

COMMENTARY ARTICLE

COVID-19 Experience 2020: Changes in the Laboratory Environment

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Declaration

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During the few months of the Corona Virus spread in Asia and into other parts of the world, the Laboratory community waited to see how this would impact the lab operations here in the United States. Truthfully, no one envisioned the changes that would follow. We saw the first request for a PCR on a possible case on March 13th. The exposure information was limited but everyone held their breaths and sure enough it was positive. Immediately, the explosion started with 20 requests on Day 2. Eighteen of them were positive, so it confirmed that this was not a random event and we truly had COVID-19 in the community. The number of calls that were handled during the next several days were unbelievable. The requests for immediate testing was uncontrollable. Everyone wanted the test results in an hour. Obviously, that could not happen with the length of time to process and test using sophisticated molecular techniques. In addition, we had panic calls such as a need to test an organ donor that was providing multiple organs to recipients and had to be tested to ensure that COVID-19 was not present. We accomplished this whole process from call to report in under five hours. Multiple calls were for providers that had seen a patient with COVID-19 and now showed symptoms or had a febrile condition. The number of strange calls for testing alone could be in a book. The biggest fear was from our partner hospitals who envisioned being overwhelmed with cases and clinics that were potentially shutdown for exposures to providers who were then quarantined. By the end of March, we had already tested nearly 26,000 people and we reported greater

than 1,700 PCRs a day with a 7.8% positive rate.

April came in with a bang with cities closing down, clinics limiting patient visits, elective surgeries being cancelled or delayed, and drive through testing became the norm. Although the amount of testing was magnificent numbers, the rate of infection detected remained in the 7-8% positive range. Antibody testing was released and the expectation that it would mirror the PCRs, the amount of utilization during the early period of the pandemic did not occur in our area of the country. By the end of April, we had tested nearly 139,000 people by PCR, with nearly 113,000 done in April. The positive rate for April was 7.6% and we were now testing nearly 4,000 patients per day. Again, no one had envisioned such a storm for the clinical laboratory. Swab shortages, viral transport media became a premium, and all laboratories began to look for options to handle the greater testing volumes that were almost consuming.

In early May, the controversial re-opening began and all the laboratory community held their breaths again. Many states allowed the re-implementation of elective procedures and enforced a COVID-19 PCR status prior to the surgery being performed. Several states started at a “within 48 hours” rule which created yet another storm for logistics to support rural hospitals and surgical centers for testing within such short windows. This resulted in a surge of testing of over 2,000 pre-op cases per day. We expanded to nearly 6,000 PCRs per day. The requirements of the patient to present within the window for testing, transport and

testing did not always work, so unfortunately, we saw a limited number of cases that were delayed. Another major obstacle was imposed by the pre-op testing, as the surgery centers were not typically equipped with staff that could collect nasopharyngeal swabs. Many adjustments were made to acquire the specimens, get them to the lab and test within the short windows. During the month of May, we tested nearly 179,000 people for a total of nearly 318,000 people. The positivity rate dropped during the month of May to 5.9%. This may be due to several reasons, the surge in pre-op patients being tested as well as the emphasis on testing asymptomatic people. Another factor may have been the flattening of the pandemic due to the shutdown and the emphasis on social distancing and group avoidance.

During the midst of the pandemic, we had opportunities to work closely with a number of state and county health departments with testing nursing home residents, businesses with outbreaks, and correctional facilities where outbreaks had been detected. These all posed different requirements for the laboratory. One major issue was that these facilities were unable or not sufficiently equipped to provide electronic orders and electronic results, so we had a decline in electronic orders that required manual entry in the laboratory and created a nightmare of faxes going back to various facilities. It reiterated the need to have a stronger electronic connectivity which could facilitate a laboratory operation without disruption as we experienced during the early phases of the pandemic. Another major factor that created a bottleneck was the reportables to multiple state health

departments. The various states had different reporting requirements and the sheer volume of reports created a requirement to move quickly to an electronic format. In retrospect, had these efforts been addressed prior, the sentinel community laboratories would have been much more effective in reporting timely numbers to the state epidemiology efforts. Another impact that we had not anticipated was the need to report local and regional data to the municipalities. The numbers reported to the State were delayed until verification contact was made and this may have required a day or more between the reported case from State to City. We corrected that with a local reporting format similar to that used for the State. Another issue that became apparent early in the pandemic was the lack of capabilities to handle large volumes of tests within the State Health Department Laboratories. Although the volume of early testing was handled by the “State Labs”, it became apparent that they did not have the surge capacity to withstand the volumes required for mass testing. Three states relied heavily on us to provide additional testing with high volume throughput. Many Metro and County Health Departments sponsored drive through testing and created large numbers of tests to be done. These too were manually ordered and until we provided an alternative electronic look up, we had thousands of faxes being sent.

Another major impact was the mass testing in correctional facilities and nursing homes. These outbreaks were major threats to these populations. In one incident, we tested hundreds of inmates in a correctional facility and immediately they responded with segregation of positive and negative cases

and stopped the spread of the virus immediately. For nursing homes, the vulnerable population of elderly was a major threat of increased mortality. In our area, most of these facilities have used large national or regional labs that specifically deal with nursing homes and with the cuts in reimbursement given to the independent clinical laboratories, we were unprepared to handle the complex billing and limited reimbursement for testing in these skilled care facilities. We adjusted to work with them but the lack of specialty nursing home labs to respond was clearly due to the reimbursement issues created by Protecting Access to Medicare Act (PAMA). They were not prepared to offer complex molecular testing as their profitability in the pre-pandemic era has been threatened by the reimbursement mismanagement under PAMA. In some cases, it took these specialty labs months to gear up to test internally and some of the national labs provided little support for them during the early phases of the pandemic.

During the month of June, we tested 213,661 patients for COVID-19 by PCR. We were constantly pressed for turnaround times, as were many laboratories across the country. At various stages, this caused a serious backlog for routine testing. Following the Memorial Day weekend, approximately 14 days later, we started seeing increased cases and another spike occurred. Many municipalities implemented masking by executive order or through health department directives. Compliance was limited in the early stages through the month of June. The media continued to promote masking and surveys were completed to evaluate

compliance. However, the number of cases continued to rise. By the end of June, we saw levels of 12-14% positivity across the entire region. There were hot spots in major municipalities but in general the virus was fairly widespread.

As we entered July, the laboratory industry was hit again with manufacturers that could no longer produce enough reagents for the PCR tests. One actually had a decline in agreed shipment by 40%, stating that they could not produce enough reagents to maintain the level of throughput we had agreed upon in March. Another manufacturer had a supply issue with plastic plates for PCR testing and another had a shortage of pipet tips for their automation. All this led to the clinical laboratory decreasing its throughput, which was required for the turnaround times that was expected. We turned to prioritization testing for hospital critical cases, health care worker exposures, and pre-op testing. Ultimately, the laboratory had to look at alternatives to compensate for lack of support from the manufacturers. The concept of pooling low prevalence populations was adopted. FDA came out with some vague guidelines for submitting an EUA to them for approval. This included a series of 30 positive patients that were in pools of negatives and was still detectable in the pool without decreasing the sensitivity of the PCR. FDA required the same for a group of negatives. Ultimately, we determined a pool of five patients worked well and submitted data to support the use of pooling when the selected population was below 5% positivity. This concept was very successful except when high-risk patients were slipped into the pool by clients not

understanding the differences in priority testing versus pooled testing.

By the beginning of August, the Laboratory had tested over 700,000 patients from the Mid-South and was planning the next phase of testing when surges were anticipated. More efforts were being considered for back to work, school opening, and monitoring selected populations such as athletes. One manufacturer changed its testing protocol, which facilitated the potential for cross-contamination immediately before testing the PCR. This was caused by a surfactant in the lysing agent, which created a bubble in the tube. The bubble rupture was just strong enough to aerosolize a small amount of fluid to the adjacent tube, ultimately causing potential for a positive to create a second positive in the adjacent test. The Laboratory nightmare was created by reviewing every step of the specimen collection, processing, and testing until we recognized the surfactant impact.

The manufacturer was very cooperative in working with us to ascertain the root cause. However, this did facilitate changes in pre-analytical protocols.

In summary, the Clinical Laboratory experience during the COVID-19 pandemic has changed the entire perspective of the laboratory operations. The significance of the accurate and quality data from the laboratory has never been more evident. The lack of readiness of our sentinel laboratories in the United States was also more than evident by the slow response to testing volumes required by this pandemic. The future is clearly uncertain as this pandemic continues but highlights that a simple infection that can spread across the world impacting more than 19 million people thus far, also highlights the need for healthcare facilities to be prepared for such events and the laboratory must lead the way in effective and timely testing options.