Improving Wait Time for Chemotherapy in an Outpatient Clinic at a Comprehensive Cancer Center

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Abstract

Purpose: We conducted our study at the Ambulatory Treatment Center (ATC) of the MD Anderson Cancer Center, a network of six outpatient treatment units for patients receiving infusion therapies. Excessive patient wait time for chemotherapy was a primary source of ATC patient dissatisfaction. ATC employees expressed frustration, because often, patients arrived physically on time but were not treatment ready. Additionally, ATC staff emphasized challenges associated with obtaining finalized treatment orders for prescheduled appointments (ie, placeholder appointments without associated physician treatment orders). We aimed to decrease mean patient wait time from check-in to treatment in one ATC unit by 25%.

Methods: We studied appointment cycle time in the ATC Green Unit, stratifying appointments by type (ie, prescheduled [no finalized treatment orders] and scheduled [finalized treatment

orders]). We obtained mean wait times at baseline (control) and again after our intervention period. We conducted interviews and observations in ATC Green, from which we developed 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.

Results: After our intervention, we observed a 15% decrease in wait time for patients with prescheduled appointments and a 29% decrease for those with scheduled appointments. Overall, there was a 26.8% reduction in mean patient wait time relative to baseline (control).

Conclusion: We observed a significantly decreased mean patient wait time after implementing our intervention. This decrease may improve patient satisfaction, relieve employee frustration with appointment scheduling, and create opportunities for increasing institutional revenue.

Introduction

The Ambulatory Treatment Center (ATC) at The University of Texas MD Anderson Cancer Center comprises a network of six distinct outpatient treatment units located on the main campus of MD Anderson. Patients arrive at the ATC from 28 different clinics and specialty centers to receive infusion therapy: chemotherapy, blood products, or hydration. ATC scheduling is responsible for creating patient appointments for each of the individual ATC units, with more than 9,000 appointments scheduled each month across the six units.

In spring 2010, we learned from ATC staff that patients were expressing dissatisfaction with wait times for chemotherapy in the ATC. The following composite vignette, which is based on the experiences of one of the authors of this article while he recently received treatment in the ATC and on comments shared with him by other ATC patients, illustrates patients' typical concerns and frustrations:

"I just started chemotherapy for my cancer, and I am sick, frightened, and wonder what is coming up tomorrow. Time is precious, and waiting time is a waste. When I am on time but my appointment is late, I must wait before getting started with my treatment. Then I feel more stress, confusion, and frustration, as does my family. Long wait times make me think my medical providers do not really respect my time; I think they have more important things to do than care for me. From my point of view, I see the chemotherapy treatment process as being rather simple: I show up at the clinic and sign in, they take my vitals and move me to the treatment area, my treatment is administered, they ask if I'm experiencing any problems with

the treatment, and then I go home. Why is it that so often I must wait long past my scheduled appointment time before I can even get started with my chemotherapy? I also wonder why my medical providers just won't tell me why I have to wait. But I don't complain. At least, I don't complain to my medical providers. I think my best hope for survival lies with them, and I don't want to take the risk of offending them. So, I guess I will quietly complain to other patients, to my family and friends, and to my fellow patients—my 'neighbors'—in the waiting room."

Patient dissatisfaction with wait times is a widely reported problem; excessive appointment delay time has been identified as a primary source of overall patient appointment dissatisfaction among the general medical patient population¹⁻⁷ as well as among oncology patients.⁸⁻¹⁵ We found, in preliminary interviews with ATC employees, that staff were frustrated and dissatisfied, because patients who had arrived on time were not treatment ready—that is, for reasons beyond patients' own responsibilities, patients were not ready for their prescribed treatments to be administered, because their chemotherapy orders were not complete, their labs had not been ordered, or intravenous (IV) access was not available. In such cases, patient appointments would come to an abrupt halt.

Our preliminary interviews identified an additional, complex factor leading to patient and employee dissatisfaction with wait times: so-called prescheduled appointments. There were two types of ATC patient appointments: scheduled appointments, which had finalized physician treatment orders, and prescheduled appointments, which did not. Staff emphasized

that processing prescheduled appointments was difficult, because the process of tracking down physicians and getting them to finalize orders was time consuming.

Apart from affecting patient and employee satisfaction, long wait times in clinic may adversely affect patient adherence to scheduled appointments¹⁶⁻¹⁸ and recommended oncology treatments schedules.^{8,19-23} Long wait times can result in costly financial burdens on health care systems, exploration of which has only just begun.^{24,25}

For our study, we sought to reduce wait time for chemotherapy in the ATC and thereby increase patient and employee satisfaction. Specifically, our aim was to decrease by 25%, compared with baseline (control), the mean patient wait time for chemotherapy, defined as the time elapsed from when a patient checked into the unit until the start of treatment.

Methods

Baseline Interviews and Observations

Between July 15, 2010, and August 15, 2010, we observed patient appointment processing in the ATC Green Unit (one of six ATC units) and conducted field interviews with ATC Green patient service coordinators, charge nurses, and nurse managers.

Recording of Appointment-Related Events

For the success of our study, a critical requirement was to establish an effective electronic measurement system to support our aim of reducing wait time. We needed a system in which to accurately record all relevant time points representing actual patient appointment encounters and processing events. To build this system, we first needed to recognize and then operationalize all appointment events and subevents that could occur within a designated appointment time period.

Although alternative software solutions exist,^{26,27} we used two software applications—Clinical Appointment Resource Enterprise (CARE) and Treatment Excellence Through Resource Impact Scheduling (TETRIS)—as our primary patient appointment tracking and measurement systems. CARE is the appointment management system of MD Anderson. TETRIS, which interfaces with CARE, is the patient appointment and treatment time management system of the ATC. Developed in 2008 by the MD Anderson Department of Cancer Medicine, TETRIS provides the ATC with the ability to schedule patient appointments based on treatment acuity, staffing level, and room availability. TETRIS monitors ATC patients' appointment and treatment time experiences. It seeks to optimize appointment processing in relation to available resources while comparing appointment processing with its own theoretic model of an optimized appointment process.

For our study, enhanced TETRIS programming provided us with the ability to measure and document the time-saving effects of our interventions as they were introduced at targeted time points within patients' appointment cycles. The measurement process of our system captured occurrences of appointment events and subevents as discrete time points within

patients' appointment cycles, thereby facilitating the determination of when and why appointment delays happened. Patient appointment data collected by TETRIS were the data necessary to document the effectiveness of our interventions.

After our measurement system was established, we conducted a series of validations to confirm data integrity, meaning, and quality. Validation efforts ensured that appointment time data recorded by our measurement system reflected true patient encounter and processing times, from which wait times could be derived. Event validation also provided a clearer understanding of appointment events and subevents occurring within our defined appointment time period. The information technology members of our team were then tasked with putting in place the measurement system of our study, so patient responses (ie, appointment event and subevent encounter times) could be recorded and wait times analyzed.

Our key performance measure was patient wait time for chemotherapy, defined as the time elapsed from when a patient checked into the ATC unit until that patient's treatment started. We monitored this metric for the ATC Green Unit for each patient appointment type (ie, scheduled and prescheduled).

Development of Plan to Reduce Wait Time

On the basis of our baseline interviews with the ATC Green staff and our baseline observations of patient appointment processing in the ATC Green Unit, we delineated potential intervention strategies for reducing patient wait time for chemotherapy and rank-ordered these strategies according to their anticipated impact and feasibility of implementation (Table 1). This ranking process served as a formal evaluation of identified opportunities for improving wait time and established criteria for targeting the most significant, most feasible interventions.

We next developed a multifaceted plan to reduce overall patient wait time for chemotherapy, incorporating three intervention strategies: first, increase appointment process efficiency within the ATC; second, enhance communications with MD Anderson clinics and centers external to the ATC; and third, employ an information technology–based communications application in the pharmacy (Table 2). We chose to implement multiple interventions, because a series of changes, rather than a single change item, has been reported to be more effective in improving outcomes.¹⁹

Improving Appointment Processing Efficiency: IV Nurses and Fast-Track Nursing

Our first intervention focused on improving ATC appointment processing efficiency. One recurring ATC issue was patient IV access: First, does the patient have the right line for the planned chemotherapy? Second, is the patient's IV line accessible? ATC patient service coordinators and nursing staff believed that assigning a dedicated nurse to address IV access issues (ie, IV nurse) at the ATC unit level would produce a reduction in patient wait time. A second issue identified by ATC staff was that many quick treatments (eg, injections, short infusions, IV

Table 1. Potential Intervention Strategies

Strategy	Priority Rating*
Develop electronic checklist to validate that all appointment components are ready and treatment can proceed	108
Split treatment-ready and non-treatment-ready patients into different processing paths	103
Improve appointment processes; establish dedicated quick-turnaround areas with specific staff assignments†	100
Identify resources to preview prescheduled appointments in advance to troubleshoot issues as early as possible	100
Improve communications; identify point person in each clinic, unit, pharmacy, laboratory, or business office for patient appointment-related issues†	99
Notify pharmacy earlier in appointment process so preparation of short-stability or high-cost drugs can start earlier†	94
Implement process of reconciling actual v estimated appointment data to use in refining scheduling process	93
Reduce room cleaning time	90
Dedicate another ATC unit for managing prescheduled appointments and walk-ins	90
Reduce cycle time for completion of laboratory work	88
Have phlebotomist and dedicated nurse to address IV access issues assigned to ATC	88
Publicly display patient wait times for chemotherapy	84
Treatment ready campaign to encourage providers to complete chemotherapy orders, review labs, and secure IV access	68

Abbreviations: ATC, Ambulatory Treatment Center; IV, intravenous.

* Priority ranking score determined by rating six impact and feasibility features of each intervention on scale of 1 to 3. Seven team members rated each intervention; individual ratings could range from 6 to 18.

† Interventions selected for implementation based on priority ranking score and consultation with ATC management.

pump disconnections) were taking longer than necessary; quick-treatment patients were interspersed with patients having longer, more complicated treatments, and therefore, quick-treatment patients were not experiencing quick appointments. To address this issue, ATC patient service coordinators and nursing staff decided to direct short-treatment-duration patients to a designated quick-turnaround area in another ATC unit to increase the general processing speed of all appointments and decrease overall wait time.

We selected another ATC unit (ATC Transfusion Unit) to pilot-test these two processing-efficiency interventions. Specifically, first, an IV nurse was assigned to conduct early assessments of patient IV placement issues, identifying issues as soon

after patient check-in as possible, and second, patients with anticipated short-duration therapies were identified immediately on arrival to the ATC and channeled to designated fast-track nursing staff, who could manage therapy administration in a streamlined manner.

Improving Lines of Communication: Communications Protocol

Our second intervention was to enhance communications with MD Anderson clinics and centers, the patients of which were scheduled to receive treatment at the ATC to expedite completion of chemotherapy orders. Institutional policy states that all chemotherapy treatment orders require two signatures to be actionable: one from the ordering physician and the second from a verifier (ie, independent person checking ordered chemotherapy dose as it relates to patient's parameters). When a physician order arrives at the ATC with a missing signature, it is not actionable. From our study interviews and field observations, we learned that first, unsigned orders caused substantial appointment processing delays, and second, patient service coordinators spent considerable amounts of time tracking down responsible parties whose signatures were required to complete an order set. We therefore developed and tested a specific communications protocol with the Gastrointestinal Medical Oncology Center, a high-volume ATC user. According to this protocol, ATC patient service coordinators were to directly page GI medical oncologists whose patient treatment orders had not been fully signed. This would reduce the time ATC staff spent obtaining complete treatment orders and decrease the delay time for appointment processing.

Incorporating Information Technology Applications: The Pharmacy Whiteboard

According to institutional standard practice, the pharmacy requires notification from an ATC charge nurse via Omninode, an internal communications tool, before preparing any short-stability or high-cost medication to be administered to an ATC patient. Typically, this notification does not occur until a patient is physically situated in a treatment room. However, patients are not actually situated in a treatment room until late in the appointment process.

Our third intervention was to create and implement the pharmacy whiteboard, an electronic communications tool to alert pharmacy staff when a patient had arrived in an ATC unit

Table 2. Intervention Strategies Implemented

Category	Intervention	Description
Improving appointment processing efficiency	IV assessment	Perform early evaluation of appropriateness and accessibility of IV line
	Quick treatments	Streamline short-duration appointments
Improving lines of communication	Completion of chemotherapy orders	Directly page oncologists to ask them to sign/complete orders
Applying information technology	Pharmacy whiteboard	Provide pharmacy with early notification of patient readiness for medications

Abbreviation: IV, intravenous.

and was seeking treatment. This real-time patient arrival notification would enable the pharmacy to determine the appropriateness of preparing short-stability or high-cost medications shortly after a patient's ATC arrival rather than preparing such medications much later in the appointment cycle.

The pharmacy whiteboard is a portable communications device displaying real-time information about when a patient is having vital signs checked, determined to be ready for treatment, and beginning to receive treatment. The whiteboard displays a change in colors and emits audible sounds as patients advance through their ATC appointment cycle. With the whiteboard, the pharmacy knows precisely when patients arrive in the ATC and can therefore prepare and deliver chemotherapy medications for patients in a more timely fashion.

Intervention Period and Analysis

We started the various intervention strategies on or around August 16, 2010, and continued them through September 17, 2010. Using the ATC Green Unit as its own control in a baseline intervention design, we compared mean patient wait time for chemotherapy between the baseline (control) period (July 15, 2010, through August 15, 2010) and the intervention period. This within-unit design allowed for the control of wait time variability attributable to differing ATC unit processes, personnel, and patient mixes. There were no new institutional policies or procedural changes implemented in the ATC during the study period. A 25% decrease in mean patient wait time for chemotherapy was determined, *a priori*, to be clinically significant.

Results

Complexity of Appointment-Related Events

For an ATC patient, the process of reporting for and receiving treatment in the ATC likely seems fairly straightforward: You arrive, check in at reception, obtain an arm band, have your vital signs measured, and get placed in a treatment room. Then you meet with your nurse; treatment is initiated, proceeds, and is completed; and you are checked for any adverse occurrences. Finally, you are released to go home.

Nevertheless, although the appointment process may seem straightforward from the patient's perspective, the process is actually a complex overlay of processes and subprocesses that involve not only ATC staff but also four major additional entities: the patient's attending physician and the MD Anderson Business Center, Laboratory, and Pharmacy. The patient appointment cycle from the perspective of the ATC appointment schedulers and front-line employees is shown in the flowchart in Appendix Figure A1. This flowchart was produced as a result of multiple observations and interviews with ATC patient service coordinators and nurses. The flowchart depicts the true, multilevel complexity of ATC patient appointment cycles, with their multiple paths, decision branches, time points, and external system interfaces.

Patient Wait Times During the Baseline Period

After enhancing our measurement system to enable the accurate capture of relevant prescheduled and scheduled patient ap-

Table 3. Average Wait Times at Baseline and After Intervention Period

Appointment Type	Baseline (minutes)		Intervention (minutes)		Percent Decrease
	Mean	SD	Mean	SD	
Overall	72.7	52.1	53.3	49.1	26.8
Prescheduled	104.7	61.5	89.2	63.2	15
Scheduled	69.1	49.7	48.9	43.0	29

Abbreviation: SD, standard deviation.

pointment data, we obtained our study's baseline (control) data from the ATC Green Unit (Table 3). These data clearly documented the challenges that the ATC staff were facing in managing prescheduled patient appointments, which had previously been shared anecdotally by ATC staff. In the ATC Green Unit, the mean patient wait time ($\pm$ standard deviation) for chemotherapy at baseline was 104.7 ($\pm$ 61.5) minutes for prescheduled appointments versus 69.1 ($\pm$ 49.7) minutes for scheduled appointments. These baseline statistics were based on 1,303 ATC Green Unit appointments, of which 10.1% were prescheduled appointments. Overall mean wait time (for scheduled and prescheduled appointments analyzed together) was 72.7 ($\pm$ 52.1) minutes.

Patient Wait Times During the Intervention Period

During our intervention period, we observed a measurable reduction in the mean patient wait time for chemotherapy in the ATC Green Unit (Table 3). There was a 15% decrease in the mean wait time for patients with 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, on the basis of 1,224 intervention-period patient appointments, we observed a 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, *a priori*, to be clinically significant.

Discussion

Our study demonstrated a reduction in the ATC Green Unit mean patient wait time for chemotherapy of 26.8% relative to the baseline (control) wait time. With lower patient wait times, we anticipate that patient satisfaction will improve, current patients will likely continue to use our institution, and new patient appointments might increase. With improved patient flow through the ATC, nursing staff can be more effectively deployed, reducing overtime expenses. With improved efficiency, we expect to reduce or eliminate the need for capital investment associated with acquiring new patient treatment space.

Our results may also be interpreted in terms of cost savings, an important consideration in the expanding financial landscape of cancer care.²⁴ The reduction in patient wait time achieved in our study represents an overall average reduction of 19.5 minutes per patient appointment. Because the ATC Green

Unit serves an average of 42 patients per day, we estimate the potential net reduction in patient wait time (ie, total time saved) to be 819 minutes per day across the 42 patients. The mean total appointment time per patient is 226 minutes, or 9,492 appointment minutes over 42 patients in one day; thus, our study presents an 8.6% savings in time per day. The net reduction of 819 minutes represents time for 3.6 additional new patient appointments. On the basis of our estimated average cost for an ATC visit of \$1,092 and the total available ATC treatment days per year (excluding weekends and holidays) of 260 days, we estimate our annualized potential financial opportunity for 3.6 additional patient appointments per day exceeds \$1 million.

Our study focused on reducing ATC patient wait time and is therefore aligned with the MD Anderson Cancer Center institutional metric of “patient cycle time.” Patients are routinely asked on the institutional patient satisfaction survey if they are “likely to recommend” our institution to other potential patients. The wait time reduction metric of our study is also aligned with this institutional survey metric, because an improved patient wait time increases the likelihood patients will recommend MD Anderson.

Our study demonstrated that it was possible to decrease patient wait time in one of the six units of the ATC. We now hope to implement and study the impact of similar interventions in other ATC units. We anticipate that our path forward will involve fine-tuning current interventions and implementing them in other ATC units. We will explore new interventions previously identified but not yet implemented. We plan to institute a process control mechanism using the TETRIS appointment system for data reporting at the clinical and management levels. Finally, we would like to consolidate our success and transfer it to other clinical areas at MD Anderson that have also identified issues with patient wait time. The strategies that we implemented in this study—site-specific improvements to appointment processing, standardizing and simplifying internal and external lines of communication, and obtaining targeted information technology applications for enhancing health care teamwork coordination—should be equally likely to reduce patient wait times in nonacademic care settings.

Revenue implications are also generalizable, because saved appointment time can now become part of new appointment time for future patients.

Accepted for publication on August 3, 2011.

Acknowledgment

We thank Mark Choate, MBA, Harihara Subramanian, MBA, Bacardi Bryant, Jerry Gilbert, and Robert Joyce, MS, for their assistance with data collection and technical support; Susan C. Lackey, MPH, for her administrative support; and Stephanie Deming for editorial review. Supported in part by National Institutes of Health MD Anderson Cancer Center Support Grant No. CA016672. Presented in part at the University of Texas System Clinical Safety and Effectiveness Conference, November 5, 2010, Austin, TX.

Authors' Disclosures of Potential Conflicts of Interest

Although all authors completed the disclosure declaration, the following author(s) indicated a financial or other interest that is relevant to the subject matter under consideration in this article. Certain relationships marked with a “U” are those for which no compensation was received; those relationships marked with a “C” were compensated. For a detailed description of the disclosure categories, or for more information about ASCO's conflict of interest policy, please refer to the Author Disclosure Declaration and the Disclosures of Potential Conflicts of Interest section in Information for Contributors.

Employment or Leadership Position: None **Consultant or Advisory Role:** None **Stock Ownership:** None **Honoraria:** None **Research Funding:** None **Expert Testimony:** None **Other Remuneration:** None

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DOI: 10.1200/JOP.2011.000281

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Appendix

Figure A1. Flowchart showing the patient appointment cycle from the perspective of the Ambulatory Treatment Center (ATC) appointment schedulers and front-line employees. CARE, Clinical Appointment Resource Enterprise (main hospital management system used at MD Anderson); PSC, patient services coordinator; TETRIS, Treatment Excellence Through Resource Impact Scheduling (interfaces with CARE and is the real-time patient appointment and treatment management system used by the ATC).