

## Aerosol-generating Procedures and Decision Drivers for COVID Pre-procedure Testing

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### ABSTRACT

**Introduction:** SARS-CoV-2 is thought to spread between individuals in close contact, primarily through respiratory droplets, including asymptomatic individuals [1,2]. The virus has been shown to persist in aerosols for hours [3]. Aerosol-generating procedures may increase the risk of transmission to healthcare providers, potentially putting dentists and patients at greater risk of exposure [3]. Current CDC guidelines for dental professionals include: N95 or higher-level respirator use during aerosol-generating procedures; COVID screening and triaging of patients; hand and respiratory hygiene best practices; facility updates; and physical distancing. The CDC also recommends considering pre-procedure testing identifying pre- and asymptomatic patients [2].

**Methods:** In June 2020, New Jersey health centers Zufall Health and CHEMED implemented COVID-19 testing prior to aerosol-generating dental procedures, along with other protocols, as part of the safe reopening of their facilities. They utilized screening and testing to safeguard dental staff and patients, to calm anxious front-line employees, and to facilitate patient follow-through on dental care. In September 2020, the centers undertook additional process improvements to determine the continued viability of pre-procedure COVID testing in their dental facilities.

**Results:** From September 2020 to March 2021, the centers found parity between their COVID testing methods. Testing results were similar, indicating very few asymptomatic dental patients tested positive. Staff treating patients later determined positive for COVID were not infected.

**Conclusions:** In an area of low, moderate, and high transmission, providers can feel confident that stringent adherence to recommended COVID precautions can safeguard staff and patients, including during aerosol-generating dental procedures. While testing is an important public health tool and helpful in reassuring staff and patients, one center determined it was no longer necessary to the safe and effective delivery of dental services. By the completion of the project, the other center was evaluating halting pre-procedure testing, and has since stopped testing.

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## Keywords

CDC precautions, COVID-19, Dental services, Manage anxiety, Pre-procedure testing.

## Introduction

Early in the pandemic, in the spring of 2020, New Jersey and other northeastern states led the US with high COVID-19 transmission rates. After strict lockdown measures reduced the number of infections [4], two New Jersey federally qualified health centers (FQHCs) serving areas severely affected by COVID reopened their dental units with skeleton staffs to provide emergency services, without aerosol-generating procedures, to adult and pediatric patients. The goal for Zufall Health and The Center for Health Education, Medicine and Dentistry (CHEMED) was to preserve human and financial resources of area hospitals already strained by coronavirus care by helping reduce the number of dental patients presenting with oral health problems at emergency departments [5]. Poor oral health is linked to heart disease and diabetes, as well as to poor health outcomes for mothers and infants, and can be life-threatening. Preventing oral health problems and the infections they can cause are especially important during a pandemic [6-9].

Per evolving state and national guidelines, Zufall and CHEMED implemented rigorous COVID safety protocols: reduced patient scheduling; air ventilation modifications; PPE (including N95 masks and head/face shields); respirator mask fit-testing for staff; masking, distancing, and frequent hand-washing/sanitizing; stringent cleaning; reconfiguration of entries, exits, and waiting rooms; workflow flexibility, and daily patient and staff screening for symptoms, including temperature checks.

But in June 2020, Zufall and CHEMED opted to go beyond official guidance on prevention best practices and began conducting COVID testing in asymptomatic pediatric and adult patients who were also screened prior to aerosol-generating procedures in their dental facilities. They were two of the first healthcare centers in the state of New Jersey to add pre-procedure testing. The centers added testing to protect dental patients and staff from infection, reduce front-line provider anxiety about exposure, and encourage patients to schedule needed and preventive oral healthcare, especially those who were high risk due to comorbidities or age. Additional goals included measuring the actual vs. perceived level of infection in patients, observing the impact of testing on the health and peace of mind of staff and patients, and determining the viability of COVID protocols in the safe reopening of healthcare clinics in communities where there were fluctuating levels of virus transmission: Mild, Moderate, and High.

Zufall Health initially administered the Quidel Rapid Response test to asymptomatic patients prior to procedures. This test has a 15-minute turn-around and estimated accuracy of 80%. Because of limited access, other patients received the PCR test (polymerase chain reaction technology), with its standard two- to seven-day response. Patients testing negative received oral health treatment. Patients testing positive were sent home to quarantine and results

were entered into the state system to activate contact tracing. Zufall followed up with positive patients to connect them with a medical provider.

Starting in June 2020, CHEMED required a negative PCR test prior to treatment. Asymptomatic patients with a negative PCR were allowed to continue necessary treatment for up to 30 days without repeating testing; the test had to be negative within one week of aerosol-generating procedures. This test delivers nearly 100% accuracy and takes two to seven days to report results (longer during peak virus transmission). Approximately, 50% of PCR testing was completed on-site and 50 % was completed at other facilities. Untested patients who arrived for treatment were accommodated on an emergency basis, but only for non-aerosol-producing procedures (oral health cleanings, x-rays, etc.). Initially, CHEMED did not accept rapid testing results. Appointments of patients who tested positive were canceled, reported, and followed up. Patients thought to be COVID-positive on temperature or question screening were not seen, and were directed to a different workflow for testing.

Over the last six months, September 1, 2020 to March 1, 2021, the two facilities made further process improvements to discern decision drivers for next steps as the world prepared to enter year two with coronavirus. These additional process changes and analyses were under taken to measure the impact of healthcare protocol change on not only transmission rates, but also on patients' confidence and peace of mind, and staff morale and performance. Ultimately, the centers wanted to determine the viability and utility of continuing pre-procedure COVID testing of patients as part of the safe and healthy delivery of services in a dental facility using proper PPE and other standard COVID precautions, per CDC guidelines.

## About Zufall Health Center

Zufall Health Center is an FQHC founded in 1990. In 2019, Zufall served 39,763 patients in northwest and central New Jersey, including 9026 unique children, with 145,000 visits across nine sites, including two mobile units. There are seven dental offices. The health center serves a low-income, medically underserved population, with a special focus on homeless individuals, public housing residents, and farm workers: 83% of patients are below 200% of the federal poverty level, 52% of patients are uninsured, 67% of patients are Hispanic, and 61% of patients are best served in a language other than English. Pre-COVID, Zufall accommodated 3727 dental visits a month. After the early pandemic closures and limited opening for emergency care only, services have been steadily increasing, with more preventive care and procedures on more patients. The facility is currently at 89% capacity and expects to return to 100% by the fall of 2021. The number of dental visits at the end of the process improvement assessment period (February 27, 2021) was 2115.

## About CHEMED

CHEMED, an FQHC in operation since 2009, provides comprehensive health, medical, and dental services to private,

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uninsured, and underinsured patients in Lakewood, New Jersey. In 2019, CHEMED served 48,410 patients, including 24,380 unique children, with 187,974 visits across three sites, which includes a mobile unit. The mission is to increase access to care and to improve the health status of underserved and vulnerable populations through outreach, disease prevention, and patient education activities. Of these populations, 71.2% are on Medicaid; 3.04% are on Medicare. The percentage of uninsured patients is 8.04, and 8.62% is best served in a language other than English. Pre-COVID, CHEMED logged approximately dental 2800 patient visits per month. Since reopening in June, the number of dental visits has been steadily climbing, and was at 2073 at the end of the process improvement measurement period of February 27, 2021.

## Methods

### The Service Landscape

Zufall serves the Northwest and Central West areas of New Jersey. CHEMED serves the Central East. During the six months of their process improvement (September 2020 till March 2021), the state of New Jersey, including the areas Zufall and CHEMED serve, experienced Low, Moderate, and High COVID-19 activity levels. There was a brief period of Low activity for 4 weeks (case rate of less than 1 daily new COVID case per 100,000, and a positivity rate of less than 3%). There was Moderate activity for 8 weeks (case rate of 1 to 10, with a 3 to 10% positivity rate). The state experienced High COVID activity levels for 15 weeks (case rate of 10.01 to 25, and a positivity rate of 10.01 to 20%) [10].

### Process Refinements and Changes

From September 2020 until March 2021, both facilities provided a full range of services, including aerosol-generating procedures (cleanings, restorations, fillings, surgical extractions, etc.). Zufall changed its protocol slightly to include using a different rapid response test on asymptomatic patients prior to aerosol-generating procedures. Test results were valid for three days. While the PCR test was more accurate, especially compared to the Quidel Sofia II Antigen test in use at the time with its reduced sensitivity on asymptomatic patients, the facility chose to continue with rapid testing because staff was more reassured by seeing immediate test results. In the event of staff exposures, the center improved their process based on the most current guidance to wait five days instead of two days to test staff.

CHEMED responded to the community—both outside and inside the organization—and shifted its protocol, moving from PCR testing to rapid testing (Abbot BinaxNOW and BD Veritor Plus) on September 29, 2020, with full deployment by October 15. The testing protocol was changed because it was a time of Low incidence of COVID in the service area, (10) PCR testing was revealing very few positive results, and dental staff anxiety levels were high. Staff was anxious, not only about the PCR results turnaround of two to seven days (and possible community exposure in the meantime), but also about the center’s “shelf life” of PCR test results, which were valid for 30 days. The 30-day period was felt to be excessively long in a time and geographic

area of elevated community transmission. Also, due to tremendous demand for testing, PCR results were delayed as long as nine days, dramatically decreasing the practical utility of that testing modality. With the process change to rapid testing, patients were instructed to arrive 15 minutes early for testing before appointments. Every patient requiring dental service received the rapid test, although a few underwent PCR testing at outside facilities. By October 20, CHEMED was administering 30 rapid tests a day. The center continued screening patients, including a temperature check. Rapid test results were valid for one week. CHEMED improved the process further by streamlining procedures, separating testing from the dental department to a dedicated testing area.

### Staff Engagement

Both facilities understood the value of staff engagement in the refining of processes and procedures. Regular meetings, open discussion, sharing, ongoing training, and feedback were critical to protocol success, particularly around switching testing brands and types and the “shelf life” of patients’ test results. These conversations were especially vital in the assessment of the viability and utility of continuing pre-procedure COVID testing in asymptomatic patients.

### Measurement and Evaluation

Both facilities developed new EMR digital dashboards, trackers, and IT solutions, recording patients’ test results daily into electronic records and uploading results for patients who were COVID-positive into the state of New Jersey’s system to launch contact tracing. Both centers followed up with patients who tested positive. CHEMED, which served an area of the state severely impacted by COVID, assessed community metrics every week in order to quickly adjust workflow and patient appointing if community infection rates rose. CHEMED staff completed contact tracing.

### Barriers and Challenges

#### Zufall

Zufall found adding pre-procedure COVID testing was costly to implement, time-consuming, resource-intensive, and difficult. More than a process change, it was a paradigm shift to adapt facilities, reconfigure workflow, add testing, and invent new IT, procedural, and personnel systems and training.

A second challenge Zufall faced centered on reassuring anxious staff about possible exposures. Sometimes, staffs were inadvertently exposed to a patient seen at one appointment who tested positive for COVID at the next appointment a few days later. Another issue was managing patients who visited the center for treatment, tested false negative, and were later found in the state system records to have tested positive at another site a day or two earlier. An additional roadblock was asymptomatic patients or their family members who tested positive not being willing to follow quarantine protocols. Because they had no symptoms and were experiencing financial pressure, these patients continued to work and keep appointments, which, again, put staff at risk.

Health literacy was also a challenge. Some patients were confused about what “symptomatic” meant: they did not mention having sore throats and congestion until receiving a positive COVID test result, assuming symptoms resulted from allergies or the common cold. In another instance, a pediatric patient tested positive, yet her mother came in for a dental appointment the next day, not understanding that she too needed to quarantine. These types of challenges reinforced the value of patient screening, and the importance of improving health literacy by keeping the screening questions clear and simple with a list of specific symptoms for patients to respond to: fever, chills, cough, etc.

### CHEMED

CHEMED faced a number of barriers: the biggest was operating without an official dental director for a period of time. Without internal leadership, it was difficult to curb staff’s legitimate fears, work together to formulate a plan, and move forward in a cohesive and unified direction. The CMO assumed leadership, with dental input, meeting with dental staff regularly to address concerns.

Another challenge was responding to staff fears about exposure to the virus during their interactions with patients. Concern about the exposure risk associated with the turn-around of PCR test results (two to seven days, and longer at peak community infection periods), as well as the center’s policy of validating those test results for 30 days, drove process change.

The center mediated those concerns by swiftly switching to the rapid test. While dental staff felt more comfortable with this process improvement, there were still concerns about the test result “shelf life”: the new policy validated rapid results for a week. Staff preferred patients to undergo rapid testing at every visit, which resulted in complaints from patients about too much

testing. CHEMED had experienced patients’ COVID fatigue during the summer as well. Another point of contention was patients complaining about returning outside of the one-week test validation period and having to get another COVID test to finish a dental procedure. Also, as more and more area dental offices opened and were offering services without testing, patients complained about CHEMED’S testing requirement.

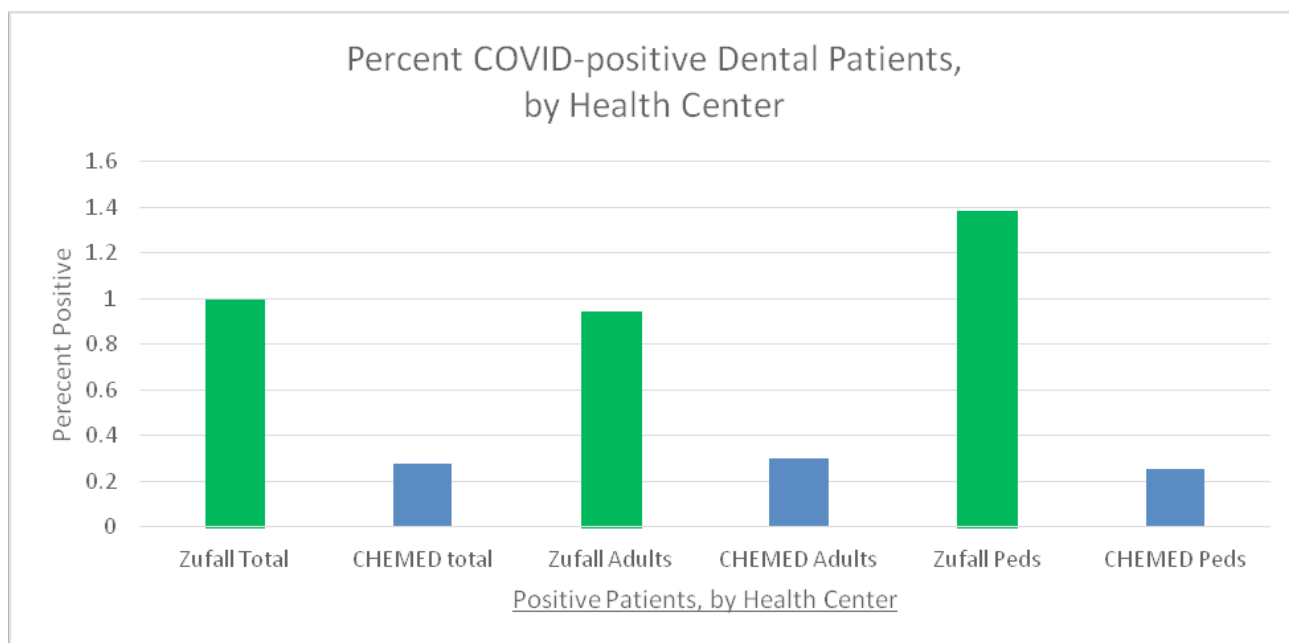
CHEMED’S streamlined procedure that channeled patients directly into testing prior to their dental appointments was not a perfect system. Some patients wanted testing in the dental department instead of the medical department. Also, because it took 15 minutes to get a rapid result, asymptomatic patients could return to the dental treatment area before the test result came in, potentially exposing staff. The center improved the process by securing test results prior to moving patients to the dental chair.

### Results

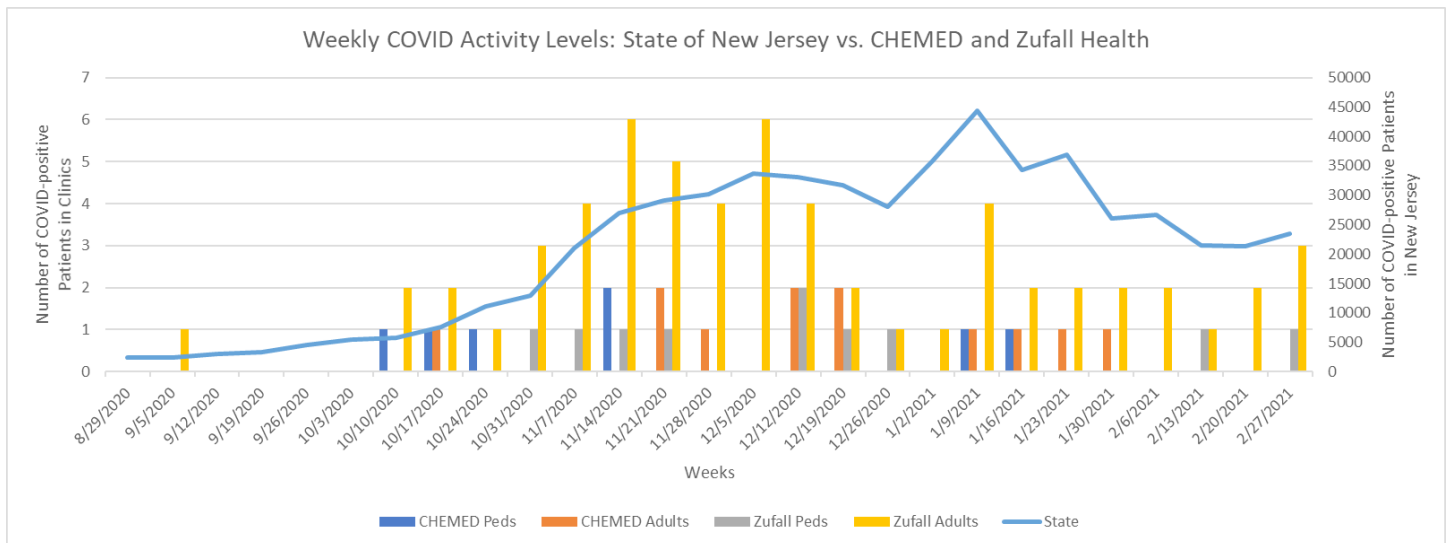
There was parity between the testing methods across the two centers: the results were similar, indicating very few asymptomatic patients tested positive (Chart 1).

Per CDC guidelines, dental team members at both facilities found to have treated a patient who was later determined to have COVID-19 were tested within five days of the encounter at Zufall and two days of the encounter at CHEMED. Between September 1, 2020 and February 27, 2021, none of those staff developed symptoms or tested positive.

According to New Jersey Health, Department of Health Communicable Disease Service COVID-19 Activity Level Report, the COVID level for the state throughout the duration of the process improvement (September 1, 2020 through February 27, 2021) was



**Chart 1:** A comparison of the percentage of COVID-positive adult and pediatric dental patients during the process improvement period of September 2020 to March 2021, by health center.



**Chart 2:** A comparison of the weekly COVID Activity Levels for the State of New Jersey (line, and right vertical axis) vs. CHEMED and Zufall Health (bars, and left vertical axis) for the process improvement period of September 2020 to March 2021.

primarily in the Moderate to High range. The level was Low for three weeks in September; Moderate for seven weeks, primarily in the fall; and High for 15 weeks, primarily from mid-November to February 27, 2021. Zufall’s positivity rates during the process improvement term (September 1, 2020 - February 27, 2021) were Low, and far below the service region’s and the state’s averages, consistent with findings and averages upon first launching pre-procedure testing in June 2020 [10] (Chart 2).

### Zufall Health Results

From September 1, 2020 through February 27, 2021, 73 out of 7351 patients tested positive. Of 796 pediatric patient’s ages 0 to 18, 11 tested positive: 3 of 353 (0.84%) were ages 11 and younger, and 8 of 443 (1.8%) were ages 12 through 17. Of 6555 adult patients, 62 tested positive (0.94%).

Although community COVID-positive rates have fluctuated throughout the pandemic, the overall positivity rate for Zufall patients tested prior to dental appointments was 1%; in February, that rate decreased to 0.9%. The cumulative rate was 0.99%. Per the State of New Jersey Department of Health, an acceptable positivity rate is less than 3%, and with fewer than 1 case per 100,000 people.

The time of year COVID-positive trends were noteworthy. Most of the pediatric dental patients ages 0 through 17 who tested positive were seen in weeks 44 through 52 (October 31, 2020 through January 1, 2021). The state’s COVID activity status was moderate in weeks 44 and 45, and high in weeks 46 through 52. There were two cases in February 2021; the New Jersey COVID activity level was high at that time. Most of the adult dental patients ages 18 and older who tested positive were seen in weeks 42 through 53 of 2020 (October 10, 2020 through January 1, 2021) and weeks 2 through 9 of 2021 (January 9 through February 27, 2021). Most of those weeks were times of High COVID activity in the state, except for weeks 42 through 45 and week 8, when the state status was Moderate [10].

Despite fluctuations in community transmission rates, the actual number of asymptomatic patients presenting at the center as COVID-positive was extremely low. The highest rate was just over 2% in November, 0.7% in January 2021, and 0.9% in February 2021. During the same time, the state of New Jersey COVID activity level was High [10].

### CHEMED Results

From September 1, 2020 through February 27, 2021, CHEMED had 9963 dental visits. Of those, 6807 received the rapid COVID test: 4028 adults and 2779 minors. The rest were tested elsewhere or were within the one-week duration of acceptable test results. Nineteen patients tested positive for COVID (0.28%): 7 children (0.26%) and 12 adults (0.29%). Of the 7 children testing positive, 3 were ages 0 to 11, and 4 were ages 12 to 17. Of the patients testing positive, 7 were asymptomatic, 1 was symptomatic, and there was no data for 11; four of the rapid tests were false positives.

Time of year COVID-positive trends in CHEMED’s service community revealed that most of the pediatric patients (5) tested positive in the autumn of 2020: weeks 41 through 43 of 2020, a period of Moderate COVID activity in the state (October 12, 22, and 26; and November 17). The other two pediatric patients tested positive in weeks 2 and 3 of 2021 (January 12 and 21), a period of High COVID activity in the state. The 12 adult dental patients tested positive in weeks 42 (October 19), and 47 through 51 of 2020 (November 24, 25, and 29; and December 9, 15, 20, and 23); and weeks 2 through 5 of 2021 (January 14, 20, and 28; and February 3). Eleven of the 12 adult patients tested positive when the state was at a High COVID activity level; it was Moderate for the twelfth patient [10].

Despite fluctuations in community transmission rates, the actual number of asymptomatic patients presenting at the center as COVID-positive was extremely low. The rates had been 0.97%, dropped, and holding at less than 0.25%. This was during a time of

Moderate to High COVID activity level in the service regions and the state [10]. Once again, per the State of New Jersey Department of Health, an acceptable positivity rate is less than 3%, and with less than 1 case per 100,000 people.

## Conclusions

Per CDC and state and local guidance, ample supply and proper use of PPE as well as stringent adherence to environmental control measures (such as the use of HEPA filters) have been very effective in keeping staff and patients safe in times of Mild, Moderate, and High community transmission.

Despite decreased rapid test sensitivity, no staff contracted COVID through inadvertent exposure. This further assured the center that continued enhanced infection control best practices (N95 masks, hand-washing and distancing, HEPA filters, screening questions, temperature checks, etc.), without COVID testing, was sufficient to maximize care while keeping patients and staff safe.

Although there was a decrease in sensitivity of the rapid test in asymptomatic patients, utilization was continued in response to staff concerns: the centers were willing to trade higher sensitivity for immediate turnaround of results to reassure its team.

In times of great uncertainty and fear, such as the COVID-19 pandemic, it is vital to relieve the legitimate anxieties of front-line staff. Although it was time-consuming, costly, and resource-intensive, it was worth it to change workflows and systems to add testing as a safety mechanism.

## ZUFALL

Based on operational experience since June, and with further process improvement starting in September, Zufall can deliver safe and effective care solely by following the CDC COVID-19 guidelines without the addition of pre-procedure testing. The center discontinued pre-procedure COVID testing of patients, effective March 1, 2021, and shifted into vaccinating patients against COVID. It is more worthwhile to move human and financial resources from pre-procedure testing and into pre-procedure COVID screening of asymptomatic patients and staff, and vaccination.

While testing was halted March 1, 2021, Zufall will continue to closely monitor evolving guidelines and recommendations, and will continue to make available to all employees vaccines that are effective at preventing COVID-19, including the UK and South Africa variants, as an added safety measure.

As a result of the pandemic, the center is looking at the long-term ramifications of changing protocol to ensure sick patients are not being seen in dental facilities to reduce the impacts on staff and other patients.

## CHEMED

Having only 19 positive results of 6807 tests showed COVID, testing was not a useful screening tool. The center will be rethinking

its procedure: CHEMED believes that continuing the current screening and temperature check of patients and staff, as well as COVID-safe facility improvements, is enough. It is important to evaluate the complex balancing act of providing an extra sense of security to staff—even if the security measure is proven to have no value—with inconveniencing some patients. If COVID testing is eliminated, the next step would be to move screening of patients to the dental department. NOTE: Since this process improvement project, CHEMED halted testing.

The process improvement of switching from PCR testing to a rapid response test reassured anxious staff.

The low number of positive test results in asymptomatic patients begs the question: how many exposed patients do not make or cancel appointments because screening may reveal them as COVID-positive? Does having a screening process launch an attrition process, stopping exposed or potentially positive patients from coming to dental appointments?

This pandemic has shown that data changes continuously and learning happens through experience. The learning curve was high, and the target was constantly moving. It is uncertain if what was learned during coronavirus can be applied to future pandemics, especially in light of the new variants. CHEMED continues to monitor the new variants, per the Department of Health, and reevaluate its protocols to meet emergent need.

## Acknowledgment

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## References and Footnotes

1. <https://www.nj.gov/health/cd/topics/ncov.shtml>
2. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/dental-settings.html>.
3. [https://www.cdc.gov/pcd/issues/2020/20\\_0266.htm](https://www.cdc.gov/pcd/issues/2020/20_0266.htm).
4. <https://www.forbes.com/sites/alisondurkee/2020/07/31/alarms-are-going-off-new-jersey-hits-highest-transmission-rate-since-april-as-northeast-sees-new-spikes-in-cases/#165fad827ead>.
5. <https://www.ada.org/en/press-room/news-releases/2020-archives/may/as-dental-practices-resume-operations-ada-offers-continued-guidance>.
6. <https://www.mouthhealthy.org/en/az-topics/h/heart-disease-and-oral-health>.
7. <https://www.nidcr.nih.gov/health-info/diabetes/more-info>.
8. <https://www.cdc.gov/oralhealth/publications/features/pregnancy-and-oral-health.html>.
9. <https://www.mouthhealthy.org/en/dental-care-concerns/how-do-we-prevent-cavities>.
10. <https://www.nj.gov/health/cd/statistics/covid/index.shtml>.