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University COVID-19 Surveillance Testing Center: Challenges and Opportunities for Schools of Nursing

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ABSTRACT

As the impact of the COVID-19 pandemic became clear, it was evident that higher education schools and universities, including schools of nursing were facing enormous challenges to create a safe environment for educational instruction to continue. Clinical education in particular was affected as clinical sites were increasingly unable to accommodate student clinical rotations due to crushing volumes and overwhelming care needs of COVID patients. This article outlines the innovative efforts of one university that set up a robust surveillance testing program that required and provided weekly COVID-19 testing of all students, faculty and staff that were on-campus. The testing center is nurse led and nurse managed, providing a clinical experience for over 50 nursing students each semester, allowing them to accrue community clinical hours so that they can progress through their nursing program. Clinical quality and patient experience outcomes are shared, and lessons learned described.

Background

With the announcement from the World Health Organization (WHO) declaring that the outbreak of the SARS-CoV-2 virus was a global pandemic, 2020 presented challenges to the healthcare community that had not been seen for decades. With rising numbers of identified cases and increases in early hospitalizations, the acute care delivery system was swiftly overwhelmed in impacted cities, such as New York City. Shortages of critical care beds, ventilators, personal protective equipment (PPE) and nurses created widespread alarm. Efforts to flatten the curve of new cases of infection were challenges, and testing for the presence of COVID-19 became a critical tool in identifying disease early and quarantining those people who had been exposed. The availability of reliable and swift results for the presence of COVID-19 is a core component of identifying infected people and tracing exposure to contain and limit contagion. Surveillance testing for COVID-19 was identified as a strategy for containing the spread of the virus, yet little progress was made to implement comprehensive, coordinated testing efforts in communities in the United States.

Across the country during early 2020, schools and businesses responded to the spread of COVID-19 by closing down and having people work and attend school remotely. These changes happened swiftly. Institutions of higher education were unable to bring students back safely, and projected lower number of enrollments in the academic year 2020–2021. Creating mechanisms to assure student safety was critical to minimize the financial impact on schools and assure continuity of educational progression (Belkin, 2020; Chesser et al., 2020; Denny et al., 2020; Ebell et al., 2020; Marinoni et al., 2020). The George Washington University (GW) located in Washington DC, with a science and technology campus in Ashburn, Virginia, decided that surveillance testing for COVID-19 was essential for any safe return to campus for students, faculty and staff (Paltiel et al., 2020; Thomas, 2020). Through surveillance testing it would be possible to detect the incidence of COVID-19 in the University community. This containment of the virus to minimize spread of infection was especially needed within clinical education tracks such as the school of nursing (Choi et al., 2020; Nielsen et al., 2020; Wolfe, 2020).

From idea to launch

Early in 2020, GW created University Pandemic Planning Committees and started a discussion of possible ways to provide surveillance COVID-19 testing to everyone in the GW community who was required to be on campus. The effort required coordination and cooperation...
across schools and departments in a very short timeframe. Existing resources were mobilized, and the structures and processes identified to stand up a massive University COVID-19 surveillance testing effort. The GW Public Health Lab had a lead role in obtaining Emergency Use Authorization (EUA) for testing, while testing logistics for specimen collection were also a major focus. These included identification of space, ordering of required supplies, information technology systems, and staffing. The testing center workplans were developed following project management guidelines, and the plan included standing up two testing centers that would routinely test approximately 1500 people weekly. A COVID budget was set up at the University level for all COVID related items so that any federal or local reimbursement could be obtained as part of the COVID relief funding. Costs that were allocated to this budget included the costs of PPE, lab supplies, and staffing semester hires for University departments and schools. The University teams involved included Safety and Security, Transportation services, the Public Health Lab, Procurement, Marketing and Communication, Finance, Human Resources, Materials Management, Facilities, and the schools of Public Health, Medicine, and Nursing. Coordinating calls were conducted daily and then three times weekly to assure that efforts were organized.

The surveillance testing, which was managed under an Emergency Use Authorization (EUA), is a COVID-19 RT-PCR test, which is a real-time (rt) reverse transcriptase (RT) polymerase chain reaction (PCR) intended for the qualitative detection of nucleic acid from the SARS-CoV-2 in upper respiratory specimens, such as nasal, mid-turbinate, nasopharyngeal and oropharyngeal swabs. The collection method used was a nasal swab test, which is an anterior nasal collection that is done by a healthcare provider, which is a minimally invasive swab of both nostrils.

Surveillance test sites were established both in Washington DC in the Foggy Bottom area, and the Virginia Science and Technology Campus (VSTC) in Ashburn, Virginia. A symptomatic testing center was also housed on the DC campus. In August 2020, with just 2 weeks preparation, detailed plans were created by the School of Nursing faculty and staff to turn an unused cafeteria on the Virginia campus into a six (6) station COVID-19 testing center. As plans began to emerge, it created an opportunity for the testing center to become a clinical site for nursing students to gain critical community clinical hours in the BSN program. The opportunity presented itself just as clinical sites were beginning to become limited for undergraduate nursing students (Rupley et al., 2020). The pandemic meant that hospitals and health systems sought to limit visitors and reduce the number of people being exposed to the virus. With changing clinical protocols and guidelines, students were limited access as healthcare systems were stressed with managing the flood of COVID cases. There was also an identified need to enhance nurse education to ensure that students have adequate education in infection prevention and control and the opportunity to develop the knowledge, skills and attitudes required to provide care to infected patients during a pandemic (Montgomery & Johnson, 2015; Saylor et al., 2018). As a result, the GW Virginia campus test center was designed as a community clinical site for final semester nursing students to complete their community clinical hours. Groups of 6–8 students rotated through their clinical rotation at the center for a 2 week period as part of their final semester community health course. Supervision includes one faculty member and 2 registered nurses. In total, 92 students completed community clinical hours at the VSTC Test Center in fall 2020 and spring 2021.

The GW Virginia and DC campus surveillance testing sites worked together to assure that similar processes were used for the testing. The Virginia site was managed by the associate dean of clinical practice at the school of nursing along with a faculty director. Staffing included a clinical faculty member that led the orientation and education of the students on site. The students received clinical hours as part of their Community coursework managed by a course coordinator faculty. There was on-site faculty each day the students were in clinical. The testing center management team worked closely with the clinical faculty to supervise the nursing students and ensure that their clinical experience in the testing center met the goals of the Community course and clinical requirements.

The student clinical experience

The COVID-19 pandemic challenged the traditional approaches to nursing education, amplifying the need to deliver real-time education to nursing students at the frontlines. Most common traditional clinical nursing education models include supervision, preceptorship and clinical education units (Newton et al., 2012). With the onset of the pandemic, major restrictions were placed on nursing schools, halting a significant number of clinical learning experiences and delegating most of the education to remote online platforms. The GW COVID Testing clinic, however, embraced the new challenges and embarked on novel nursing education strategies to enrich the clinical experiences of the students. The COVID-19 clinic was able to transform clinical nursing education by actively applying experiential learning.

All students completing their community clinical at the COVID-19 test center were required to attend an orientation and training day. After the initial student nurse orientation at the beginning of the fall 2020 semester, ongoing orientation for new student rotations occurred every 2 weeks. Each new clinical group received didactic training before participating in hands on experience in the different areas of the test center with the outgoing clinical group. To achieve this, there was a 4 h clinical overlap of both clinical groups. The training and orientation for new students is outlined in Table 1 Orientation schedule of new students, and Table 2. Checklist for training for students at COVID-19 Testing Center. Orientation focused on professionalism, infection control and safety practices, and core competency skills for registration and specimen collection. Peer to peer instruction and return demonstrations provided leadership opportunities and peer coaching for the outgoing clinical group under the supervision of the faculty and core management team.

Test center operations

The Virginia Campus COVID-19 Surveillance Testing Center was open for testing 3 days/week (Tuesday, Thursday, Friday) from 9 AM to 4 PM in fall 2020 semester. Clinical staff and students arrived 30 min prior to the start of testing and participated in a safety huddle and briefing each morning. At the end of the day the students participated in a debriefing where issues were discussed, and quality improvement ideas generated. The testing appointment schedule allowed for a total of five appointments every 5 min (60 appointments/h) throughout the testing day, with a maximum capacity of 450 tests/day.

The test center was staffed with student nurses for 2-week rotations along with faculty supervision. Students rotated through three roles: registrar, specimen collector, and charge nurse/safety monitor (see Table 3 Student roles in testing center). During each daily shift, students would fulfill two different roles, one in the morning and one in the afternoon, to allow maximum experience in each role. The staffing plan (see Table 4 Daily schedule and assignments) ensured equitable rotation in each role assignment. Roles were clearly outlined in job aids provided at the beginning of the clinical rotation and available in a binder on site.

Specimens collected at the Virginia test center were picked up by a courier twice a day at noon and at 4 PM and transported from the Virginia campus to the GW Public Health laboratory on the GW main campus in Washington, D.C.

Public health content and knowledge attainment

The COVID-19 pandemic has created unprecedented challenges and opportunities for student learning. Students expressed appreciation for the opportunity to contribute to the health of their community in the
context of this pandemic. At the same time, they were concerned for their own health and the health of their friends and families. Weekly COVID testing of the students added a level of safety for the student testers. Faculty were able to provide context for the surveillance testing activities, epidemiology of the pandemic, the local impact of COVID, and the pathophysiology of the disease through a series of lectures spaced throughout the testing center shifts during low appointment periods.

### Table 3: Student roles in testing center.

| Student role     | PPE required | Client identification | Responsibilities                                      |
|------------------|--------------|-----------------------|------------------------------------------------------|
| Registrar        | Surgical mask | Confirm appointment   | - Label specimen tube with ID number and DOB         |
|                  | Gloves       | Check Picture         | - Place specimen tube in a biohazard bag             |
|                  | Flexiglass Barrier | Identification | - Direct Client to the specimen collection area       |
|                  | Nitrile gloves | Confirm Date of Birth (DOB) | (mm/dd)     |
| Specimen collector | N95 mask | Confirm DOB on specimen tube (mm/dd/yyyy) | - Perform anterior nasal swab                         |
|                  | Face shield |                       | - Secure specimen swab in specimen tube               |
|                  | Gown        |                       | - Place specimen tube in a biohazard bag             |
| Charge nurses/ Safety monitor | Surgical mask | None | - Place specimen in collection cooler                   |
|                  |             |                       | - Direct Client to the exit                          |
|                  |             |                       | - Perform hourly rounds, assessing quality, environmental checks, assuring social distancing and PPE compliance |
|                  |             |                       | - Be available to testing students and staff for any on site issues |
|                  |             |                       | - Assign short breaks and lunch breaks ensuring adequate staffing |
|                  |             |                       | - Provide break relief as needed                     |
|                  |             |                       | - Monitor PPE compliance                             |
|                  |             |                       | - Observe registration processes for compliance with protocol |
|                  |             |                       | - Observe specimen collection for compliance with protocol |
|                  |             |                       | - Observe PPE doffing to ensure safe removal of PPE and disposal |
|                  |             |                       | - Report any breaches in protocol to the Site Director or Faculty Supervisor |
|                  |             |                       | - Restock registration bins and testing drawers       |
|                  |             |                       | - Count inventory and record on the inventory tracking sheet |
|                  |             |                       | - Prepare specimens for transport to the laboratory   |
|                  |             |                       | - Collect and document observations and ideas from staff, peers, and clients regarding process improvement opportunities |
|                  |             |                       | - Assist leadership in quality data collection activities |

### Table 4: Daily schedule and assignments.

| Time            | Task                                      | Role                              |
|-----------------|-------------------------------------------|-----------------------------------|
| 8:30 AM         | Morning set up                            | RN supervisor                     |
| 8:45 AM         | Morning huddle                            | SON faculty                       |
| 9:00–12:00      | COVID testing                             | Testers (3–5)                     |
| 11:30–12:30     | Lunch breaks                              | Testers (3–5)                     |
| 12:00–4:00 PM   | COVID testing                             | Safety monitor/Charge nurse (1)   |
| 4:00 PM         | Debrief                                   | Safety monitor/Charge nurse       |
|                 | Site closing                              |                                   |

The COVID-19 clinic was equipped with classroom-style space as well as information technology and educational media. Foundational learning focused on both community nursing and public health topics such as basic epidemiological and immunological concepts, prevention guidelines and timelines of historical pandemics, COVID-19 pathophysiology, surveillance and tracking data websites, use of evidence based resources, health literacy and patient engagement, and COVID-19 case vignettes. Faculty created scenarios for students to increase their knowledge about epidemiological principles, and data review from credible sources. Teaching methods included debriefing sessions, peer to peer presentations and educational learning projects.

In addition, opportunities arose for student cohorts to engage the community members directly to promote COVID-19 awareness and prevention. For example, there was a need identified in educating the environmental services support staff working at the Virginia campus. Students prepared teaching material in both English and Spanish languages which was disseminated through formal teaching to the environmental services staff. Teaching material included education on the COVID-19 virus, importance of prevention activities, such as regular handwashing, 6-foot social distancing guidelines, mask-wearing, as well as knowledge of signs and symptoms of COVID-19. A sample of the student educational project is depicted in Table 5. The environmental services staff were given informational hand-outs in both English and Spanish to reinforce the learning and share with friends and family members. An example of an educational poster that the students created is shared in Fig. 1.

### Personal Protective Equipment (PPE)

The decision was made to provide the most rigorous PPE recommended by the CDC for a testing site. PPE was provided for each role and appropriate donning and doffing was monitored. All students and faculty were fit-tested for the appropriate N95 mask that would be

### Table 5: Summary of community student education projects.

| Type of education project | Content                                  |
|---------------------------|------------------------------------------|
| Recorded presentations    | COVID vaccine hesitancy among African-Americans |
| Live presentations        | COVID-19 vaccine hesitancy               |
| Video production          | COVID vaccines (bilingual in English and Spanish) |
| Infographics              | COVID self-collection video (with English and Spanish subtitles) |
| Social media projects     | Staying healthy during COVID              |
|                           | COVID self-collection                    |
|                           | Care after COVID vaccination             |
|                           | COVID vaccines                           |
|                           | 6 ways to de-stress during COVID-19      |
|                           | Show me your Band-Aid                    |
available at the test site. The students performing specimen collection were garbed in a disposable gown, N95 mask, face shield and nitrile gloves. Faculty and staff donned full PPE if supervising students in the specimen collection booths. N95 masks were discarded at the end of each shift and a new mask provided each day. Registrars wore a surgical face mask and exam gloves while working behind a plexiglass shield. The Charge Nurse/Safety Monitor, faculty, director and all clients were required to wear a mask at all times while in the center. Gloves were worn when using disinfecting wipes or solutions to wipe down surfaces. Goggles and surgical masks were available for disinfecting tasks if needed.

**COVID safety: the environment**

The Virginia Campus testing center was set up in a University building with an effective HVAC system and air exchange. The first floor of the building was designated as the testing site as it had an unused cafeteria and event room as well as a dedicated entrance with a lobby. The floor plan facilitated appropriate social distancing and a separation of clients entering from those exiting. No one was allowed to enter the building without a mask and the locked entrance required an appropriate University identification keycard to enter. The environmental services staff disinfected common touch points every hour and the student testers disinfected their testing area after each test and the registrars sanitized their stations at least every hour. Separate donning and doffing areas were set up and stocked with hand sanitizer, disinfectant wipes and replacement PPE.

**Inventory management**

Continuous access to appropriate supplies was critical to the success of the COVID-19 testing program and the student’s clinical experience. The GW Public Health laboratory provided all of the direct testing supplies, swabs, test tubes and biohazard bags. Keeping up with supplies of disinfection supplies and PPE was challenging due to long delivery lead times to receive high demand supplies. The development of a tracking system allowed the calculation of the burn rate for high demand supplies. This allowed for the anticipation of supply needs and ordering supplies with enough lead time to receive the order before critical levels were reached.

**Student leadership opportunities**

Deliberate intention was made to create a student Charge Nurse/Safety Monitor role. Student nurses were assigned to fulfill the role of Charge Nurse/Safety Monitor for half a shift, allowing two students to experience this role each day. This role focused on ensuring center safety protocols were maintained, scheduling breaks and lunch for center staff, and monitoring inventory and supplies for the center. The Charge Nurse/Safety Monitor worked closely with the Center director to ensure that COVID-19 safety guidelines were followed including maintenance of social distancing to adhere to a minimum of 6 ft spacing. They were also responsible for the disinfection protocol and monitoring the appropriate donning and doffing of personal protective equipment (PPE) of specimen collectors. The Charge Nurse/ Safety Monitor re responsibilities included scheduling breaks and lunches ensuring continuous adequate staffing, restocking, and inventory management. A key function of the Charge Nurse/ Safety Monitor was to work with the Center director and clinical faculty to determine if they needed to step in to register or test if queuing became problematic. The Charge Nurse/Safety Monitor also prepared specimens for transport to the lab and received replacement coolers and lab supplies for return delivery. The students also evaluated the appointment schedule to determine quiet times and assign groups to participate in the educational sessions offered throughout the shift. The student charge nurses learned to delegate and monitor tasks such as restocking and disinfecting, and they performed

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**Fig. 1. Student generated educational poster: staying healthy during COVID.**

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supply inventories each day. The importance of peer monitoring and feedback to promote safe care was reinforced and the students experienced first-hand the challenges inherent in this important safety activity. Privacy and confidentiality was critical to the success of the testing center. Students were asked to protect confidentiality and lead through role modeling appropriate privacy and confidentiality behaviors. Students were in a position of caring for their peers, faculty and academic leaders and needed to respect the need for privacy and confidentiality. Behaviors such as social distancing among peers were emphasized frequently and discussed during debriefs.

Data analysis and reporting

Data collection and analysis were a critical component of evaluating the testing center operations and the clinical experience. Data analyzed included tracking the testing center volume by time of day to better understand client flow through the system and improve scheduling. Specimen quality and near misses were tracked as well as supply usage. GW public health leadership created a COVID-19 dashboard (https://coronavirus.gwu.edu/dashboard) that publicly displayed testing volume by day and by testing site, positive COVID tests by test date, testing site and status (student or employee/contractor). Data were regularly reviewed during student debriefs.

Quality improvement

The quality improvement activities of the testing center were driven by the analysis of data on specimen quality and the reports of ‘near misses’. With each near miss the faculty and students discussed the system root cause and a potential remedy. For example, one near miss was an incorrect date of birth captured on the test tube. This potential error was caught when the tester checked the birth date identifier in the testing booth. Distractions, usually noise and conversations at the registration stations, were the main cause of an incorrect date of birth. These root causes were discussed and corrections identified during debrief and morning huddles. Students at registration were empowered to ask for quiet at any time and to ask anyone who was causing a distraction to pause – no matter the person causing the distraction, whether peer or faculty leader.

One example of a system improvement was the process of labeling specimen tubes. Initially separate labels were used to capture school ID number and date of birth. When testing began, adhesive labels were being added to the specimen tubes. The labels were small, difficult to read and did not always adhere to the tube. Rapid cycle tests of change were employed to determine that the ID number and date of birth could be written directly on the test tube with a fine point marker. The information was easier to read and did not smear or wipe off. The change was done with the GW Public Health lab’s permission and the change was spread to the other testing sites.

The lab provided specimen quality reports, specifically the number of invalid specimens based on testing method. The cause of invalid specimens was inadequate samples, and this was tracked daily by patient and site. The data were captured for each clinical group, and the sample collection sufficiency averaged 99.9% by the student testers for the semester. This excellent quality performance was celebrated and reinforced the effectiveness of the orientation education process. Table 6 (Specimen sample quality) demonstrates the consistently high performance of specimen collection method by the students.

Other procedural quality improvements included implementation of a verbal counting procedure when swabbing each nostril. This increased the likelihood of a valid specimen and our clients liked knowing how much longer they would experience swabbing. While anterior nasal swabbing is not painful, it is not entirely comfortable, so the verbal countdown from 10 to 1 provided the client some reassurance of when the swabbing would end.

| Clinical group | Sample sufficiency percent accuracy (percent) | # inadequate samples | Total samples/ clinical group |
|---------------|---------------------------------------------|---------------------|-------------------------------|
| 1             | 99.9                                       | 1                   | 1033                          |
| 2             | 99.9                                       | 1                   | 1026                          |
| 3             | 99.7                                       | 1                   | 1026                          |
| 4             | 99.8                                       | 1                   | 921                           |
| 5             | 100                                        | 0                   | 922                           |
| 6             | 99.9                                       | 1                   | 825                           |
| 7             | 99.9                                       | 1                   | 752                           |
| Average       | 99.9%                                      |                     |                               |
| Total # tests | 10                                         |                     | 6577                          |
| Average # tests/ clinical group | 939.5 | | |

COVID test center experience survey

As part of the evaluation of the effectiveness of the center’s operations, the leadership obtained satisfaction data to assess the experience of people being tested. The surveys began in October 2020, and was administered through the Qualtrics system. Qualtrics is an online survey tool that is very user-friendly and allows for tracking and analysis in a timely manner. The survey was sent out via email every Thursday to individuals who tested at the testing center. The survey was developed by the COVID Test Center leadership team in conjunction the GW SON assistant dean of assessment and evaluation. The initial survey included 15 questions including basic demographic information and measured aspects of the registration and testing experience. All but one survey question is multiple choice, and questions are measured using a 5-point Likert scale. There was one open ended question at the end of the survey to gather any additional information individuals would like to provide.

Since the COVID-19 Experience Survey launched, a total of 373 experience surveys were completed for the VSTC test site. Response rates ranged from 40 to 77 surveys per week which was a 10–16% response rate. All questions measured on a 5-point Likert scale had an average score between 4.8 and 5.0 indicating overall satisfaction with the text center experience. Fig. 2 – Overall patient experience survey below illustrates the results for a sampling of the quantitative survey questions for the time period of fall semester 2020.

Qualitative feedback was also received. Over 55% of the 108 comments received on the survey for VSTC were positive. In addition to the positive feedback, the main areas for quality improvement were identified. Swab technique was noted as the greatest area of improvement. While some listed the swab technique as too aggressive or the swab

![Patient response to question: “On scale of 1-5, please rate your overall experience with the GW COVID-19 Testing Center?” Mean score 4.8 n=373 September - November 2020](image-url)
being too deep, many people stated that the swab technique was too
tend and expressed concern that the swab would not produce an ac-
curate COVID test. The tracking revealed that sample accuracy was high,
so communication efforts were directed at assuring “testees” that sample
collection was adequate. Additionally a ‘gold standard’ method of return
test demonstration was introduced into the education process, which
included faculty being the patients, to assure consistency in specimen
collection methodology.

Privacy and confidentiality was also identified as an area for
improvement. Individuals requested that a review of the process for
verifying the date of birth as an identifier in the registration area should
occur. People were unsatisfied with having to share their birth year in
the lobby registration area, and asked that birthdate validation in the
registration area be changed to request month and day of birth, not year.
This was especially mentioned by people older than 60 years old who
needed to be tested and were not comfortable sharing their birth year.
Some individuals requested changes to the test center operating
schedule and days of the week that the center was open, and other
requested changes to their testing cadence, not wanting to be required to
be tested weekly. Feedback was also obtained regarding the information
technology system to schedule appointments, track symptoms on a daily
basis and provide test results.

Student experience feedback was collected as part of the course
evaluation and the center was consistently ranked as an excellent cli-
clical experience. Comments from students included that they particularly
appreciated an in-person clinical experience as opposed to virtual clin-
cical experiences. They enjoyed meeting clients, and practicing patient
teaching. Students also were given volunteer opportunities, and com-
ments about advice they would give to other students working clinically
during a pandemic was that the volunteer experiences were very
rewarding.

Summary

The changes that the COVID-19 pandemic brought to the world were
swift and all encompassing. The implications for nursing education was
definitely impacted, yet opportunities to assure nursing student pro-
gression emerged in unexpected places. The ability to provide both
needed COVID-19 surveillance testing infrastructure for a university,
and also provide clinical site experience for baccalaureate nursing stu-
dents, was by definition a win-win situation for a school of nursing. The

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