Machine Learning and Predictive Analytics Solution Transforms Infusion Center Operations

BY MADDELYNNE PARKER
AND CHIDI IKE

In 2022, the Association of Community Cancer Centers (ACCC) teamed up with LeanTaaS—a technology-driven health care innovator—to better understand the state of cancer program and practice operations from the perspectives of nursing directors and operational leaders. ACCC intended to use this survey to understand the current infusion center operations landscape and analyze how artificial and business intelligence, among other technologies, can help improve efficiencies for patients and staff.

Respondents to the survey encompassed community-based and academic cancer programs, as well as private oncology practices. Further, the majority of survey respondents report managing an infusion center ranging from 10 chairs to 30 chairs total.[1] Survey findings show that cancer programs and practices across the United States face 3 major challenges in efficiently operating their infusion center(s)[1]:

1. Resource constraints
2. Staffing shortages and burnout
3. Limited access to data in the electronic health record (EHR).

The first 2 challenges listed above may not come as a surprise for many in health care, as the COVID-19 pandemic and its impacts exacerbated already felt workforce-related challenges, heightening people's burnout and desire to leave the health care field altogether. Additionally, lower-resourced cancer programs and practices may be limited in their ability to add new technologies and staff to enhance their operations, including having staff dedicated to the EHR and understanding the full scope of its functionality.

Fifty percent of survey respondents report finding it "somewhat difficult" or "extremely difficult" to access the EHR data they need, while another 50% currently track their operational performance manually in spreadsheets.[1] These data illustrate a need to improve EHR utilization across the board to ensure staff can access and leverage data to improve capacity for care, as well as the patient and provider experience. Further, manual tracking of any kind can be tedious, inefficient, and prone to human error. So, how can cancer programs and practices, including smaller and/or lower-resourced organizations, improve the efficiency and data utilization of their infusion center(s)?

> iQueue calculates all the patient wait times and provides an overview of how many patients should be there at a certain time. That makes it easier for the schedulers... I can compare patient wait times in the different pods—the lobby wait time to the chair, and the wait time to their first drug administration.

iQueue for Infusion Centers

LeanTaaS developed the iQueue for Infusion Centers solution to help cancer programs and practices improve their infusion efficiency, with technology that can be customized via templates to best meet staff and patients' needs. The solution uses artificial intelligence and predictive analytics to assist infusion center staff and schedulers in level-loading their daily schedules and provides data to help flag issues that can be targeted for quality improvement efforts. According to the company, iQueue for Infusion Centers has helped those who use the technology increase revenue and lower patient wait times.[2]

To better understand how ACCC members can leverage iQueue for Infusion Centers to improve their cancer program or practices' bottom line, employee satisfaction, and the patient experience, *Oncology Issues* (OI) spoke with 2 member programs who have been using this technology for more than a year now and are seeing positive results.

The University of Alabama at Birmingham

The O'Neal Comprehensive Cancer Center at the University of Alabama at Birmingham is the only National Cancer Institute (NCI)-designated comprehensive cancer center in the state. Located

in the heart of Birmingham, Alabama., the cancer program offers a full suite of cancer care services, from medical, radiation, and surgical oncology to infusions (both oncology and non-oncology), research, and supportive cancer services.

In 2019, the team at the University of Alabama at Birmingham transitioned their scheduling and insurance authorizations to be done through a central team. The team then complementarily implemented iQueue for Infusion Centers to further enhance the scheduling team's ability to schedule infusion center appointments, while keeping patients from waiting too long for their treatment, and the infusion nursing staff's ability to balance out their workload each day. *Oncology Issues* spoke with Molly Webb, MSHQS, BSN, RN, OCN, nurse manager for infusion services, and Alicia Griffith, director of ambulatory access, at the O'Neal Comprehensive Cancer Center at the University of Alabama at Birmingham, to learn more about the implementation of iQueue for Infusion Centers and how it has made a positive impact on the cancer program.

OI. What challenges were you faced with at your infusion center prior to implementing technology as a solution?

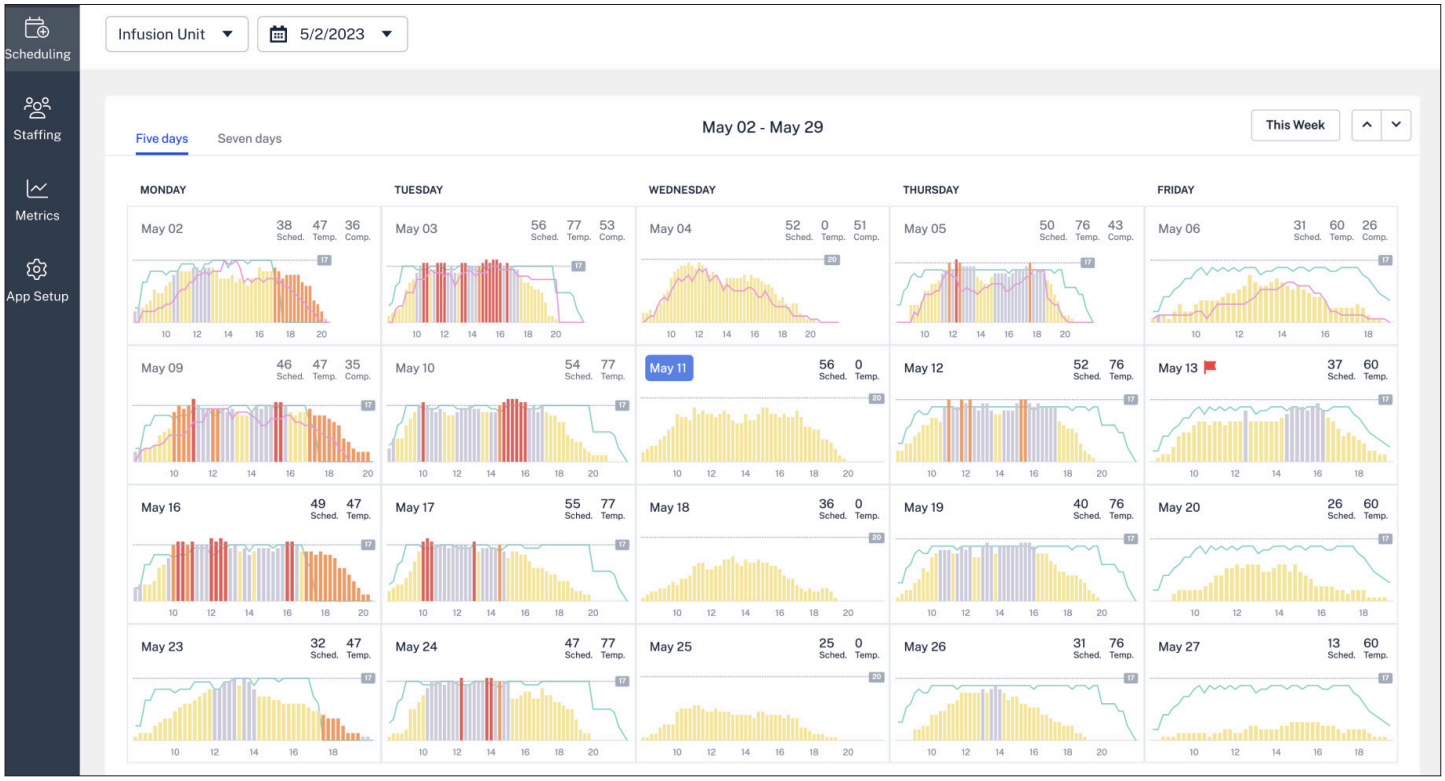
WEBB. One of our big challenges was the expansion of our infusion center from 24 chairs to 84 chairs at the end of 2019. We also combined our interdisciplinary, hematology, and oncology spaces into one, and it is very hard to coordinate that many patients in a day. Everyone ends up running into each other. Infusion is unique in the fact that it is not a 30-minute spot every time, similar to a clinic visit. That is something we really needed this iQueue technology for—to make these appointments make sense. On a larger scale, overbooking was always an issue. We could schedule a few 2-hour appointments, but, if we had four 8-hour appointments hanging out there, they were bound to clash at some point. So, it's just hard to tell without technology.

GRIFFITH. It is difficult to know what slots are available when you're not in the clinic, looking at chairs as a queue continues to grow in the waiting room. A challenge on our end was being able to know that a patient is a 4-hour spot and ensure that overbooking does not happen. If overbooking does [occur], it really can build that queue in the waiting room and have a negative impact on the patient experience.

OI. Why did you feel technology was the right tool to solve these challenges?

WEBB. Based on the algorithms these companies run, their programs can do the work for you on such a large scale. A technology like

Figure 1. Huddle Calendar



The Huddle Calendar shows 4 weeks of daily huddles in one view to make it easy to level-load patients across units or days and helps identify problems before they occur.

iQueue can take it [the data] all in, comprehend it, and display it for us to see—vs us trying to think it through. We are doing a lot of counting and asking questions like, "How many patients do we think are going to be here at this time? Is it viable to book a patient in a specific time slot?" It was really appealing to use to use the algorithms and equations technology provides, given the scale and complexity of our scheduling process.

GRIFFITH. It is like going from using a paper map or an atlas to using a Garmin, electronic navigation system. The atlas will get the job done, but are you going to be as efficient as you want to be? A Garmin or any kind of navigation system can tell you the shortcuts and help you navigate that journey in a more efficient manner.

OI. What other technologies did you consider before choosing LeanTaaS' iQueue for Infusion Centers?

WEBB. Other options were considered, but the only valued option for an infusion center as large as ours was the iQueue platform.

> There are so many complexities with all the moving parts within an infusion center that I do not think our human brains could put together all those puzzle pieces without the assistance of technology to pair with the human experience.

OI. Can you discuss the iQueue platform and any specific features that appeal to your team?

WEBB. There are so many cool features. We divided our schedules into 4 different templates each day because there are so many chairs. Our schedulers do not schedule through iQueue, we use a different system (IDX Scheduling) because that is what we started with. Of our 4 different templates, 3 of them are about the same size. It is a lot easier now because they [schedulers] can look at the infusion center pods and say, "Pod A has 70 patients, pod B has 60 patients, and pod C has 55 patients." At a quick glance they can look at everything together.

iQueue calculates all the patient wait times and provides an overview of how many patients should be there at a certain time. That makes it easier for the schedulers. I personally use iQueue for wait times. I can compare patient wait times in the different pods—the lobby wait time to the chair, and the wait time to their first drug administration. I pull the statistics every month from all the pods, and they are all compared to each other. Each pod has a different group of nurses and medical assistants, so it's like a unit. With these data, we can compare wait times for each pod and each team, so it creates a little bit of healthy competition. And we have seen a big improvement on our wait times as a result.

It also helps me calculate our utilization rate for chairs when we are doing our financial reporting. It is significantly easier to be able to pull the data from iQueue, instead of calculating by hand because I am no mathematician. I cannot say enough good things about iQueue—it is a wonderful tool for me.

GRIFFITH. I agree with everything Molly said from a scheduling perspective. It is really our road map to what we do every day.

OI. What specific outcomes did you expect when implementing this technology solution?

WEBB. At the end of May 2022, we extended our clinic hours. We went from operating from 7:00 AM to 5:30 PM to 7:00 AM to 7:30 PM. iQueue helped us come to that decision by allowing us to efficiently observe our chair utilization rates. We were able to add patients to our templates each day.

It also helped us visualize those peak hours, which are the busiest times in the day. We were able to see when too many patients were here at one time. We were seeing that between the hours of 10:00 AM and 2:00 PM we were slammed—no patients were moving. We adjusted our templates for that and took some appointments slots away at this period, while adding appointments toward the end of the day to even it out. Then the patients were not having to wait as long. We also tried to schedule fewer patients during lunch hours (that is 12:00 PM to 2:00 PM), so the nurses could take a meal break.

OI. From idea inception to launch, how long did it take your cancer program to access and implement the iQueue platform and when did you start to achieve anticipated financial, operational, or clinical benefits?

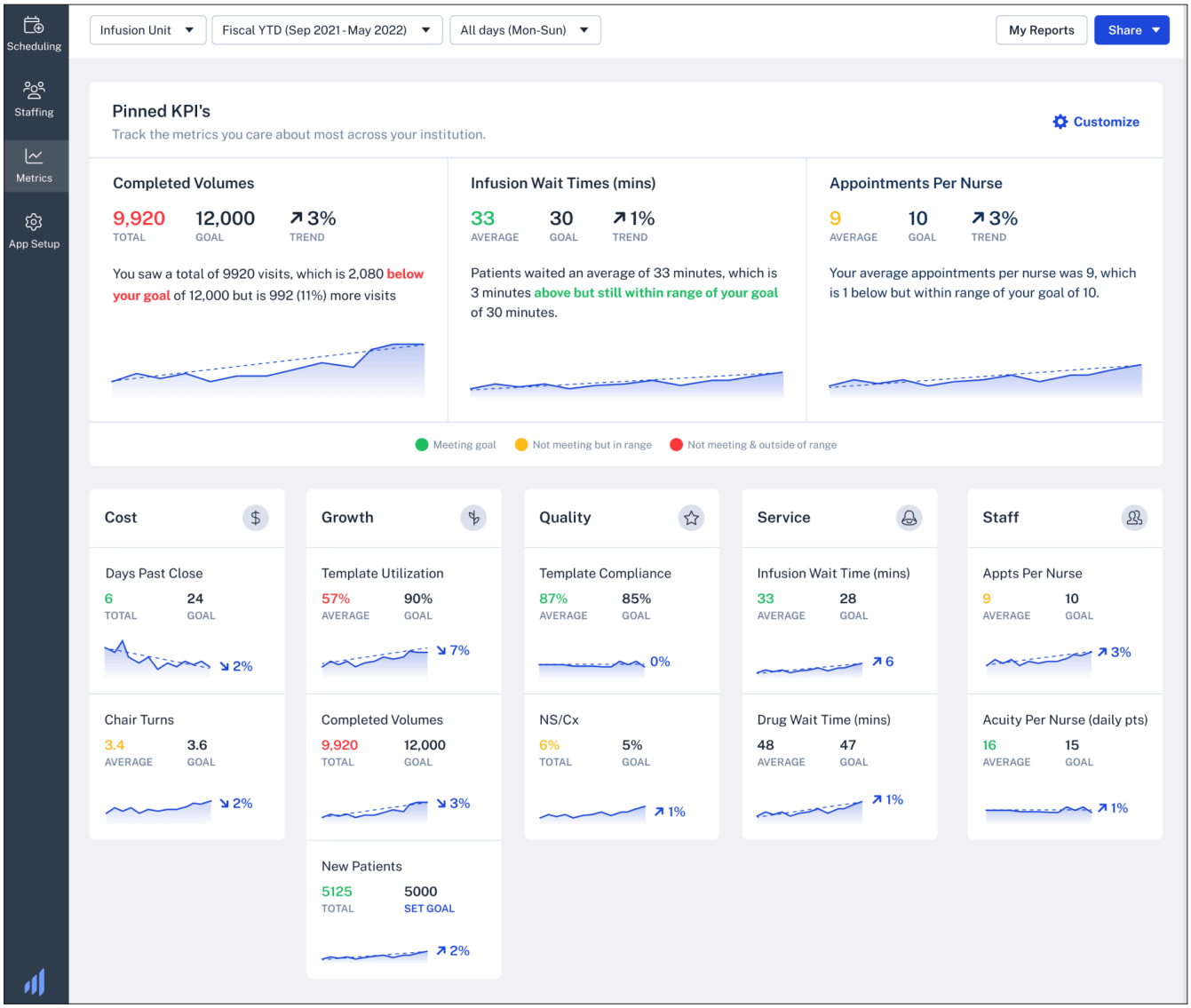
WEBB. It took 6 months, primarily because we had to have our access team trained with this program, and it is just a new element to add in your workflow. We were all new to the technology. Tracking our wait time was something that we have talked about for a little while, and we started that in April 2022. Our informatics department had to develop a system to track that data. It took about 5 months.

GRIFFITH. The centralized scheduling piece moved over to Access Center Scheduling in March 2021. At that time, the utilization of iQueue was not where it needed to be. Since that time, the scheduling teams are now utilizing iQueue to its full benefits. That was another piece as well—the utilization.

OI. What were the positive impacts this technology had on patients and your staff—from schedulers, infusion nurses, administrators, and others like pharmacy and labs?

WEBB. For our pharmacists and nurses, the even distribution of patients means that they are not getting huge waves of patients or tons of medication orders activated at the same time. It has helped their workflow, and that is best for patient safety. Spreading out

Figure 2. Executive Summary



Executive Summary is a view in iQueue designed to help managers easily deliver executives the data they need to make strategic, proactive decisions and quickly spot operational issues that need attention.

the appointments and giving staff the time to think is important in a 12-hour day.

For administration, our template utilization is great. The schedulers have done an awesome job, and that just shows us that this technology investment is worth it. It is easy to aggregate the data and use it in any way we need to use it.

I also touched upon this earlier, but the best feature of iQueue is tracking patient wait times. I can pull up any date range, and I can look at our wait times. I can look at the volume of patients that were completed. I can see how many appointments per nurse there were and compare my three main pods to each other. I can make sure everyone is on the same page with their workflow—that has been very important for me. The chair utilization rates have been a game changer for me because they are ridiculously hard to calculate by hand.

GRIFFITH. To echo what I shared previously, it is just the visibility to be scheduling for our partners in the clinic and really have a bird's eye view into the clinic as it relates to scheduling. The visibility iQueue brings helps us and enhances the patient experience. If we are not overbooking and we are spreading those appointments out based on being able to see the full picture, then we will have happy patients, who do not have to wait an extra amount of time in the waiting room.

OI. If a cancer program or practice is considering using an AI-based technology solution to improve their infusion center operations, what is one insight or piece of advice you would offer them?

WEBB. I would encourage them to think about what works best for their clinic. If they have any issues or roadblocks right now, then they

can look at root causes, and use iQueue to try and overcome those challenges—that is what we did. We were looking to see at what time every patient was here at the same time and figuring out how we were going to move our appointments around to try and fix those bottlenecks. I think it's best for a larger infusion center. It is a game changer to be able to have 70 infusions of all different durations scheduled in 1 day and take 1 look at a graph to know what your day looks like. It is incredibly helpful. I would say, really think about what works best for your clinic and your goals. There are a lot of things to think about, but it is also "learn as you go" sometimes.

Monument Health Cancer Care Institute

The only large cancer program in a 350-mile radius in Rapid City, South Dakota, Monument Health Cancer Care Institute offers medical, radiation, and gynecological oncology to the patients who present for treatment. Within medical oncology, the health system provides patients their anti-cancer infusion treatments in a single infusion center. The health system implemented the iQueue for Infusion Centers platform in 2020. Although it uses Epic as its EHR provider, Monument Health staff can make infusion scheduling changes in Epic that are then integrated simultaneously in iQueue.

To learn more about the Monument Health team's experience with this new technology, *Oncology Issues* spoke with Kristi Gylten, MBA, director cancer care institute; Michelle Boelter, RN, nursing director; Nancy Sanders, clinical operations supervisor; and Jan Lowe, PharmD, BCOP, oncology pharmacist; Jill Rasmussen, patient access supervisor; and Dani Collins, RN, OCN, charge nurse.

OI. What challenges were you faced with at your infusion center prior to implementing technology as a solution?

BOELTER. Prior to the use of iQueue, the infusion center was subjective on our chair utilization. We needed objective data like how we're scheduling or how we're turning over chair time. iQueue gives you a nice platform that you can slice and dice your data, and you can look at where your opportunities are as far as scheduling. We are still looking at that.

GYLTEN. We did not have the data and metrics an infusion center needs and wants to have to evaluate what our opportunities were, such as workflows, inefficiencies, and wait times, to name a few. We did not quite know where to prioritize our time and our efforts with making

Figure 3. Chair Utilization

The chair utilization chart is a forward-looking visualization of how your chairs will be utilized over the day based on your scheduled appointments, and how that relates to your scheduling template.

improvements and to help prepare for the future. Without that technology [iQueue], we were relying on the subjective, our feelings, vs the data.

LOWE. We had a lot of patients who needed chemotherapy, but our chairs were just full. We wanted to ensure we were optimizing chair time. iQueue helped us level out our chair time so we reduced empty time and maximized time to treat as many patients as possible.

OI. Why did you feel technology was the right tool to solve these challenges?

GYLTEN. It takes the subjective nature out of the formula. With artificial intelligence, it gives our team the factual data, identifies better opportunities to improve and in a way that a human brain probably cannot. There are so many complexities with all the moving parts within an infusion center that I do not think our human brains could put together all those puzzle pieces without the assistance of technology to pair with the human experience.

SANDERS. It also helped us identify which patients were actually linked to a provider appointment same-day vs just a lab and infusion. These are important data, too.

GYLTEN. Our infusion center is not a standalone. It's driven by our providers' schedule as well. So having to coordinate between a clinic schedule and infusion center is another element of complexity, where, I think, some of those independent infusion centers that are standalone do not face those same challenges. This technology removes and helps with some of that complexity.

With the help of LeanTaaS, completed patient hours went up, so we can handle more volume or more hours both in the infusion and fast-track center.

OI. What other technologies did you consider before choosing LeanTaaS' iQueue for Infusion Centers?

SANDERS. I think Epic had a snap board, but we just did not understand how that could work for us. We talked about it with our Epic team, but I think it was not something we could implement at that time. The reporting capabilities from LeanTaaS are very important. There are so many data points that it's able to pull what we cannot. We don't have the true picture of what is happening in our infusion center until we have the reports from LeanTaaS, and their team is available to us anytime we want to go into the portal.

OI. Can you discuss the iQueue platform and any specifics that appeal to your team?

GYLTEN. Back in 2020, we knew that we were going to be expanding our clinic, and we wanted to have a good picture of what our current state was, as it pertained to infusion chair utilization. And then use that data to help us build for the future. We also wanted to make sure—in the current state and before expanding—that we had efficiencies in place and the appropriate human capital and chairs to handle the volume for today and the future. We also knew that we had limitations to how much we could expand. This played a role in confirming what we thought we would need to build for the future—efficiencies in our workflows and efficiencies gained with the right number of staff to manage our infusion center. This all helped us in the planning process.

COLLINS. It's also helped us with knowing where we can put people in, where we're full, and where we're not. We can see that information easily, so that helped with add-ons.

OI. What specific outcomes did you expect when implementing this technology solution?

LOWE. Initially, when we were looking at our use of chair time, we had some patient dissatisfaction with wait times between doctors' and chemotherapy appointments. It just always felt like we were behind, and patients were not satisfied. I think implementing iQueue and then the queuing portion, where we could have a timestamp on what really is going on, took the subjective portion out and made it more objective. What we learned is that we are really good at getting patients in chemotherapy at their appointment time. Also, we just wanted to have some real numbers for patient satisfaction purposes.

GYLTEN. We implemented iQueue in 2020, and then LeanTaaS came back in 2021 to do a review of how we were using the platform. Initially, patient wait times were a concern. Post implementation, the wait times did go down. The average time nurses and patients were waiting for the chemotherapy to be made was another metric we thought we had an opportunity to improve. This metric improved as well.

RASMUSSEN. It [iQueue for Infusion Centers] gave the schedulers a better idea as to what was scheduled, where before they were counting and not working off a template. But we also had to figure out the template that worked best for our infusion center. Like Nancy said, it gives us the data and the numbers that we need. In our fast-track area, we are able to handle more patients. With the help of LeanTaaS, completed patient hours went up, so we can handle more volume or more hours both in the infusion and fast-track center.

GYLTEN. As Jill mentioned, iQueue assists us in making better scheduling decisions. The dashboard and tools are used by schedulers and nursing staff to help them make better decisions. Or for those challenging decisions, they can look at the dashboard together in real time to make better decisions on behalf of our patients and caregivers.

OI. From idea inception to launch, how long did it take your program to access and implement the iQueue platform and when did you start to achieve anticipated financial, operational, or clinical benefits?

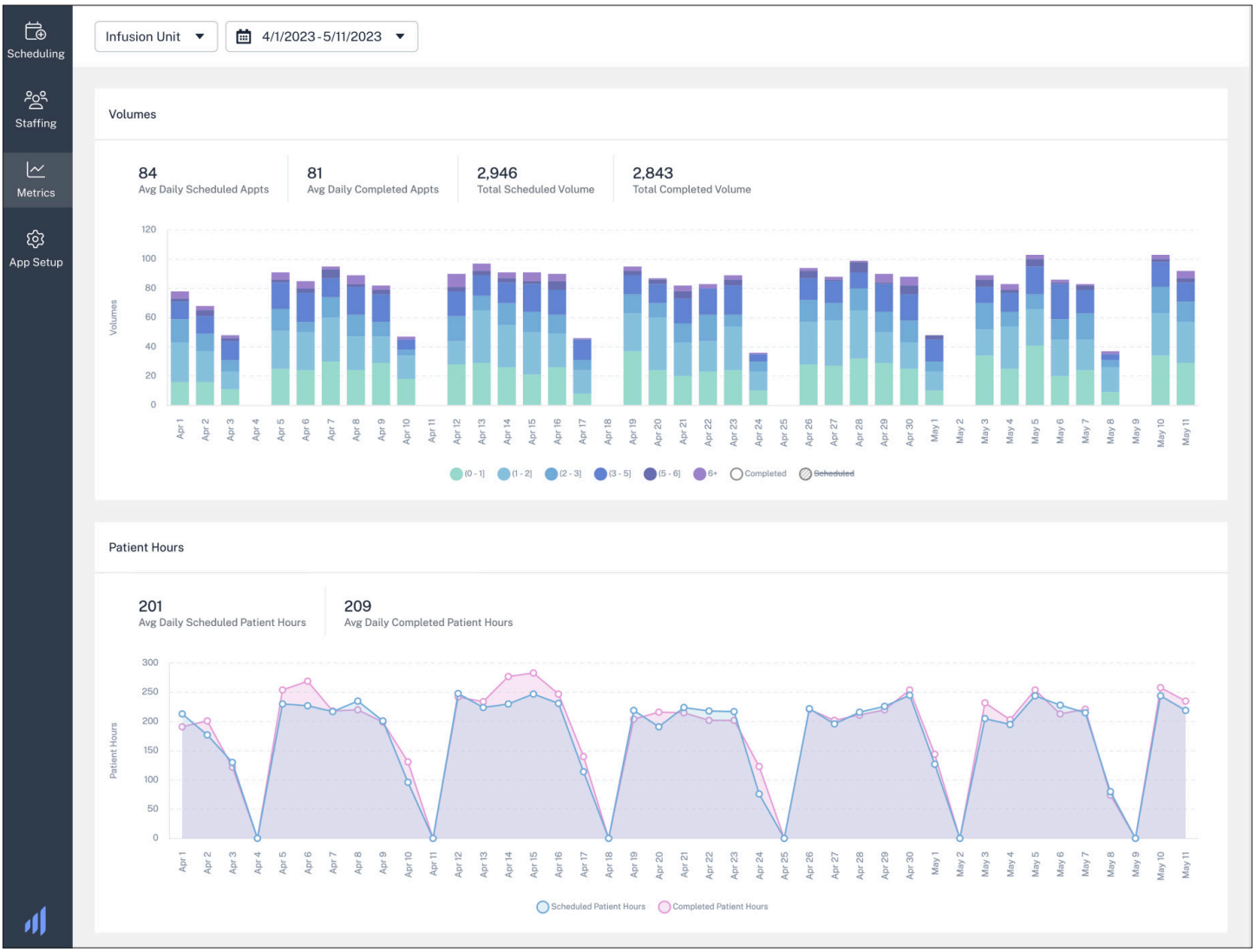
LOWE. We met weekly to review the data that was available with just a small amount of time since implementation, but it was several months before we could draw any conclusions from the initial data. It was 3 to 6 months before we met with LeanTaaS to review the results of our changes. We had frequent meetings back and forth and tweaked things, and worked on it. But finally, I think it was several months before we had enough data to potentially draw conclusions.

GYLTEN. Start with the basics. Then consider the additional features and enhancements as you get more comfortable with the platform. It took us at least a year before we could introduce the next phase or next step, so it's a continual work in progress.

BOELTER. We continue to meet with the LeanTaaS team on a regular basis and look at our data, looking at how we are performing. They will give us some suggestions or changes that have come along with Epic and their processes. LeanTaaS will also give us some suggestions on how to work with that and what our opportunities are. So. when we meet with them, they go through our dashboard with us, and they may say, "It looks like you're still bottlenecking at this time, and maybe this is the opportunity to fix that." It's a continual improvement process.

OI. What were the positive impacts this technology had on patients and your staff—from schedulers, infusion nurses, administrators, and others like pharmacy and labs?

Figure 4. Volumes and Utilization



Easy to understand retrospective dashboards help staff review past performance, and provide insights into cycle times, volumes and utilization, wait times, and add-on patterns.

BOELTER. It does help us utilize our resources, so we know where we are as far as availability. It's a kind of 1 stop if a provider calls and asks to squeeze in a patient. In the past, we would have squeezed the patient in, but it would cause chaos over here. Or we could say, "All right. Well, these are the people we can move around, so we can squeeze that patient in." So iQueue just gives us a little bit more of a bigger picture.

LOWE. I would like to add that as a result of iQueue data, from a pharmacy standpoint, we had dedicated time over the lunch hour to allow staff to get lunch breaks, which put a stop to starting chemotherapy patients during this time. We realized, because of the LeanTaaS data, that this staff break was causing a bottleneck and issues with treating patients when chairs were empty. We were able to add an additional technician, who could cover us throughout the lunch time. So, we were able to continue to prepare chemotherapy throughout the dedicated lunch period. And I think that was a good expansion of our services to help with the flow and getting more patients treated throughout the day.

GYLTEN. It confirmed for us that we have room for growth and capacity to take care of our community in the future, and that was good to know. When we had to decide on the number of chairs that we were going to add in our new expansion, it was a little nerve racking to think that decisions we made prior to implementing iQueue would impact our ability to take care of patients in the future, which was unknown at the time. So, knowing after implementing iQueue that we have room for growth and capacity in the future was a great outcome.

OI. If a cancer program or practice is considering using an AI-based technology solution to improve their infusion center operations, what is one insight or piece of advice you would offer them?

GYLTEN. Allow time for staff and the organization to trust and validate the data. People do their work in a way that makes sense to them, so when you add some type of new technology or change in workflows it can take a little time to become comfortable with the new workflows, processes, and data. Really look at what the data is telling you, validate it, and help staff understand what the data means and how it's calculated.

COLLINS. That was probably the biggest challenge. We knew what we could do in a day. It was difficult to let go of that. And then to see with LeanTaaS that maybe we can safely fit in a few more patients. The numbers and the data are in there. I think that is because I just trust the process.

SANDERS. The reporting capabilities we have talked about are great. We do review the data with the LeanTaaS group, but there are some good data that perhaps we could have a dedicated person use and look at.

LOWE. My advice is to embrace the process from the very beginning and learn as much as you can about it. There are a lot of benefits. I remember being overwhelmed at the beginning and thinking, "How are we going to implement this?" It just seemed like a lot of work, but it was worth it. And having accurate input regarding initial, current processes is important. Trust the process and technology, even though it may seem like it's not going to work when the technology first goes live. It is worth it; stay with it. OI

Maddelynne Parker and Chidi Ike are associate editors of Oncology Issues *in Rockville, Maryland.*

References

1. What was the state of cancer center operations in 2022? 3 key findings from a new survey by LeanTaaS and ACCC. *LeanTaaS* blog. December 15, 2022. Accessed March 15, 2023. https://leantaas.com/blog/what-was-the-state-of-cancer-center-operations-in-2022-3-key-findings-from-a-new-survey-by-leantaas-and-accc/

2. iQueue for infusion centers. *LeanTaaS* blog. December 15, 2022. Accessed March 15, 2023. https://leantaas.com/blog/what-was-the-state-of-cancer-center-operations-in-2022-3-key-findings-from-a-new-survey-by-leantaas-and-accc/