

Host:

This is the podcast from *Clinical Chemistry*. I am Bob Barrett. Automated notification systems help address an immediate and important problem that frustrates laboratory professionals: efficiently contacting a responsible caregiver and documenting that communication has taken place. Current practices of reporting critical laboratory values make it challenging to measure and assess the timeliness of receipt by the treating physician as required by the Joint Commission's National Patient Safety Goals.

The March issue of *Clinical Chemistry* reported on a multidisciplinary team of laboratorians, clinicians, and information technology experts, who developed an electronic system called "ALERTS," for broadcasting critical laboratory result to the pagers of caregivers. The ALERTS system was used on inpatients and eliminated approximately 9,000 phone calls a year made by medical technologists.

Overall, documentation of physician acknowledgment of receipt in the electronic medical record increased to 95% of critical values during a nine-month period, while the median time decreased to less than three minutes.

Dr. Edward Shultz, a coauthor of the paper is Associate Professor of Biomedical Informatics, Associate Professor of Pathology, and Director of Technology Integration at Vanderbilt University Medical Center in Nashville, Tennessee. He is a recognized leader in Medical Informatics, and is our guest in this podcast.

Tell us Dr. Shultz, the ALERTS system you describe in your paper operates independently of the Laboratory Information System, only using the results output. Wouldn't it be desirable for it to be part of the LIS itself?

Dr. Edward Shultz:

Yeah, that's a natural inclination to think that, but there is a few reasons why we think that our approach is a better solution. It really gives us a lot more power to deal with the workflow that's associated with critical value, not just the laboratory workflow, but the whole idea of closing the loop and getting that critical value acted upon.

So, for instance, critical value, if not responded to, can be handled by non-laboratory personnel, so we can include the operators as we did in ours. But also, think about it, if the clinician say doesn't respond or if he does respond, but we can actually look at our

order entry system, and say, hey, he didn't do anything about it, he didn't order a change in the medication or order a change in dosage or whatever. So we are able to actually close the loop much more effectively.

As a further example, he might go ahead and order a change, but then the nurse does nothing about it. So the critical PTT and we wanted to decrease the Heparin drip, perhaps he orders it, but then the nurse doesn't administer it, we are able to actually detect all of those things and to escalate that workflow to make sure that the optimal care is being given.

Finally, if I replace my laboratory vendor, the critical ALERTS will work on day one of the new system without any change or loss of workflow rules that have been hammered out over the years as to what's optimal. So it really gives us a lot more flexibility to decouple ourselves from the laboratory, but also to include many other systems that exist in our hospital and make them part of the general workflow.

Host:

Now, only inpatient critical values are handled by the system because analysis of an outpatient test typically are interspersed. Is it difficult or error-inducing for the lab to track the critical value they are responsible for compared with the ones being handled by the system?

Dr. Edward Shultz:

Yeah. That's a great question. We didn't mention that there was actually an ALERTS Dashboard in the laboratory. It provides the status in all the alerts. So if people are concerned, I wonder if people handle this, they can actually just look at that and see that someone is handling it, but in addition, there is a section on the dashboard that says, these are the alerts that you in the laboratory should be taking care of.

There is a couple of advantages for that. First of all, of course the outpatient stuff, in direct answer to your question, is all in that section, but also as we implement new parts of the laboratory or perhaps part of the outpatient area, gradually their list of things they need to take care of just keeps on getting smaller. So there is no educational overhead where someone has to come in and say, so, which tests are they covering today, I have to know what's in, what's out? The policy you have to worry about is, anything in their section needs to be called by them.

Host: Were there any nontechnical surprises or challenges that you encountered while implementing the system?

Dr. Edward Shultz: Yeah, it was interesting. Each group that was involved in this seemed to have a different set of business needs, and we didn't anticipate very many of them at all, sort of social intersections with the system.

The laboratory was surprisingly nervous about safe receipt early on and really knowing, that's why we put in things like letting them know exactly what the status of it is; it has been five minutes and they haven't responded, or it has been two minutes and they have responded, so they can see that confirmation. So that helped.

The operators that we had, as you recall, if someone does not respond after a certain period of time, operators pick it up and they start calling to make sure that someone will handle it. They really enjoyed this and felt empowered by having a new role in the hospital. Actually started a training program where they actually documented they finished the training program.

But other types of things we needed for them to feel comfortable with their workflow is, we gave them a big monitor that sits in the wall, so they can see from across the room that there is a brand new alert. And they actually hear a beep, because they are fairly busy with a lot of their other operator tests and to have this interruption is important, and not have it behind another application on their screen.

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Also we found out that it was really necessary to make sure they got a real-time alert when the doctor actually closed it by doing it. What would happen is, the operator would be sitting there trying to track down the doc, and the doc would go ahead and be confirming at the same time, so there was that disruption and communication, and by changing the system, we were able to satisfy their business needs.

One of the big surprises in this, we actually thought nurses would say, well, this is great, now I am not a meaningless middleman, where the laboratory calls me, and then I have to call the doc and close down on this, we thought they would be delighted to be out

of this role. But in fact, it was just the opposite. They said, I really feel like I am out of the loop now. I used to know when there was a critical value, and I could sort of nudge the doc if he wasn't doing something about it, but now I don't even know about it.

So what we did was we actually have an FYI pager, that is For Your Information, they get beeped on, actually they get it on their telephone, they have cellphones, so they actually know that there is a critical value, but they don't have to respond, but at least now they are in the loop. And that was really key for our success. One hundred percent of the alerts now actually go to a nurse in addition to the doctor who confirms that he got it.

Finally, the physicians, it was interesting, this is a new task. If you think about it, the normal scenario, the nurse would get the alert from the laboratory. The nurse would then page the doc. The doc would then phone the nurse, and then the doc would say, okay, go ahead and do a, b, or c. Go ahead and change this order, do whatever. So he was done with it. He never really had to interact with another system.

And we were asking them, no, you need to go to a touch-tone phone or you need to go to a computer and indicate you got it. So that was a new task, and they weren't quite sure that they saw the utility that early on. But by having the mobile entry points, we pointed out to them, you can go in to the order entry system and right there indicate you are taking care of it and close it out, and in addition, the seven-minute warning saying, it has been seven minutes and you haven't responded, and in three more minutes we are going to escalate it, really shot up their compliance rate in terms of closing the loop.

Finally, when the new residents came in, in July, we just sort of said, this is an expectation. So they didn't have the sense that this was a prior task that used to be handled in another way. This was like, this is the way we do business here. And after that we really got well into the 90% in terms of the physicians being compliant and helping us out with closing the loop.

Host:

Now, you mentioned that the system is not available commercially. Do you expect this to change?

Dr. Edward Shultz:

Well, I will tell you, I have gotten this question from a number of people. One of the things that we actually had here in terms of internal infrastructure was the idea of a team pager. That is, every time a patient comes into the hospital or gets transferred or whatever, he has a pager number that's associated with him.

Now, that pager number doesn't just go to an individual, it goes to a pager or is rolled to a pager of someone who is covering for that individual patient. It's active 24 hours a day, and it just happens to notify a different clinician when it occurs. Without that piece, this whole system of ALERTS would not work.

That particular piece is idiosyncratic to Vanderbilt. A lot of other people have different ways of contacting their physicians, or they have a manual workaround. As a matter of fact, we had manual workarounds before, as I have described, with the nurse knowing who was covering.

So because of that piece being idiosyncratic to Vanderbilt, while the rest of it, I think, is eminently exportable and usable by other hospitals, they would have to have that piece done locally.

In short, we think that the package isn't complete and useful the way it is, but if a vendor came along and said, hey, we are going to handle the covering pager numbers and we want the rest of it, then we would certainly talk to them about the idea of exporting the technology.

Host:

Dr. Edward Shultz is Associate Professor of Biomedical Informatics, Associate Professor of Pathology, and the Director of Technology Integration at Vanderbilt University Medical Center in Nashville, Tennessee. He has been our guest in this podcast from *Clinical Chemistry*.

I am Bob Barrett. Thanks for listening.

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