RN, 6 medical assistant/scheduler, 8 pharmacy, and 12 phlebotomy. 100% of staff members were educated on the new treatment process.

Figure A3.

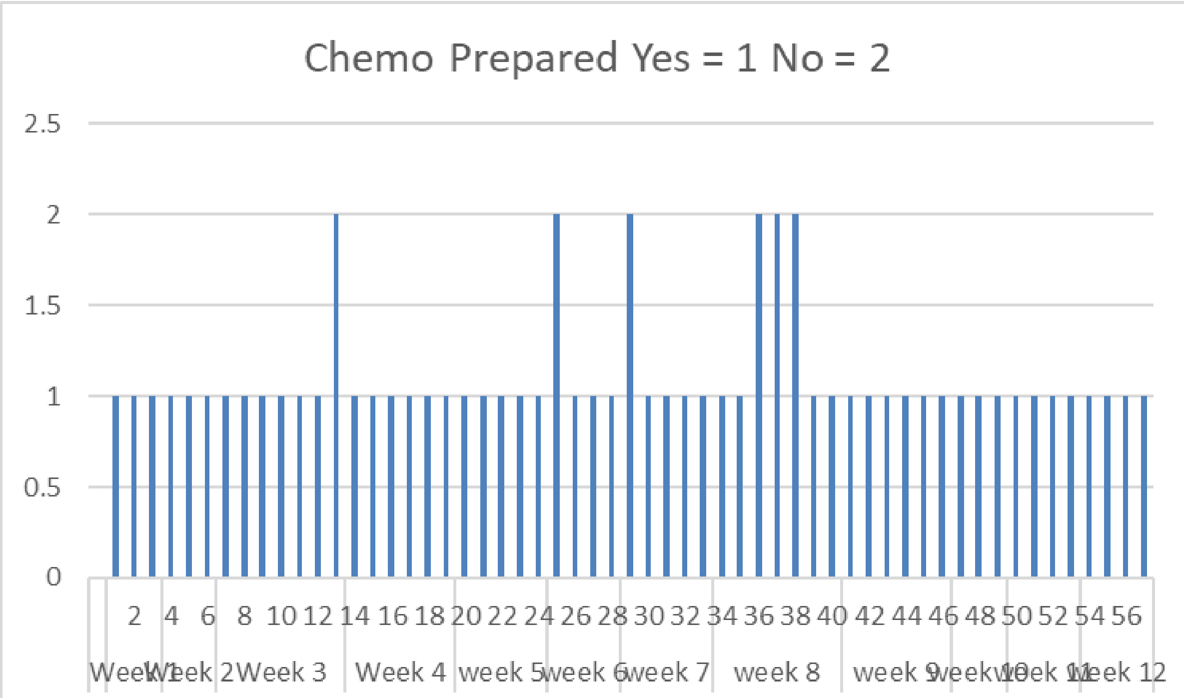
Patient Adherence to Provider Clinic Visit and Pre-Treatment Laboratory Testing

Week	patients	clinic visit	percentage seen in clinic	pre-treatment laboratory test	percentage of laboratory test
week 1	3	3	100	3	100
week 2	3	3	100	3	100
week 3	7	7	100	5	71.4
week 4	6	6	100	6	100
week 5	5	5	100	5	100
week 6	4	4	100	3	75
week 7	5	5	100	5	100
week 8	7	7	100	5	71
week 9	6	6	100	6	100
week 10	3	3	100	3	100
week 11	4	4	100	4	100
week 12	4	4	100	4	100

N=57. 52 out of 57 patients, 91%, successfully had laboratory tests drawn in advance. One of the patients had laboratory tests scheduled at an outside facility and forgot to go; another patient did not want to have laboratory tests drawn and be stuck for an intravenous catheter again on a different day; a patient was getting a mediport placed and did not want to have laboratory testing done until after that was placed; three patients did not have laboratory tests drawn due to scheduling issues.

Figure A4.

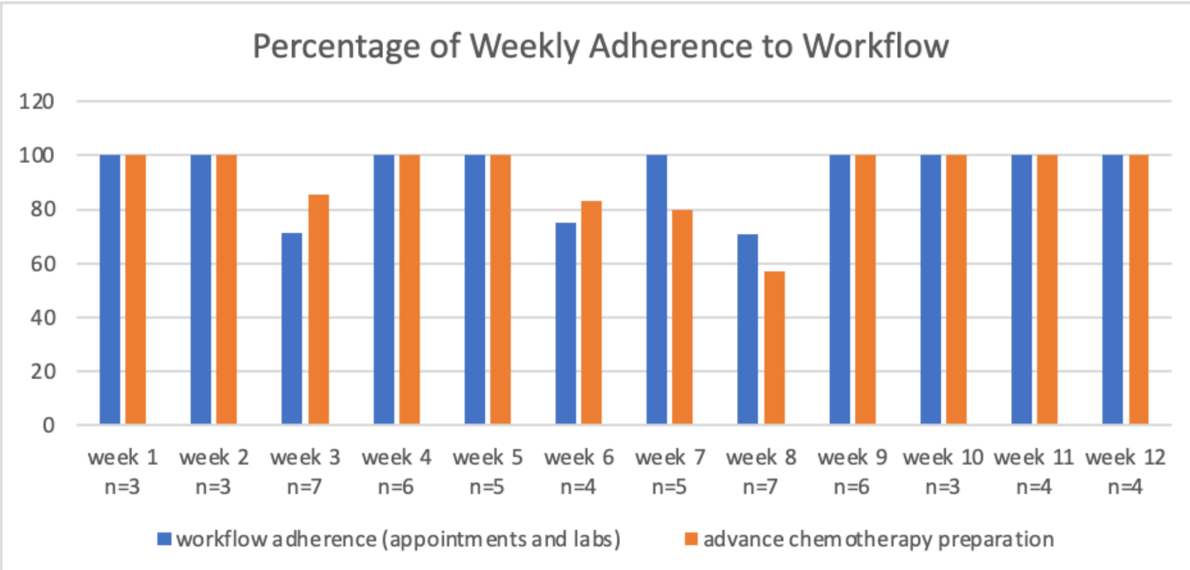
Completion of Advance Chemotherapy Preparation



N=57. 51 out of 57 patients, 89%, successfully had chemotherapy made in advance. They are directly correlated with pre-treatment laboratory testing adherence. 100% of the patients who had pre-treatment laboratory testing completed and were qualified to treat had their chemotherapy made.

Figure A5.

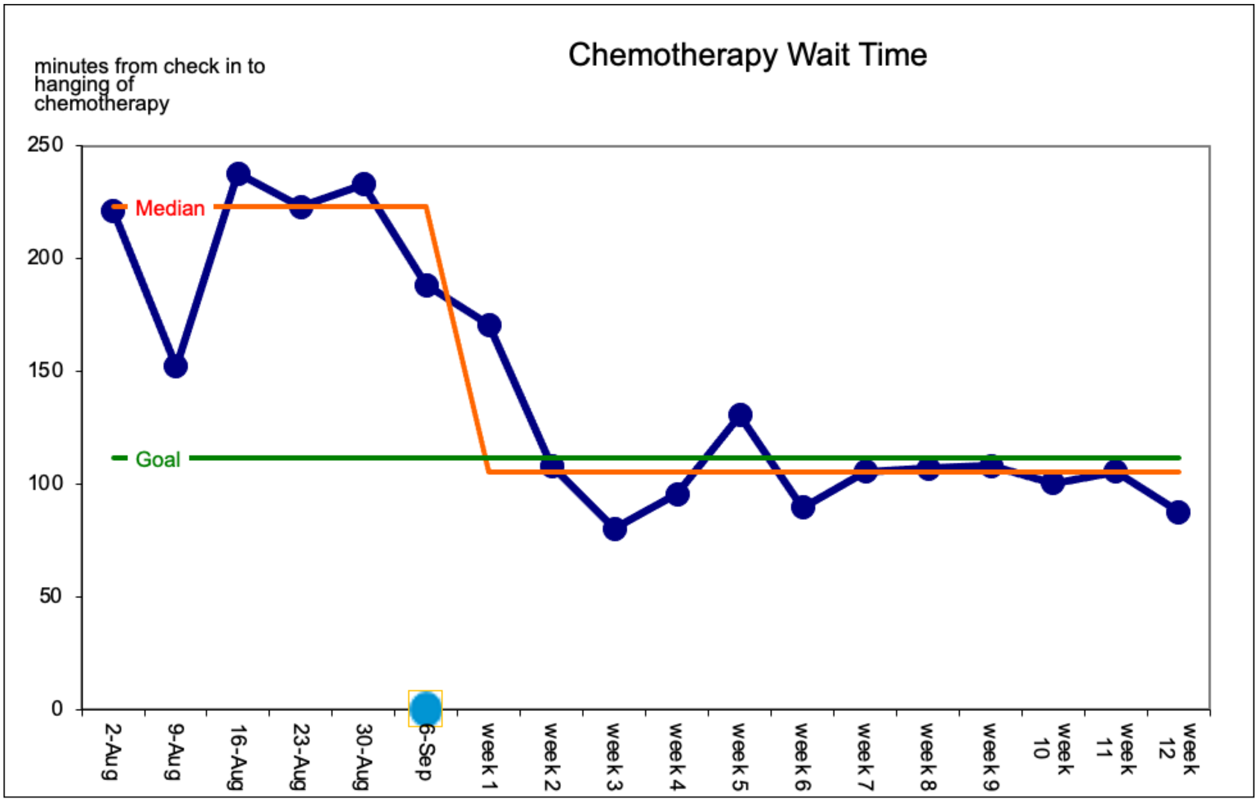
Appointments and Laboratory Testing Adherence And Adavance Chemotherapy Preparation



Combined data of figures A1, A3, and A4

Figure B.

Run Chart of Outcome Measure From Patient Check-In To Initiation of Chemotherapy



N=57; Pre-implementation wait time median in minutes was 223 minutes. Wait time median in minutes post-implementation was 105 minutes after 12 weeks.