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When Cardiac Intensive Care Unit Medical Director Anthony F. Rossi came to Miami Children's Hospital in 2000, his goal was to make an elite program even better. Having previously used the *i-STAT® System* for point-of-care testing, Dr. Rossi knew that bringing the laboratory to the patient's bedside could improve care. Collaborating with colleagues, including Chief of Pathology and Laboratories Steven J. Melnick, PhD, MD, and Cardiac Intensive Care Unit Nursing Director Mary E. Ernst, RN, Dr. Rossi helped make point-of-care testing a reality at Miami Children's Hospital.

ESTABLISHING THE NEED

Question: *What prompted Miami Children's Hospital to implement point-of-care testing?*

Dr. Rossi: In the summer of 2000, I was recruited to Miami Children's Hospital, one of the finest pediatric hospitals in the country. It had an elite cardiac surgical program, one of the best in the world, and an internationally renowned cardiac ICU. I'll never forget the first time I met with Redmond Burke, one of our surgeons. He asked me this question: What should an outstanding surgical program aim to achieve in cardiac surgery in the year 2000? I knew that great programs were having about 5% mortality for congenital heart surgery and I answered that it would be outstanding if we could achieve 2%. Dr. Burke looked at me and asked, "Well, why not 0% mortality? Why would we ever aim to achieve anything but perfection when we're dealing with the lives of children?" I realized two things—that he was exactly right and that Miami Children's Hospital was going to be my new home because that is the kind of program I wanted to be part of. It was that simple.

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So I was at an outstanding institution and our goal was clear. All I could think was, "What can I add to this program? What can I do to make it better?" I realized that bringing the laboratory to the patient's bedside would make a difference. While working in another hospital, I had seen what point-of-care testing with the *i-STAT System* could achieve. Based on this experience, I knew that at Miami Children's Hospital, point-of-care testing could help us do what we do every day, but much, much better.

Question: *Dr. Melnick, as Laboratory Director, how did you approach implementing point-of-care testing?*

Dr. Melnick: We realized we had to look at the entire process of how our intensive care units (ICUs)—cardiovascular, pediatric, and neonatal—were being served. While our stat labs were very efficient, getting results was taking much longer than was appropriate. When a request was made, one of the technologists would actually go to the particular unit, obtain the

The results shown here are specific to one health care facility and may differ from those achieved by other institutions.

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blood, go back to the stat lab, run the sample, and then report the results. The stat lab was located outside the cardiovascular intensive care unit, but was a rather long distance from the neonatal intensive care unit. While it may not seem like five or ten minutes is a great deal of time, in the life of an intensive care patient, that's a very long, potentially unacceptable, amount of time. We realized that transitioning to point-of-care testing would help physicians and nurses care for their patients, so we worked in collaboration with them to make bedside testing a reality.

GAINING HOSPITAL-WIDE SUPPORT FOR POINT-OF-CARE TESTING

Question: *Dr. Rossi, when you started working to get point-of-care testing into Miami Children's Hospital, how did you gain buy-in for this new technology?*

Dr. Rossi: First I recruited our surgeons, helping them to understand how this was going to be important to the cardiovascular program. From their perspective, things had been going pretty well. I had to prove that point-of-care testing was going to be better for them. Surgeons are results oriented and they wanted to see real results, real quickly.

"If we were going to do this, it was only going to happen as a hospital-wide endeavor."

Next, I needed to sell the laboratory. Then I needed to make the case to the other intensive care units because if we were going to do this, it was only going to happen as a hospital-wide endeavor. The director of the neonatal ICU, the director of the pediatric ICU, and the director of laboratories all had to be on board with how this was going to be advantageous to the hospital. We needed to make it clear that this was going to be a true advantage to all. Hospital staff members were very comfortable with the current practice; they didn't really see a need for change. We needed to show them that this was not only going to be better for the cardiac ICU, and for patients in the cardiac ICU, but for every part of the hospital. People listened and showed a willingness to consider it. The *eureka!* moment at Miami Children's Hospital was clearly when the *i-STAT System* was brought to the NICU for a patient with critical lung disease. The NICU director was there; the nurses were getting the patient set up. They drew off the blood gas and the result was there before the ventilator was even completely set up, and the NICU director had all the laboratory tests he needed to adjust the ventilator. They realized that they had everything they needed to make every clinical decision almost immediately. They didn't have to wait 10 or 15 minutes to have it all. The head of the NICU said, "I want this today." And I think that changed everything. It was this kind of big, big rolling stone that couldn't be stopped.

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OVERCOMING OBSTACLES

Question: *What were some of the obstacles faced when considering taking on point-of-care testing?*

Mary Ernst, RN: From the nursing perspective, I think some nurses felt like they were getting more work pushed on them. There are always a lot of changes going on; we're always adapting to new equipment and bedside monitors and documentation, and this was another thing that nursing was going to have to do. Once the nurses understood how point-of-care testing would impact the patients, that made all the difference.

Dr. Melnick: When initially discussing implementing point-of-care testing, people in the laboratory are very concerned, obviously, that their position might be at stake: "If somebody else is collecting the blood and if somebody else is performing the testing, what is my role?" It's important to step back for a moment and look at how point-of-care testing fits into the role of the laboratory. The laboratory manages the entire

process from the time a sample is obtained from a patient to the point at which data are disseminated electronically to clinicians and nurses who manage those patients. Every part of that process between those two endpoints is highly regulated and under the control of the laboratory. We are responsible for quality control, assurance that there's reproducibility, and for meeting standards. So in principle it doesn't really matter at which point the testing actually occurs, as long as the process is effectively managed.

In fact, the roles of laboratory staff are in no way diminished if the samples are obtained outside the walls of the laboratory. The first thing that did happen in this process was that the stat labs were taken away as they were no longer necessary. We had been using a lot of relief staff, technologists from other hospitals who came in to help fill gaps. Instead, we were now able to use people who were already here to fill other responsibilities. No position was lost as a result of our eliminating the stat labs. And once people understood that their jobs weren't in jeopardy, there was a lot more buy-in.

Another hurdle we overcame from the lab perspective is the comfort level with the traditional size and bulk of analyzers. Whether it's a blood gas analyzer or a chemistry analyzer, you're looking at a heavy device with a very large footprint, either sitting on the floor or on a table. Then you look at the *i-STAT System*, which is about the size of an original cell phone or a walkie-talkie. Relative size was no longer an obstacle when staff realized that results and reproducibility from the analyzer and the point-of-care device are equal.

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Question: *Mary, how did you overcome the initial obstacles and encourage the nursing staff to embrace bedside point-of-care testing?*

"I think the main rationale that the nurses needed to hear and be convinced of was that it wouldn't be an additional burden on the nursing staff."

Mary Ernst, RN: The first thing we did was hold a team meeting with dinner for the nursing staff. They had heard about the change and were pretty resistant at first. Dr. Rossi got everyone together, got some questions out in the open, and explained what we were doing and why. This helped to set the tone that the staff would be able to try out the new device, see how it worked, and give feedback on it down the line. We also talked about our current lab process and everyone knew there were delays that we weren't happy with and realized things could be done in a better way. I think the main rationale that the nurses needed to hear and be convinced of was that it wouldn't be an additional burden on the nursing staff.

Question: *Dr. Rossi, how did you approach the nursing staff in order to gain their support?*

Dr. Rossi: There was no question that for this point-of-care testing program to work, it would have to be embraced by the nursing staff. These were going to be the primary users of the device and if they didn't buy into it, we had no chance of this ever working. The open forum was very helpful. I was confident from previous experience that the nurses were going to embrace this wholeheartedly, because every single person I had worked with previously who used a point-of-care testing device said, "This is outstanding; we should never do this any other way. Every other way is just more steps and takes more time and we'd never want to go back to that."

Question: *Dr. Rossi, what types of testing do you run in your department and why are these important at the bedside?*

Dr. Rossi: Our cardiac intensive care unit is for patients with congenital heart disease, from micro preemies to adults. The cornerstone of testing in these patients in an ICU is arterial blood gas, which we run on the *i-STAT System* more often than anything else. The results of these tests help clinicians make vital decisions. For example, a patient comes back from the operating room and you put him or her on a ventilator. You're using a different ventilator than the one they have in the OR and you're not sure if you're going to ventilate the patient exactly the way you want; ventilation is critical in congenital heart disease. Maintaining

a CO_2 in a range you think is optimal for that particular patient may be the difference between a patient having a pulmonary hypertensive crisis or not.

In addition to blood gases, our serial lactate monitoring program is essential. The problem with lactate monitoring up until point-of-care testing was that it took a couple of hours to get a lactate measured, and it was really cumbersome. You needed a lot of blood in a special tube to go to a central laboratory in ice, and by the time you got the results back, hours had passed. In a critically ill patient who may be going into shock, these test results almost became irrelevant, because either you had already made them better or they were a lot worse. The ability to say, "I want to know how this patient is right now" and to actually have that piece of information—"Oh, he looks okay, but his lactate is up; that could mean regional hypoperfusion"—that is so important for clinicians. Getting results at the bedside changes the way we approach the patient. Today, we have a proactive approach to patient care; the approach when we had to wait for things like blood gases and lactate was much more reactive. And so across the board our results are markedly better than we could ever have hoped for before point-of-care testing.

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KEY BENEFITS OF BEDSIDE TESTING

Question: *What key benefits have resulted from the use of bedside point-of-care testing?*

Dr. Melnick: The most immediate and tangible benefit was decompressing the laboratory, which was doing a large volume of stat tests before point-of-care testing. Eliminating this volume of stat tests means that the tests that were referred to the main laboratory flowed much more smoothly. Another important benefit is that we can manage all of the data from point-of-care testing, whether it's from the ICUs, the OR, or the emergency department. All these data are delivered through the hospital's information system, out into the web-based applications and other areas that are important to the hospital, including the fiscal programs that are attached to our laboratory system.

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Mary Ernst, RN: For the nurses, the greatest benefit over time has been improved outcomes. We feel like we're making good decisions based on reliable data that we can get immediately at the bedside. This empowers the nursing staff and allows us to back up what we're seeing with our patients. The nurses can get a lab sample and have those results immediately, then make changes based on that. You feel like you have a lot more control over what's going on with your patient. We really don't get any of the calls about needing to redo or redraw labs, or that something was clotted off. We know right then and there if our test was good or not good. And if we do need to redo it, we don't feel like it's negatively impacting the patient because we can get another test in two minutes, which is probably quicker than we could have gotten our first test sent down to the lab. So it's eliminated a lot of the delays, miscommunications, and opportunities for error in the communication and reporting process.

"We feel like we're making good decisions based on reliable data that we can get immediately at the bedside."

Point-of-care testing has also really improved communication between the nurse and clinician at the bedside, because we're not going in and out with making the calls and having to actively seek that

result. You do a lab with your attending at the bedside, and it's in your hand in two minutes, so they're right there waiting with you for that result.

Another way point-of-care testing has helped is in the volume of blood that we need. Sometimes it's difficult getting samples; it used to be 1 to 2 cc's were needed from a little neonate. This was not always the easiest task to perform, so now just being able to get 0.3 cc's for an accurate result has been a huge advantage to the nursing staff as well as to the patients.

CHANGES IN WORKFLOW

Question: *What differences have you observed from a workflow perspective after implementing point-of-care testing?*

Dr. Rossi: When I first came to Miami Children's Hospital in 2000, if I asked for a blood gas from the bedside nurse, he or she would fill out some forms, get some tubes, draw the blood, and fill the tubes. Someone would eventually pick up the blood sample, bring it to our stat lab, and the results ended up in our laboratory information system, which I could access by computer. Turnaround time was probably about 10 minutes from the time I asked for the test to the time the result was available. That would be if I was sitting at the computer, logged on and ready to access the test. Unfortunately, in an ICU, 10 minutes is too long to sit at one patient's bedside waiting for results. So normally you go off and do a bunch of other things. You don't want to access the computer too quickly because then the result wouldn't be available and you'd have to do the whole process again. And so you wait a little bit longer. You wait until you finish all your other things and then you'll get your blood gas result. If the turnaround time is from the time you ask for the test to the time you make a change, that may actually take 15 minutes, 20 minutes, or sometimes much, much longer if you got caught up in doing something else. But now, when I ask for a blood gas, the nurse draws it, then puts the cartridge in the machine and in only two minutes, we have our result. And those two minutes are spent at the bedside discussing what's happening with the patient. We're discussing what we think the results are going to be and when the results are available, what we think they mean and now what we have to do to make the patient better. It changes the process completely; enhancing medical care and enhancing communication between the team members really brings the team together.

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Mary Ernst, RN: There was a huge change in workflow from a nursing perspective and I think it was opposite of what we had anticipated. We felt like it might put more burden on the nursing staff and, in fact, it's helped to free up their time so that they can be at the bedside more with the patient and family, which is always a positive for the staff. There's been a definite improvement in the turnaround time. Combined with communication at the bedside, it has been positive for us. With the implementation there was also much improved collaboration with the lab team getting the whole system up and running, doing the training, and getting everyone to be on the same page with the results and accessing them.

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Dr. Melnick: The impact on workflow in the laboratory was significant. Much of the staffing that we had in our laboratory was relief staff. We were able to, through our cross-training of personnel, minimize the large volume of stat testing that was directed in the laboratory 24 hours a day, eliminate the relief staff, and rely exclusively on our full-time staff.

Point-of-care testing may also help with a looming problem: the continuing shortage of medical technologists. We are seeing fewer trained technologists because of fewer schools throughout the country, combined with the increasing average age of medical technologists. Point-of-care testing offers an effective way to manage this issue.

Question: *Were the roles of the laboratory and nursing staff expanded in any way as a result of point-of-care testing?*

Dr. Melnick: Yes, it was absolutely necessary to do so. Obviously, the laboratory has to be involved in the

quality, control, and proficiency testing as well as training of individuals to perform these tests. But this couldn't be done in isolation. It was fundamentally important to develop a strong sense of collaboration with nursing because we're all working on this together. It was our responsibility to ensure that nurses had the support of the laboratory and the resources they could rely on in terms of training, feedback, help, and calls. We ensured that there was a level of comfort and collegiality in this process so that point-of-care testing ran smoothly.

CONSIDERING COST

Question: *Is there a case to be made for or against point-of-care testing from a financial perspective?*

Dr. Melnick: Initially there is the question, "Is this going to cost more?" What's more important than the actual incremental cost is the care that's provided for the patient. If a patient can be more effectively managed with bedside testing, those incremental costs are immaterial. In fact, the ability to intervene in a patient's care when it is absolutely necessary without any kind of delay is going to have enormous economic benefit in addition to the obvious healthcare benefits that the patient derives. By more effectively managing a patient, not only are we doing the right thing, but we are also reducing the amount of additional care that the patient may need during his or her stay. Paramount to any of these types of financial discussions is doing what is necessary and best for the patient at the time that it's required.

"If a patient can be more effectively managed with bedside testing, those incremental costs are immaterial."

Dr. Rossi: Even as a clinician whose only focus is on best possible outcomes for my patients, I can't ignore the cost, especially in this economy. The cost of the point-of-care testing devices and the cartridges themselves was significantly more than the cost of the traditional stat lab laboratory tests, but looking at the cost of one test versus another doesn't really tell the whole story. For example, one adverse event in a single patient could add days to a hospitalization, which translates to $10,000 a day at least for a patient in the ICU. If I can prevent a patient from progressing down the path of low cardiac output syndrome or shock by identifying it very early, then I don't have to worry about all the bad effects of shock in that particular patient. The idea is not to address shock when it occurs; the idea is to prevent it. The idea is to have the data available to me as a clinician at the bedside, being able to make decisions rapidly when I need to.

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BEST PRACTICES FOR IMPLEMENTATION OF BEDSIDE TESTING

Question: *What advice would you give to a colleague who is interested in bringing point-of-care testing into his or her institution?*

Mary Ernst, RN: It's important to collaborate with colleagues to get buy-in. The best way is for staff to see point-of-care testing being used, see it in action in other institutions to really get a feel for how seamless it can make the process of lab testing and responsiveness and to look at some outcomes. Also important are communication with the lab team as well as coordinating the education, getting buy-in from the staff and all those involved so they understand the purpose of what they're doing and why they're doing it. Support during the training process is also important.

Question: *Would you consider going back to a stat lab now that you've implemented point-of-care testing?*

Mary Ernst, RN: I think that today, if you tried to take the *i-STAT System* away from us, there'd be an awful lot of resistance, probably a lot more than we had when we were transitioning to point-of-care testing. We really rely on it 100%. People feel good about having more control and being able to get the results when they need them. We really feel like we've improved our process, we've improved our outcomes, and we're happy with it.

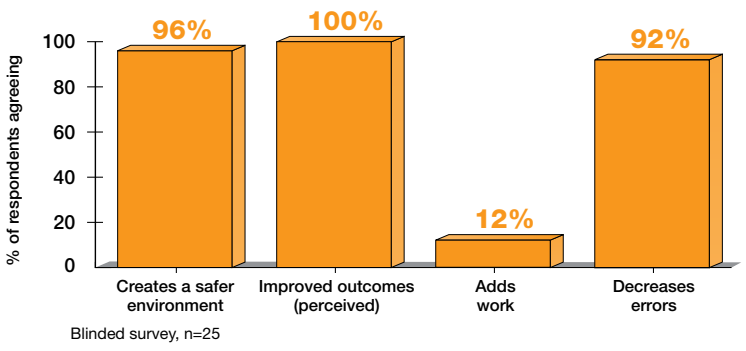
"When we asked if anyone would go back to a stat lab, not a single person said that they would ever go back to using a stat lab again if they had the choice."

Dr. Rossi: About a year ago, I conducted a survey and presented the results at Cardiology 2009 in Phoenix, Arizona. It was a blinded survey of the nursing staff that looked at their perspectives on point-of-care testing with the *i-STAT System*. Almost all said that point-of-care testing made their everyday life much easier, and that it decreased their workload. Almost everyone thought that point-of-care testing diminished medical errors. All of them thought that point-of-care testing improved clinical outcomes. When we asked them to grade the point-of-care testing device from 1 to 10, they gave it a 9.8. When we asked if anyone would go back to a stat lab, not a single person said that they would ever go back to using a stat lab again if they had the choice.

I use the analogy of a cell phone quite frequently when I get to talk about point-of-care testing: If there were a phone booth on every corner, would you give up your cell phone? Would that be more efficient? Everyone would say, "That's ridiculous, of course not," so when I think of point-of-care testing at the bedside I say, "Well, the stat lab is the phone booth. We need to get rid of that." Once you use the *i-STAT System* at the bedside you say, "I don't need the stat lab anymore." The stat lab was a 20th century solution to managing critical data in the ICU. Now it's the 21st century and we need to move forward.

Dr. Melnick: I think it's important to look at point-of-care technology as part of the evolution of laboratory medicine. We obviously wouldn't want to go back to a time that was less advanced in any area of medical technology. With point-of-care testing, we have a better way to achieve clinically important results in an intensive care or an emergent setting. So when we see advancements in technology in the laboratory, we should promote and support them and be the first ones out there actually advocating for them, because we are responsible for ensuring that testing is effectively managed for the betterment of all patients and the physicians and nurses in our institution.

Positive Survey Responses From Nursing Confirm Support of Bedside Testing



Blinded survey, n=25

Nurse Evaluation of the *i-STAT System* at Miami Children's Hospital

- 9.8 out of 10 average ranking for the *i-STAT System*
- 0 respondents said they would go back to using a stat lab

To learn more about the *i-STAT System*, visit us at www.abbottpointofcare.com.

For information about Miami Children's Hospital please visit www.mch.com and www.pediatricheartsurgery.com.

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