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Stefanie K. Forest, et al.
Automated Laboratories: When Technology Needs a Human Touch
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Guest: Dr. Stefanie Forest is a fellow at Memorial Sloan Kettering Cancer Center and will begin as Associate Director of Clinical Chemistry and Immunology at Montefiore Medical Center in July 2018.

Randye Kaye: Hello, and welcome to this edition of "JALM Talk" from *The Journal of Applied Laboratory Medicine*, a publication of the American Association for Clinical Chemistry. I'm your host, Randye Kaye.

Laboratory automation holds the promise of enhanced workflows, improved efficiency, and decreased turnaround time, while mitigating an environment of rising costs, constrained resources, and staffing shortages. Many publications tout improved outcomes from laboratory automation but realizing these results may not come easily.

"Automated Laboratories: When Technology Needs a Human Touch" was published in the May 2018 issue of T*he Journal of Applied Laboratory Medicine*. This work reflects on one lab's experience with a challenging implementation of laboratory automation. Several unanticipated outcomes were encountered that required investigation to improve laboratory turnaround time.

The first author is Dr. Stefanie Forest. Dr. Forest completed her clinical pathology residency at New York-Presbyterian/ Columbia University Medical Center. She is currently a fellow in Laboratory Medicine at Memorial Sloan Kettering Cancer Center and will begin as the Associate Director of Clinical Chemistry and Immunology at Montefiore Medical Center in July 2018.

Welcome, Dr. Forest. First question, what prompted you to look at troponin testing and turnaround time at your institution?

Dr. Stefanie Forest: It's an interesting story. So the idea for the original study came from several papers published, including a *New England Journal of Medicine* paper in 2008, entitled "Cardiovascular Events During World Cup Soccer." They looked at acute cardiovascular events in the Greater Munich area during the World Cup and found that viewing a stressful soccer match more than doubles the risk of an acute cardiovascular event. We sought to see if there is an increase in either the number of troponin orders or positive troponin test results during the time period of the 2016

United Sates presidential election compared to the 2012 presidential election and the same time period and years between.

We did not find an increase as we hypothesized. However, we did take a closer look at all this data that we pulled including troponin test volume as well as turnaround time. So, we started looking at the data to see if there is an increase in troponin orders during the presidential election and then we realized there was an interesting and more relevant story here, which is that of the increased turnaround time after automation that responded to a human pre-analytic effect.

Randye Kaye: Wow, that's so interesting. So, what were some of the potential pitfalls that you identified that could have contributed to this increased turnaround time following automation?

Dr. Stefanie Forest: Well, there was a massive change in specimen processing and workflows. In the old laboratory, there is a designated stat area in which most troponins were received. These samples were centrifuged in the stat area and loaded directly on to the instrument for analysis. However, in the new laboratory, there was a central processing area and all samples were loaded onto an MPA, or modular pre-analytic system, therefore, there is no priority in loading these troponin samples.

In addition, once on the MPA, there were centrifugation limitations. In the stat area of the old laboratory, there was centrifugation capacity for 88 samples. However, in the new automated laboratory there is capacity for only 80 samples to be centrifuged on the MPA, creating a bottleneck effect. In addition, tests were combined to one tube so there was no visual queue that the specimen contained a troponin test since it can be in a shared tube with a basic metabolic panel for instance.

The automated laboratory took over several assays from the specialty laboratory to offer them 24 hours, seven days a week, and with this expanded test menu design created some throughput issues as well.

Finally, we didn't anticipate how sensitive the MPA would be to improper labeling and therefore, when we -- even just one tube improperly labeled in the rack, the whole rack would be kicked out resulting in a delay in processing.

Randye Kaye: Wow! So can you tell me about some interventions that the laboratory has done or is considering in order to reduce the troponin turnaround time?

Dr. Stefanie Forest: Absolutely! So the main intervention, which was quite effective, was changing the troponin tube from a gold topped tube to a mint green topped tube to serve as a visual queue that this is a troponin and should be prioritized. Other interventions that could be considered include getting an additional chemistry line, although there are some space restrictions that make this challenging. An additional centrifuge for the line is also being considered. There can be a designated stat line or better utilization of centrifuges with manual loading rather than depending on just those two MPA centrifuges. And a separate instrument for troponins could also be considered to streamline troponin testing.

Randye Kaye: Now, your study looked at turnaround time as a metric. Are there any aspects of turnaround time that should be considered?

Dr. Stefanie Forest: Well, one important factor is that the turnaround time we measure in labs is "received to result" since that's what we can control in the laboratory and a metric that we can easily obtain. However, clinical staff often perceive turnaround time from "collect to result" since that is often what is most relevant to them and their patient. In addition, the received time in the automated lab is registered by the MPA since it -- in labs, the specimen, which should be placed on the MPA as soon as the sample arrives in the laboratory. However, in the previous manual lab, accessioning and in-labbing the specimen is a manual process.

So, it can result in somewhat falsely low turnaround time value from receipt in lab through results if for instance the specimen was sitting around in the laboratory, before it was manually accessioned.

Randye Kaye: I see. So if there are other laboratories that are looking to move towards automation, what advice do you have to give them?

Dr. Stefanie Forest: So I would say for other labs, they should really consider workloads such as the manual processing of a stat area and the possible limitations of automation. It's important to discuss experiences with other laboratories that made a similar transition. It is also important to do a thorough assessment of test volumes at various times throughout the day, week, and year to make sure the system offers enough capacity even during peak testing.

Randye Kaye: All right! Thank you so much for joining us today Dr. Forest.

Dr. Stefanie Forest: Thanks for having me.

Randye Kaye: That was Dr. Stefanie Forest, a fellow in Laboratory Medicine at Memorial Sloan Kettering, talking about "Automated Laboratories: When Technology Needs a Human Touch," from the May 2018 issue of JALM.

Thanks for tuning in for "JALM Talk." See you next time and don't forget to submit something for us to talk about.