

ACADEMY FOR EXCELLENCE IN HEALTHCARE

IMPACT ASSESSMENT PAPER

Improved CT Simulation and Patient Access at The James

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CardinalHealth

Improved CT Simulation and Patient Access

Making the most of a capacity-constrained process

It's not unusual in many industries for a piece of equipment to be a bottleneck. The constraints caused by machines that require a lengthy duration often can be minimized by streamlining activities that lead up to the use of the equipment and/or by performing supporting steps in parallel with the equipment run time. The objective is to reduce the duration of the end-to-end process time even though the equipment run time cannot be reduced. These situations frequently occur in healthcare as well, where access to unique, expensive equipment represents finite capacity that must be efficiently managed for the sake of patient care and for optimum return to the hospital.

At the Department of Radiation Oncology at The Arthur G. James Comprehensive Cancer Center and Richard L. Solove Research Institute (The James Radiation Oncology), CT Simulation is one such capacity constraint. In 2014, the department had 150 daily treatment visits, with a daily average of 9.5 patients per day for a CT Simulation (CT Sim). In order to keep pace with patient demand for the simulations, the department's hours of operation were extended to 9 hours per day in 2013, with patients scheduled in 60-minute CT Sim time slots. The problem was that the actual time needed for a CT Sim averaged just 43 minutes per patient — 17 minutes of activities did not necessarily add value to the overall patient-care process.

The longer-than-necessary time slots and CT Sim overtime were the result of department inefficiencies, says Tabitha Hootman, Patient Access Supervisor, which often led to unpredictable endings to the workday. A problem arising early in the day would push the schedules of subsequent patients further back through the day, adds Anthony McCabe, Senior Quality and Patient Safety Manager. Extending the day to nine hours *or more* also required the department to add a full-time employee.

"It's almost like we had a buffer built in because we expected things to go wrong," says Hootman. "Patients were delayed coming to CT for various reasons. They would either show up late or get held up somewhere prior to CT... There was a lot of work that was not clearly streamlined or defined. There was a lot of wasted time just trying to figure out what was the best way to use

The Arthur G. James Cancer Hospital and Richard J. Solove Research Institute — Radiation Oncology

New \$1.1 billion institute and care center opened in December 2014 in Columbus, Ohio:

- Adult patient-care component of The Ohio State University Comprehensive Cancer Center.
- Designated by the National Cancer Institute (NCI) as a comprehensive cancer center.

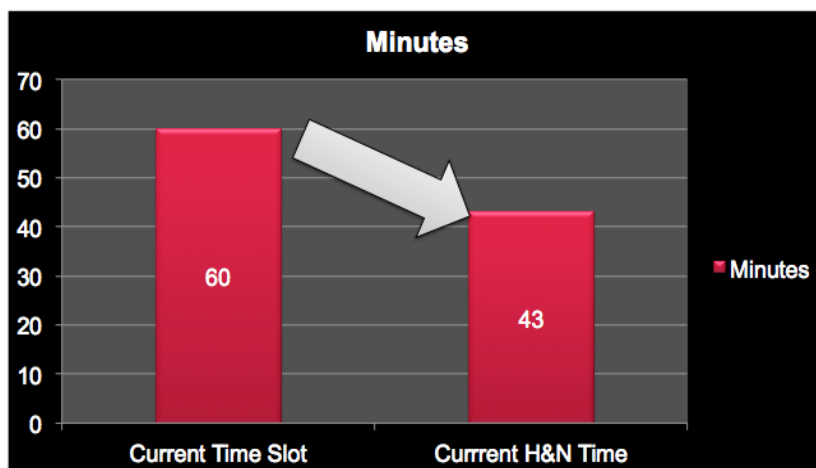
The James Department of Radiation Oncology:

- Provides advanced personalized radiation oncology care to cancer patients, specific to their individual tumor and clinical situation.
- Uses sophisticated cancer treatment methods, including conventional and high-field-strength magnetic resonance imaging and position emission tomography-computerized tomography.

our resources. It was just very chaotic, which led to a lot of dissatisfaction for both the patient and the therapist.”

Patient demand for CT Sim in Radiation Oncology had grown in recent years and is expected to rise sharply. The department moved to a new hospital in December 2014, and its space increased from less than 30,000 square feet to 100,000 square feet. Patient volumes eventually are expected to increase, with CT Sim usage reaching 13.3 patients per day — making it all the more important to eliminate the unnecessary buffer.

CT Simulation Scheduled Time vs. Time Required



Source: The James Cancer Hospital, Radiation Oncology

CT Sim is a process that varies by patient and by patient disease area. Patients are referred to Radiation Oncology for a consultation with one of the department’s physicians. If the physician determines a cancer patient needs radiation treatment, their next step is to receive a CT Sim. The simulation or scan is used to determine the precise radiation treatment fields and to plan treatment. Some patients begin the CT Sim process immediately after their consultation, and others require more information (e.g., imaging studies, lab results) prior to the simulation. During the simulation a patient is aligned to a precise position, facilitated by use of lasers and immobilization devices, and his or her skin marked to identify areas for radiation treatment.

The Radiation Oncology department sought to *schedule* CT Sim and treat patients in 45-minute time slots by March 2015. The tighter schedule would allow staff to meet current and future demand within an 8-hour day. To do this, though, would require the department to address issues of overtime, staff distractions and delays, work done outside of scope, and staff morale.

Radiation Oncology Improvement Project

The Radiation Oncology department became aware of the Academy for Excellence in Healthcare (AEH) program at The Ohio State University through McCabe, who had gone through the Master of Business Operational Excellence program at OSU’s Fisher College of Business. Staff submitted their CT Sim improvement project, it was accepted by AEH, and a cross-functional team underwent five days of training at OSU in August 2014.

The Radiation Oncology team learned about and improved their understanding of lean tools and techniques, such as workflow analysis and root-cause problem solving, which could be used to address

the problem of patient scheduling and access to CT Sim. McCabe says the five days of training helped to get everyone to recognize the value of improving the process and gave them a structured manner to examine the problem: collect measurables, analyze data, and conduct root-cause analysis as a group. “When we came into AEH, we thought the problem was that the therapists were distracted with duties outside of their role, which was why they needed more time per patient than what they really needed to complete the scans,” recalls Monica Fullenkamp, Radiation Therapy Manager. “But then, as we started evaluating it and looking into it further, we realized that distractions were not as much of the problem as we thought they were.”

Radiation Oncology Improvement Team

- Monica Fullenkamp, Radiation Therapy Manager
- Tabitha Hootman, Patient Access Supervisor
- Shannon Jordan, Radiation Therapy Clinical Coordinator
- Anthony McCabe, Senior Quality and Patient Safety Manager
- Julie Sussi, Chief Administrative Officer, Radiation Oncology

The team examined process data, such as the time a patient was physically in the scanner room, entry to exit, and began to find other factors affecting CT Sim times. “We realized that different disease sites took varying amounts of time,” says Julie Sussi, Chief Administrative Officer, Radiation Oncology. The department had been scheduling 60 minutes “across the board” for every patient, regardless of what area of the patient was to be simulated (e.g., brain, neck, chest). Some areas took 43 or 44 minutes, she adds, but others took as little as 30 minutes, which meant the unnecessary buffer was even larger for those patients.

The team also recognized that starting a simulation on time was a significant contributor to the 60-minute time slots, with up to 80 percent of scans not starting on time. “We figured out that if we could actually get the scans to start on time, we don’t need to build that extra block of time into the appointment,” says Sussi. The improvement team’s analysis revealed a number of causes that ultimately cascaded into a delayed start of CT scans.

“A lot of the things we ended up finding were that we didn’t have any standard work or that [standard work] was outdated,” says McCabe. “We had to reevaluate what we were doing and what our expectations actually were, and we tried to figure out what we needed to do to move forward more efficiently.”

The team identified areas where standard work could be applied or improved, including:

- *Standardization of orders:* Some physicians would have their orders for CT Sim placed in advance, while other patients were already in the simulation room and waited for physician to place the order or waited because of missing or incorrect information on the order. All orders are now entered and approved before a patient arrives to the simulation room.
- *Scheduling clearance for patients with dental implants:* The team proposes that the ENT Department schedule dental clearance prior to the consultation at Radiation Oncology.
- *Dosimetrists not following standard work for pushing images from CT:* The team will reinforce standard work for this process and monitor to see if it’s working.

- *Errors during scheduling from Patient Access:* Scheduling errors resulted in doctors not trusting the schedule. The team plans to evaluate those errors, incorporate standard work in reference sheets, and monitor progress. In addition, CT therapists have begun to directly schedule patients into open time slots when they see the availability, rather than waiting for Patient Access to schedule a patient into those slots.

Other suspected causes that led to longer than necessary time slots and the team's recommended countermeasures included:

- *Manually scheduling patients into multiple systems:* An interface between the hospital's ARIA and IHIS systems is being implemented, and the effectiveness of that solution will be validated.
- *Dosimetry unnecessarily double-checks therapists' work:* This practice occurred "because it has always been done that way" and contributed to delays once the patient was in the room. Dosimetry is now called only when needed, and even when needed the therapist does not wait for the dosimetrist to begin the scan.
- *Patients were not scheduled appropriately and cross-checked:* The team is gathering more data.

One significant change to the CT Sim process is how immobilization work is managed. The team realized that the process of immobilization could be removed from the CT Sim room, says Fullenkamp, which essentially split the one process into two steps: preparation of immobilization devices and then CT Sim. While CT Sim occurs for one patient, another patient can be prepared with immobilization devices.

Patients previously had been positioned and immobilized for treatment on a CT in the CT scanning room, says Shannon Jordan, Radiation Therapy Clinical Coordinator. During that time development of immobilization devices could take as little as three minutes for a simple device or up to 40 minutes for more complex devices, such as those that needed to be molded and cooled. "We removed that from the CT room and put all of the making of the longer immobilization [devices] into what we are calling the 'induction room.' We created a two-step process so that the CT scan is not being tied up."

"We're removing as much of the internal setup from the more valuable resource to an external operation to improve set-up times," says McCabe. Hootman notes that creation of the induction rooms was not possible prior to moving into the new facility because the department space was not available.

Supporting and reflecting the two-step process is a new template schedule (see *CT Scheduling Template*) for CT that was implemented once the department moved to the new facility, says Fullenkamp. The template also breaks down time slots based on patient disease areas, reflecting anticipated times for scanning various areas.

The team continues to explore ways to improve the induction and simulation work and prevent miscellaneous patient delays. For example, some patients require an IV contrast — a clear liquid that helps to highlight certain body parts during imaging tests. There were times when a CT Sim was ready to receive a patient, but the therapist waited for a nurse to start the patient's IV. Hootman says the department will begin to allow therapists to start patient IVs.

CT Scheduling Template

CT BLOCK SCHEDULE											
MONDAY		TUESDAY		WEDNESDAY		THURSDAY		FRIDAY			
Induction	CT	Induction	CT	Induction	CT	Induction	CT	Induction	CT		
700			OPEN (NOT 4D)			MD8		MD11 (4D OR SBRT)		MD13	
715											
730	MD1		OPEN (NOT 4D)							MD14 (4D OR SBRT)	
745						MD7 (4D OR SBRT)		MD11 (4D OR SBRT)			
800	MD2 (4D OR SBRT)	MD1	MD4	OPEN (NOT 4D)		MD8		MD11 (4D OR SBRT)		MD10	MD14 (4D OR SBRT)
815							MD7 (4D OR SBRT)	4D/SBRT FREE SLOT			
830		MD1	OPEN (NOT 4D)						MD11 (4D OR SBRT)		
845						MD8					
900	catch up time	MD2 (4D OR SBRT)	MD5	MD4							
915	4D/SBRT FREE SLOT		MD4			MD9	MD8	MD12 (GI/SKIN, NOT 4D)	catch up time	MD14 (4D OR SBRT)	MD10
930									4D/SBRT FREE SLOT		
945											
1000		catch up time	4D/SBRT FREE SLOT	catch up time	OPEN (IV START ONLY)	MD9		4D/SBRT FREE SLOT	MD12 (GI/SKIN, NOT 4D)	OPEN (NOT 4D)	catch up time
1015	MD2	4D/SBRT FREE SLOT		MD4	OPEN (NOT 4D)						MD14 (4D OR SBRT)
1030											
1045	OPEN (NOT 4D)		OPEN (NOT 4D)	4D/SBRT FREE SLOT	OPEN (NOT 4D)	OPEN (NOT 4D)		MD13	4D/SBRT FREE SLOT	4D/SBRT FREE SLOT	OPEN (NOT 4D)
1100		MD2							MD13		
1115	LUNCH										
1130		OPEN (NOT 4D)	LUNCH	OPEN (NOT 4D)	LUNCH					LUNCH	4D/SBRT FREE SLOT
1145											
1155									catch up time		
1200		URGENT		URGENT					URGENT		URGENT
1215	MD3					MD8				MD10	
1230		URGENT	MD5	URGENT					URGENT		URGENT
1245	MD2		MD4					MD13		MD14 (4D OR SBRT)	
100		MD3		MD5		MD10	MD8		MD12 (4D OR SBRT)		MD10
115	MD1										
130		MD1	MD6 (4D OR SBRT)	MD4	MD7 (4D OR SBRT)		MD10	MD11 (4D OR SBRT)		OPEN (NOT 4D)	MD14 (4D OR SBRT)
145	MD3								MD13		
200		MD2								OPEN (IV START ONLY)	
215			MD6 (4D OR SBRT)	MD6 (4D OR SBRT)		MD9	MD7 (4D OR SBRT)	MD12 (4D OR SBRT)	MD11 (4D OR SBRT)	OPEN (NOT 4D)	OPEN (NOT 4D)
230	4D/SBRT FREE SLOT										
245											
300		catch up time	PREP FOR NEXT DAY	MD6 (4D OR SBRT)	PREP FOR NEXT DAY	MD9	PREP FOR NEXT DAY	catch up time	PREP FOR NEXT DAY	PREP FOR NEXT DAY	catch up time
315	PREP FOR NEXT DAY	4D/SBRT FREE SLOT						MD12 (4D OR SBRT)			OPEN (NOT 4D)
330						OPEN (NOT 4D)**					
345			URGENT								OPEN (NOT 4D)
400		URGENT				URGENT			URGENT		URGENT
415											

**No Induction

Source: The James Cancer Hospital, Radiation Oncology

Results, Challenges, and Next Steps

The improvement team had assigned responsibilities for the proposed actions needed to reduce CT Sim time slots and implemented many of the countermeasures prior to moving into the new facility. None of the improvement actions required capital expenditures.

Fullenkamp says the new hybrid schedule now allows the department to schedule 14 scans in an 8-hour day, but it still requires the use of an additional full-time employee: two therapists in the induction room and two therapists in simulation. The team plans to bring in students to monitor CT Sim process data, such as actual patient time in and out of the induction and simulation rooms, to assess if the new scheduling method is working as expected.

Team members note that one challenge in making progress has been staff resistance to the changes. “Sometimes it’s the ‘We’ve always done it this way, why are we doing it different now?’ mentality,” says Jordan, “and it’s hard to get them to see the benefit of the change for it to really work.” She adds that moving to the new space helped to force some changes and helped personnel to accept the new ways.

To get a better understanding of the overall effectiveness of the project and the impact on department staff, the team planned to:

- Survey current staff morale.
- Survey current patient satisfaction for CT Sim experience.
- Monitor current staff overtime.

- Monitor scheduling errors.
- Conduct a time study of CT Sim appointments.
- Share learnings with staff.

McCabe notes that being physically in the new space — rather than just planning for the new space — will yield additional improvements beyond the creation of induction rooms: “We can actually put things where they need to go, take some of the stuff out that may have just come over [from the old space], and make it better for workflows and figuring out how to sustain [improvements].” Jordan says that as the team began working in its new space, their AEH coach, Gary Butler, reviewed the setup. Jordan says Butler had worked with the department in 2011 and on recent visits he had been impressed with the “calm in the rooms and in the hallways” and recognized the improvements made.

Team members McCabe and Sussi point out that Kris Kipp, The James Executive Director Patient Services, has been fully aware and supportive of the project, as has the leadership within the Department of Radiation Oncology: Dr. Arnab Chakravarti, Chair, and Dr. Douglas Martin, Clinical Director.

AEH Commentary

The improvement project at The James Department of Radiation Oncology illustrates how hospitals can optimize a finite-capacity process, function, or piece of equipment — a common problem for many organizations. The improvement team identified ways to improve the time available at the CT Sim process: e.g., removing delays prior to CT Sim; having patients fully ready, including information, when entering the simulation room; identifying and scheduling for a mix of CT Sim times (rather than scheduling one common duration for all patients); and separating supporting and setup activities from the actual CT Sim process time.

For example, because the team recognized that patient immobilization work did not need to be performed in the simulation room, those steps were placed in a newly created induction room and performed in parallel as other CT scans were done. This lean technique is frequently used in industries to rapidly change over equipment — the majority of the changeover work occurs while the equipment continues to run and produce product. The technique also has been widely used in hospitals to optimize high-value, capacity-constrained processes and functions, such as an operating room, where all medical equipment and personnel specific to a patient surgery have been set up and are ready to begin as soon as the operating room is available.

As with most improvement projects, the Radiation Oncology effort also shows how buy-in, support, and a willingness to change is needed from a cross-functional group in order to achieve objectives. Physical changes (i.e., new or transformed department space) can be an ally in making such changes.

About AEH

The Academy for Excellence in Healthcare blends in-person class time with hands-on project work, interactive simulations, and recurrent coaching, all aimed at helping healthcare teams spark actionable change at their organization. At the heart of this program is a real-world workplace problem each participant team selects and commits to solving through five intensive days on campus, followed several weeks later by two days of project report-outs and lean leadership training. This project-based approach pays immediate dividends and lays the groundwork for transformational change.



In collaboration with



Improved CT Simulation and Patient Access

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