Location Technology Improves Efficiency, Safety & the Patient Experience

BY BRENDA CLEMENTS, RN, MBA, OCN

In 2009 Eastern Maine Medical Center (EMMC) Cancer Care, opened a new, state-of-the-art, 135,000-square-foot, standalone three-story treatment facility, which employs more than 160 staff members, and provides care to between 250 to 300 patients each day. Today the Lafayette Family Cancer Center is home to radiation oncology, medical oncology, pediatric oncology, breast surgical specialists, rheumatology specialists, anemia management and blood management, behavioral health, genetics, supportive (palliative) care, clinical research, laboratory services, medical imaging services, and the only PET/CT in the region.

When planning for this new facility began in 2007, EMMC Cancer Care knew it would need some way to communicate the status of patients across this three-story building that measures longer than a football field. We selected a computerized communication tool, but unfortunately it proved non-viable for our setting. In 2008, desperate for an alternative, we found a real-time location system that promised to help us communicate the status of patients through automated electronic white boards. This kind of technology was used in hospitals for years, mainly for locating assets like IV pumps, and increasingly, this technology was being used to monitor the status of patients in ambulatory clinics, such as multi-specialty groups. EMMC Cancer Care would be the first to try the technology in an oncology program.

EMMC Cancer Care found that the real-time location system not only helped staff communicate the status of patients, it also streamlined patient flow through the facility, improving staff efficiency, reducing wait times, and enhancing patient safety—ultimately optimizing the patient experience.

We found that the real-time location system not only helped staff communicate the status of patients, it also streamlined patient flow through the facility, improving staff efficiency, reducing wait times, and enhancing patient safety.

The Technology

Our real-time location system consists of three basic components: badges, sensors, and software. Both patients and staff wear lightweight locator badges, which are picked up by sensors installed throughout the facility. Sophisticated rules-based software takes this location data and automatically updates electronic whiteboards. Once installed and set up, the system virtually runs itself—with very little interaction from staff. Just by wearing the badges, staff can see the location of all patients and staff on floor plan views (FPVs), a map of our facility that also displays the color-coded status of rooms and treatment chairs: available, occupied, or in need of turnover (see Figure 1, page 48).

The system's "list views" show information about each patient, including:

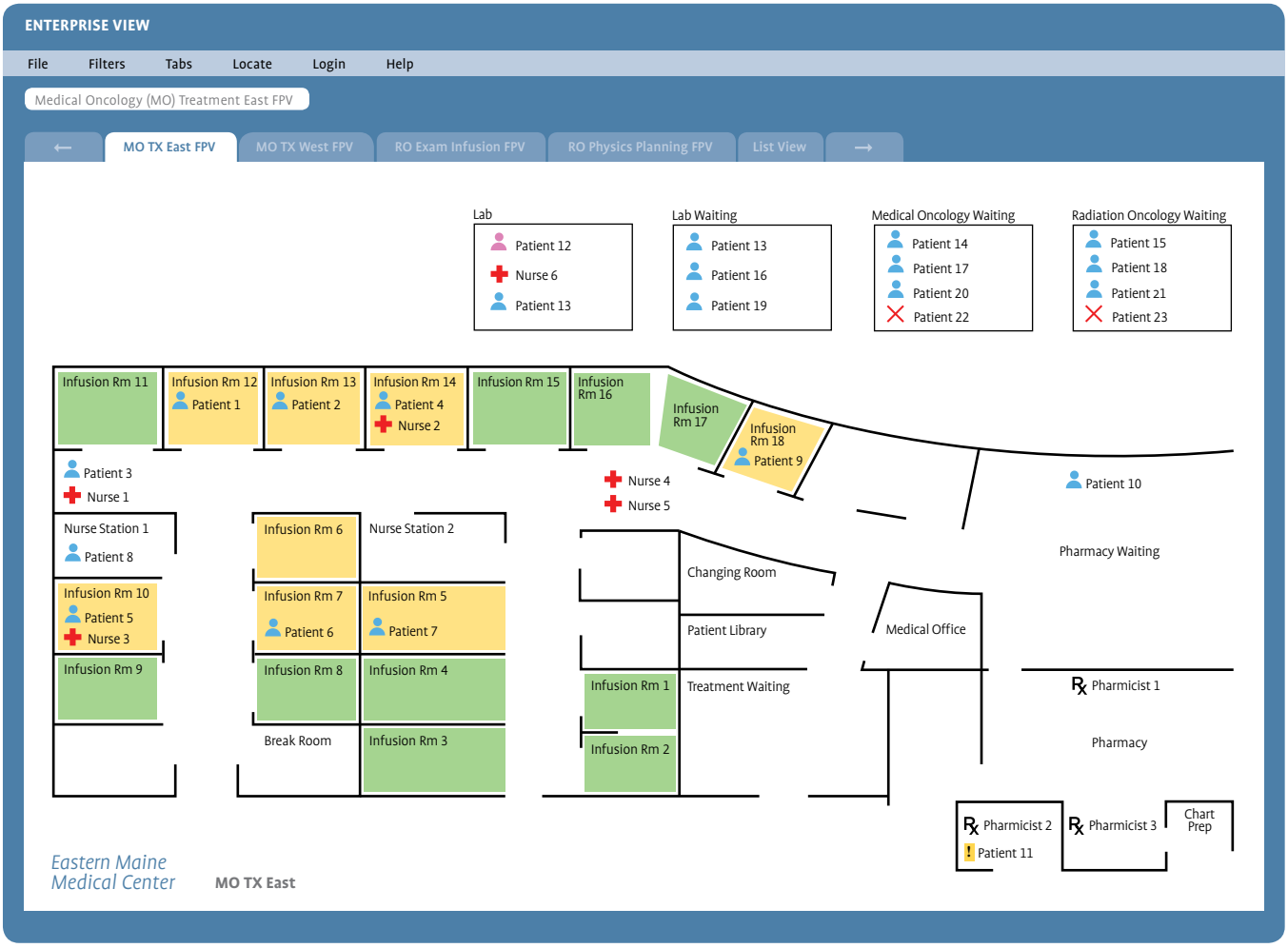
- The patient's location
- The visit type (brought in from the electronic health record [EHR])
- The physician's name (brought in from the EHR)
- Which providers have seen the patient
- The providers scheduled to see patients next
- Patients' current wait or alone time
- Patients' overall length of stay.

Because information updates automatically, the patient's entire experience is visible to everyone involved in their care (Figure 2, page 49).

Automating Patient Flow

Our first step when implementing the real-time location system was to determine the different pathways patients take through our facility. Then, the vendor programmed the software with our specific patient flow to trigger alerts on the

Figure 1. Rendering of Enterprise View Screenshot



patient's stage of care, based on their location, interaction with caregivers, and/or button pushes (explained below).

All patients receive badges when they check in for their appointment; patients then sit in the waiting room before being escorted to either an exam room or a treatment chair.

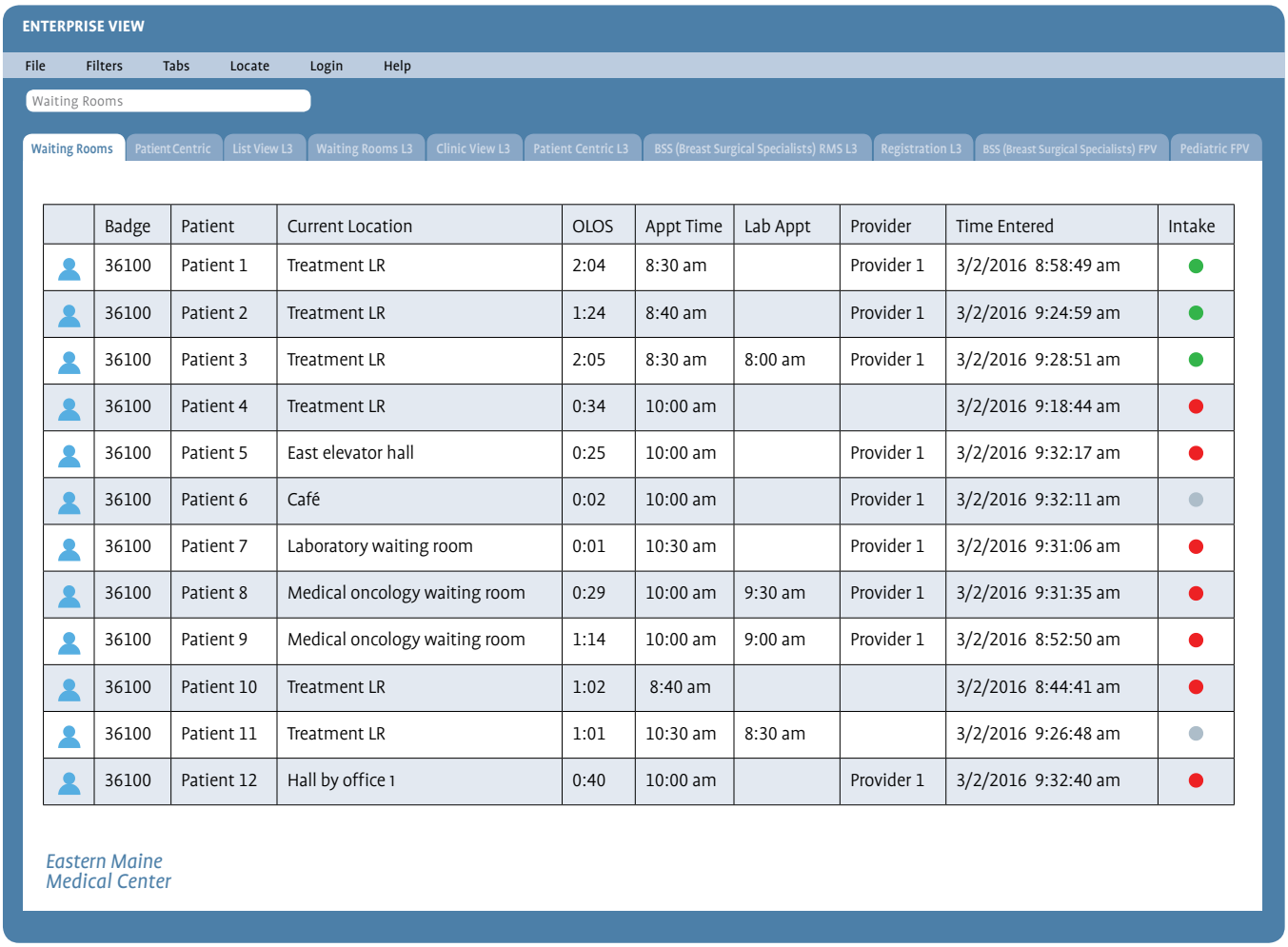
Certified medical assistants (CMAs) and treatment nurses simply glance at their monitor to see who is in the waiting room. No more walking or calling back and forth to see if patients have arrived yet for their appointment.

With a glance at the floorplan view to determine which room is clean and available, the CMA escorts patients into their treatment area. Once patients are situated, the CMA presses the button on her badge. This "button push" signals the system that patients are ready to see the provider, and the provider's name is highlighted on the list view.

All providers have a dedicated monitor in their office so they can tell at a glance when their patients are ready to be seen. When a patient's name is highlighted, providers make their way to the exam room. At first we also had the system trigger a message to the providers' pagers. However, we found this step to be unnecessary as providers preferred to use the list view only and delete extra pages that may occur during critical patient/provider conversations.

Similarly, treatment room nurses escort their patients to treatment chairs. Once they complete their assessment, establish IV access, and verify lab results, RNs press their badge buttons. We can program the "button push" to mean different things in different locations—or even based upon who's wearing the badge. In this scenario the button push signals the system that the patient is ready for treatment. On the list view, an icon appears in the chemotherapy column, alerting the pharmacist to start mixing medication.

Figure 2. Rendering of Waiting Room List View



	Badge	Patient	Current Location	OLOS	Appt Time	Lab Appt	Provider	Time Entered	Intake
	36100	Patient 1	Treatment LR	2:04	8:30 am		Provider 1	3/2/2016 8:58:49 am	
	36100	Patient 2	Treatment LR	1:24	8:40 am		Provider 1	3/2/2016 9:24:59 am	
	36100	Patient 3	Treatment LR	2:05	8:30 am	8:00 am	Provider 1	3/2/2016 9:28:51 am	
	36100	Patient 4	Treatment LR	0:34	10:00 am			3/2/2016 9:18:44 am	
	36100	Patient 5	East elevator hall	0:25	10:00 am		Provider 1	3/2/2016 9:32:17 am	
	36100	Patient 6	Café	0:02	10:00 am		Provider 1	3/2/2016 9:32:11 am	
	36100	Patient 7	Laboratory waiting room	0:01	10:30 am		Provider 1	3/2/2016 9:31:06 am	
	36100	Patient 8	Medical oncology waiting room	0:29	10:00 am	9:30 am	Provider 1	3/2/2016 9:31:35 am	
	36100	Patient 9	Medical oncology waiting room	1:14	10:00 am	9:00 am	Provider 1	3/2/2016 8:52:50 am	
	36100	Patient 10	Treatment LR	1:02	8:40 am			3/2/2016 8:44:41 am	
	36100	Patient 11	Treatment LR	1:01	10:30 am	8:30 am		3/2/2016 9:26:48 am	
	36100	Patient 12	Hall by office 1	0:40	10:00 am		Provider 1	3/2/2016 9:32:40 am	

Eastern Maine Medical Center

Improving Safety & Pharmacy Efficiency

Every time a pharmacist is interrupted during order review, the potential for error rises greatly. Yet in our previous treatment facility, pharmacists commonly experienced interruptions from nursing regarding patient arrival, need for drug, and drug readiness. These interruptions can lead to costly mistakes—both because of patient safety and the reimbursement dollars lost from mixing and preparing incorrect medications.

Our real-time location system solves this by automating communication with pharmacy. Once the pharmacist sees notification from the RN that a patient is ready for meds, a simple click on the list view changes the icon, acknowledging the order. When the meds are mixed, pharmacists click again to change the icon, alerting the RN that pre-meds or chemotherapy meds are ready (see Figure 3, page 50).

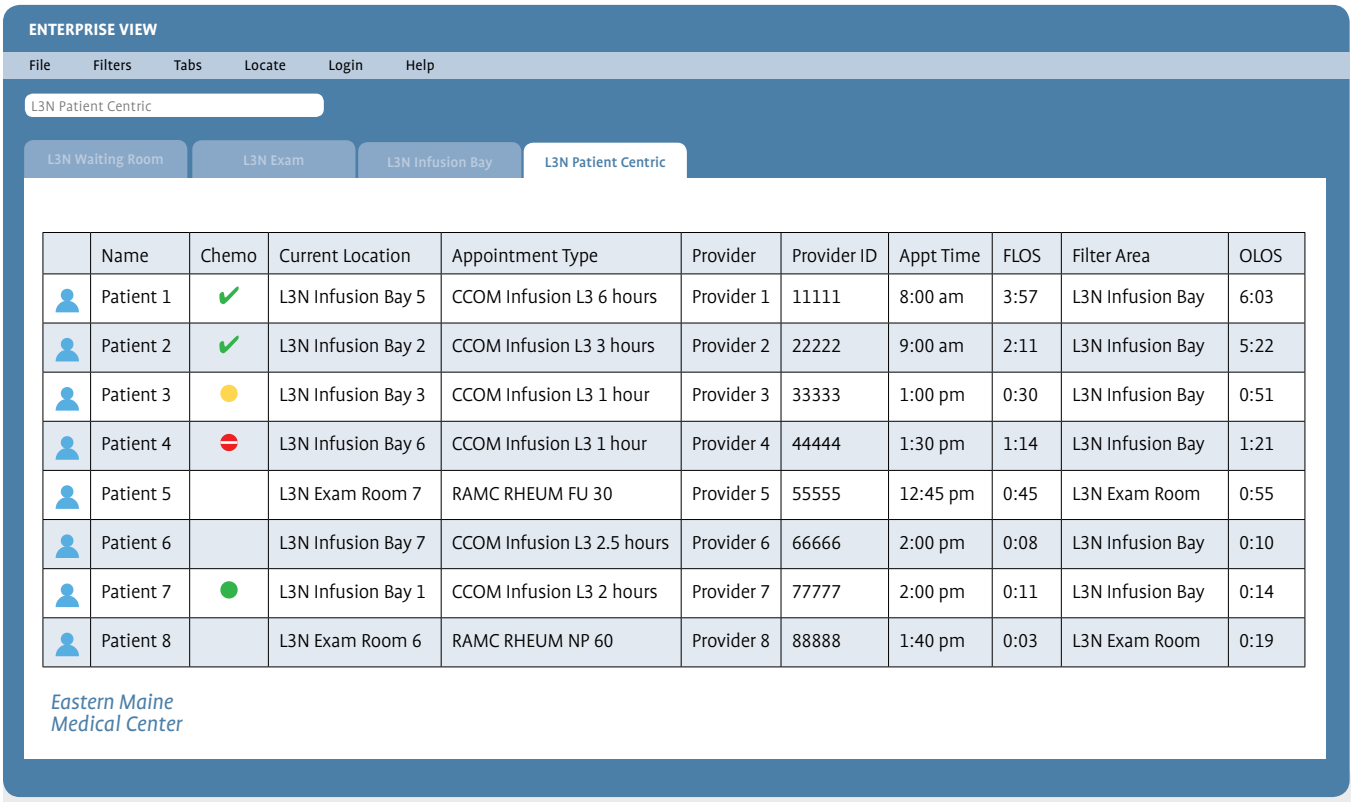
Orders are processed efficiently and without interruption, greatly improving pharmacy workflow and pharmacists' job satisfaction.

Increasing Time for Patient Care

The automated pharmacy communication is just one example of how the system optimizes nursing workflow. Prior to the integration of the real-time location system, treatment nurses would make multiple trips to the pharmacy to see if meds were ready. Now, nurses are always informed by just glancing at a monitor. This step alone has saved each treatment nurse from walking more than one mile per day.

In Medical Oncology, we used a paper trail to drive patient flow, which required CMAs to take a paper slip to the provider for each patient when he or she was ready to be seen. Now, we save time and money by not walking all this paper around.

Figure 3. Rendering of Automated Pharmacy Communication



	Name	Chemo	Current Location	Appointment Type	Provider	Provider ID	Appt Time	FLOS	Filter Area	OLOS
	Patient 1	✔	L3N Infusion Bay 5	CCOM Infusion L3 6 hours	Provider 1	11111	8:00 am	3:57	L3N Infusion Bay	6:03
	Patient 2	✔	L3N Infusion Bay 2	CCOM Infusion L3 3 hours	Provider 2	22222	9:00 am	2:11	L3N Infusion Bay	5:22
	Patient 3	●	L3N Infusion Bay 3	CCOM Infusion L3 1 hour	Provider 3	33333	1:00 pm	0:30	L3N Infusion Bay	0:51
	Patient 4	⛔	L3N Infusion Bay 6	CCOM Infusion L3 1 hour	Provider 4	44444	1:30 pm	1:14	L3N Infusion Bay	1:21
	Patient 5		L3N Exam Room 7	RAMC RHEUM FU 30	Provider 5	55555	12:45 pm	0:45	L3N Exam Room	0:55
	Patient 6		L3N Infusion Bay 7	CCOM Infusion L3 2.5 hours	Provider 6	66666	2:00 pm	0:08	L3N Infusion Bay	0:10
	Patient 7	●	L3N Infusion Bay 1	CCOM Infusion L3 2 hours	Provider 7	77777	2:00 pm	0:11	L3N Infusion Bay	0:14
	Patient 8		L3N Exam Room 6	RAMC RHEUM NP 60	Provider 8	88888	1:40 pm	0:03	L3N Exam Room	0:19

Eastern Maine Medical Center

- ● Patient in treatment chair, nursing assessment done, IV access established (if needed)
- ● Pharmacy acknowledgement that the patient is ready; pharmacy has orders and will institute processing
- ✚ Anti-emetics ready for pick-up/delivered
- ✔ Chemotherapy ready for pick-up/delivered
- ⛔ In response to a yellow dot, a negative sign means one of the following:
  1) pharmacy has not received orders, or
  2) there is a problem with the order

CMAs walk four miles less per day each, and our providers appreciate not having to wait for someone to deliver the paper, or possibly losing the paper (aka the patient) on their desk.

These wasted steps took time away from direct patient care—and not just the time it takes to go back and forth. Every time nurses step away from their work, the potential for interruption heightens, further delaying patient care.

Today our nurses not only walk a lot less, they also feel they have more time to spend with their patients, doing what they love to do—provide safe, quality patient care.

Enhancing the Patient Experience

Our patients' time is valuable. They don't want to spend it sitting in the waiting room, or waiting for their next stage of care. The real-time location system allows us to proactively monitor the time patients spend alone. If a patient has been in a location for more than 20 minutes without seeing a staff member, an alert appears on staff workstations.

The only way to clear this alert is for a staff member to physically go into the room of the waiting patient. While there, staff members let patients know how long they may expect to wait, and ask if they need anything. Patients appreciate the update and knowing that they are "not forgotten."

Because of the automated communication around the patient visit, we have drastically reduced wasted time, which means patients spend less time at the facility overall and receive higher quality care.

The system also assists EMMC Cancer Care with pediatric patients and their parents. Parents and children both receive badges, which are easily linked by pressing badge buttons

together in the registration area. We can see on our floorplan view if the parent is with the child; or if they're not, we use the locator function of the system to find the parent's location.

Parents know they can step away to take a phone call, get some coffee, or just take a walk around the facility. They can do this with peace of mind, because they know we can find them when they're needed. Thanks to this attention to patient care, our Avatar Patient Satisfaction Scores are consistently greater than 95 percent.

Finding Each Other, Finding Equipment

Beyond the sophistication of the patient flow aspects of the real-time location system, simply finding other staff members and needed equipment saves EMMC Cancer Care both time and money.

Previously, overhead paging was needed to find a provider or other staff member to ask a question about patient care; then wait and hope they would call back.

Using the "locate" feature, staff members simply enter the name of the person they're looking for and the system serves as a real-time phone directory, displaying the extension number of the closest phone. Dialing that extension allows staff members to reach each other immediately and receive answers in a timely fashion. This feature not only further expedites patient care, it also lends to a quieter environment, benefiting both patients and staff.

In the case of equipment, staff members simply attach a badge to items like a vein finder. Using the "locate" feature, a staff member types in "AccuVein" to find out where the piece of equipment is currently located. Even though the vein finder is not used very often, it's a very important piece of equipment. Traditionally EMMC Cancer Care would have purchased one for each of the three floors in the building, just so nurses would not waste time finding the piece of equipment when it was needed. The three vein viewers would then sit unused for a great portion of the day. With the real-time location system, EMMC Cancer Care is able to share one vein viewer across all floors; nurses now know its exact location when they need it. Sharing one piece of equipment instead of purchasing extras for convenience is an efficient cost saver.

Assisting with Meaningful Use

The real-time location system is so dynamic and flexible that EMMC Cancer Care is continually finding new ways to use it. Recently, we added a column to our patient "list view" that indicates which patients require Depart/Discharge paperwork. This option gives more visibility to our Meaningful Use requirements.

Decision Making & Process Improvement with Accurate Data

While the real-time location system helps us improve care delivery in real time, it is also passively recording data about our operations, much like a consultant would do by following people around with stopwatches. The data is automated and accurate, without any personal bias, allowing users to run a variety of reports on various metrics, or have them automatically emailed on a regular basis. Some of the metrics we track include:

- Room and chair utilization
- Average wait times for various stages of care
- Average length of stay in the lab, in exam, treatment, etc.
- Patient time with provider
- Patient time with nurse
- Exam-to-provider times.

These metrics help administration understand patients' overall experience and shed light on operations in various ways by:

- ***Revealing bottlenecks.*** After reviewing data from these reports, we saw that patients were waiting too long for intake and not making it to their scheduled appointments on time, putting providers behind schedule. By identifying the root cause of this issue, we realized we were not giving CMAs enough time for the intake process. With some minor tweaks to our timing and scheduling, we reduced the wait time for intake and improved patient throughput, getting providers back on schedule.
- ***Managing capacity.*** Because the real-time location system automatically monitors when rooms and chairs are occupied by patients, when they're in need of turnover, and when they are available, we can run a report to understand our room and chair utilization rates and overall capacity. We use this data to adjust patient scheduling, accommodate more patients, decrease wait times, and increase revenue.
- ***Reducing patient complaints.*** We've all been in the situation where a patient complains about how often they were checked on, or how much time their provider spent with them. In some cases, we've even had patients refuse to pay their bills. Our "alone time" alert forces patient rounding and interaction. We now know how long the provider was with the patient, or every staff member that interacted with patients during their visit. Running reports of this information—including patient wait times—has helped us improve wait times, the quality of care we provide, and patient and staff satisfaction.
- ***Managing infection control efforts.*** The real-time location system allows us to see immediately who has been exposed to an infectious patient. For example, a patient was recently diagnosed with chicken pox after a visit to our facility. Where we would normally have had to alarm upwards of 250 potentially immune-compromised patients and let them know they were possibly exposed, the location system allowed us to run a quick report and know that only 10 patients were actually in the same vicinity of the infectious patient. That meant we didn't have to call 240 patients and needlessly send them for testing or cause undue concern.

Overcoming Objections

Implementing a real-time location system is not without its challenges. The first challenge we had to overcome: funding.

EMMC Cancer Care, Bangor, Maine.

Today there is a wealth of data from various cancer programs showing how a system like this improves operations and the patient experience, but back in 2009, EMMC Cancer Care was the first health system to implement this technology. To demonstrate the need, I took executives from our health system on a tour of the new building and purposely got lost. I asked them, "How are we going to navigate this space? What happens if a patient gets lost?" It was a very effective exercise.

The next challenge, and the question we received most about the system is, "How do you get nurses and providers to wear the badge?" There are a few common objections from staff that are easily overcome with the right approach.

First, staff members may be hesitant to wear the badge because it emits signals, which they perceive could be harmful to their health. In fact, the signals are no different than what we use every day in TV remote controls (infrared light) and remote keyless entry for cars (radio frequency). Cancer program leadership explained this reasoning and led by example. Prior to opening the new building, the manager of Nursing Services wore her badge every day. Staff could see that it had no ill effects on the manager (or her clothing, as it's very lightweight).

Second, there's the "big brother" issue. Staff members are afraid administration is going to use the system to "track" them. While it's possible to use real-time location systems in this way, cancer program leadership reassured staff members that the badges would not be used for punitive action. Administration does not want to know how long breaks take, or which staff member is using the bathroom the most.

The purpose of the real-time location system is to streamline staff workflow and improve the patient experience. When presented in this light, staff members become more receptive to the idea. When you actually begin using the system (and don't use it in a punitive way), staff members quickly come to realize the benefits and embrace the efficiency it provides.

As for patients, we have found most are more than happy to wear the badge during their appointments. In fact, one patient recently told me that it takes a weight off her mind. "To know that I can't get lost in this building, that if I take a wrong turn or sit in the wrong waiting room, that you'll find me, that's just one less thing I have to worry about."

Innovating New Uses for the Technology

Because EMMC Cancer Care staff members have embraced the real-time location system, they are continuously innovating new ways to leverage it to improve the patient experience, quality, safety, and care. Many of the benefits and features noted above, such as the pharmacy communication and pediatric parent association, were actually conceived by employees and implemented in partnership with the vendor. I am most proud that the innovations in patient care made possible by EMMC Cancer Care and our real-time location system are now used nationwide by some of the top programs in cancer treatment. OI

Brenda Clements, RN, MBA, OCN, is the manager of Nursing Services for EMMC Cancer Care, a department of Eastern Maine Medical Center, Bangor, Maine.