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Lessons Learned From an Anatomic Pathology Department in a Large Academic Medical Center at the Epicenter of COVID-19

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Abstract

Many state-wide, city-wide, and hospital-wide changes have been implemented due to the ongoing COVID-19 crisis. We describe lessons learned in an anatomic pathology division at a tertiary care center during the peak of the COVID-19 pandemic in the hopes that knowledge of our experiences can benefit other pathology departments as they encounter this pandemic. Five categories that are critical in strategic planning for the COVID-19 pandemic are discussed: workload, departmental policy revisions, impact on faculty, workforce staffing, and impact on educational programs, including residency and fellowship training. Although the volume of COVID-19 testing had grown placing increased demands on the clinical pathology laboratory, the volume of anatomic pathology cases had declined during the COVID-19 peak. Lessons learned were widespread including changes in the anatomic pathology workflow due to declining surgical and cytologic case volumes and increases in autopsy requests. Modifications were required in gross room policies, levels of personal protective equipment, and workforce. Travel and meeting policies were impacted. Adaptations to residency and fellowship programs were vast and included innovations in didactic and interactive education. We must learn from our experiences thus far in order to move forward, and we hope that our experiences in an anatomic pathology department in the epicenter of the COVID-19 pandemic can help other pathology departments across the country.

Keywords

ACGME, anatomic pathology, COVID-19, laboratory, pandemic, workflow

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Introduction

The novel coronavirus SARS-CoV-2 (COVID-19) was identified after investigation into a pneumonia outbreak in Wuhan, China, in December 2019, expanding rapidly into a global pandemic.[1,2] New York City (NYC) became the epicenter of this COVID-19 pandemic in the early months of 2020, with the staff of our hospital system and our neighboring medical centers serving as the frontline workers against this virus.

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On March 01, 2020, New York State reported its first case of COVID-19 and by late-October, had experienced 503 176 cases and 25 792 deaths.[3] During the COVID-19 surge, our health system alone had a peak census of 1400 COVID-19 patients. From Mid-March to late-May, our health system laboratories had processed over 50 000 COVID-19 diagnostic tests.

As the clinical demands grew in the hospital for COVID-19 patients, requirements in other service areas markedly diminished. In surgical pathology and cytopathology, the caseload dwindled in early March following an executive order declaring a state of emergency in New York with the suspension of elective surgical procedures.[4] By the end of April, case volumes were more than 85% lower than April of the prior year. During this time, the Department of Pathology made several modifications in scheduling of staff shifts, resident roles, distribution, and conservation of personal protective equipment (PPE), travel policies, in person meetings, conferences and tumor boards, social distancing policies, and quarantining practices. We describe the lessons learned in the anatomic pathology (AP) division of the Department of Pathology at our health system laboratories during the COVID-19 pandemic in the hopes that knowledge of our experiences can benefit other pathology departments across the country as they encounter this pandemic.

Lessons learned were widespread and included major changes in the AP workflow due to declining surgical and cytologic case volumes and increases in autopsy requests. Changes were required in gross room policies, levels of PPE, and workforce. Travel and meeting policies were impacted. Modifications to the residency and fellowship programs were substantial. Below we summarize the 5 categories that are critical for planning to deal with the COVID-19 pandemic.

Materials and Methods

Our institution's policies were examined through evaluating email announcements and posts on our health system's official webpage. Case volume data were tabulated and compared based on previously collected retrospective and de-identified departmental quality assurance data. All data included were gathered from retrospectively obtained previously de-identified quality assurance data; therefore, institutional review board approval was not applicable.

Results

Workload

Surgical pathology and cytology case volume. Assessment of case volume impact was made for surgical pathology and cytology. Surgical pathology caseload was broken down by case type into 3 categories: major (resection/excision), biopsy, and consult (slides for review from outside institutions). Cytology cases were broken down by nongynecologic (non-GYN) hospital cases, fine needle aspiration (FNA) cases, gynecologic cases (pap smear), and consults.

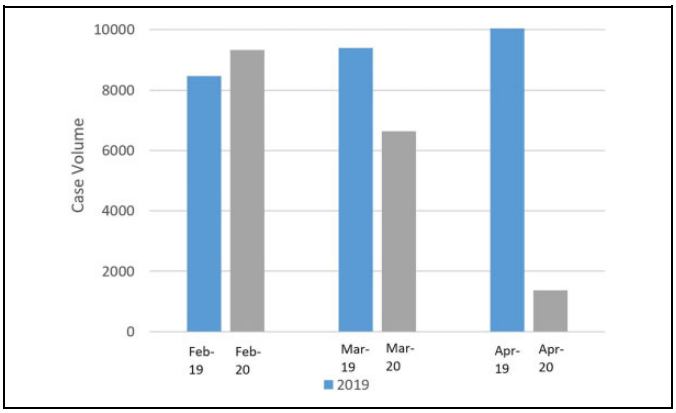

Figure 1. Surgical pathology and cytology case volume, 3 month comparison, 2019 and 2020.

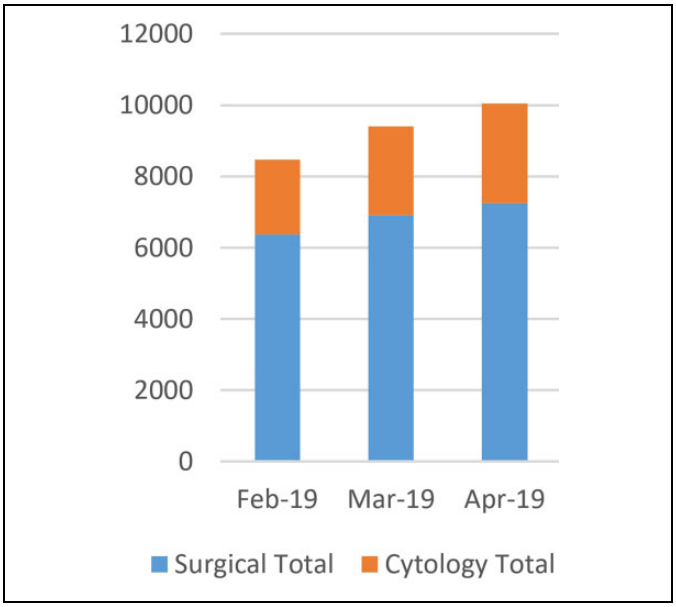

Figure 2. Surgical pathology and cytology case volume February, March, and April 2019.

Case volume was tallied for the months of February, March, and April 2020. These volumes were then compared to case volumes of the same months (February-April) of 2019 (Figure 1).

Surgical pathology February case volumes increased by 4.6% from the prior year, but decreased for the month of March by 30.4% and markedly decreased by 85.6% in April.

Cytology case volumes increased by 26.4% from 2019 to 2020 for the month of February, but decreased for the month of March (26.4%) and markedly decreased in April (88.7%), respectively (Figures 2 and 3).

Autopsy volume remained steady with numbers that were similar in February and March from the prior year. In April, cases went up by 50% with 15 of 16 autopsy cases being performed on COVID-19 positive patients.

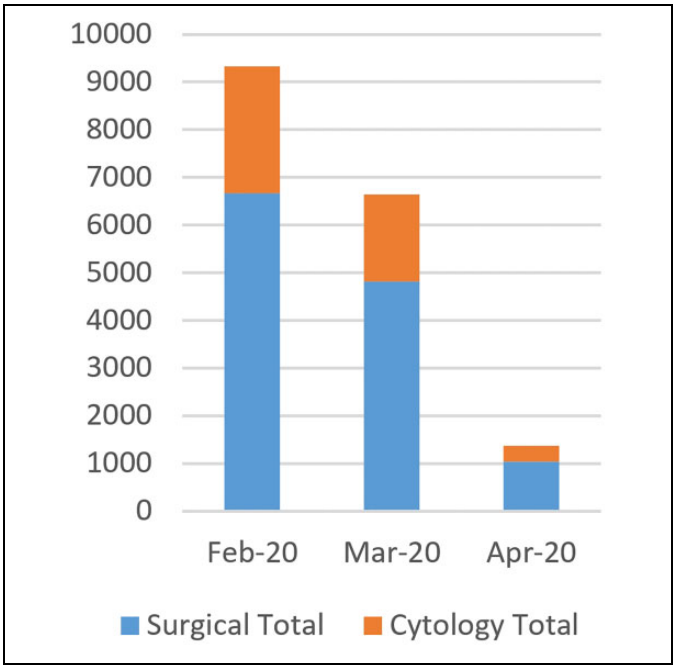

Figure 3. Surgical pathology and cytology case volume February, March, and April 2020.

In May, surgical pathology and cytology case volumes began to creep back up and ultimately reached pre-COVID volumes in July. By September, case volumes had surpassed both pre-COVID numbers and September 2019 volumes by 6.6% in surgical pathology and 13.5% in cytology (Figures 4-6).

Cytopathologist fine needle aspiration clinic. Prior to the current pandemic, cytopathologists performed up to 6 ultrasound guided thyroid FNAs per day in the department of radiology. The service was closed for 6 weeks and once reopened only allowed a limit of 4 patients per day initially, eventually increasing back to our standard 6 patients per day, with increased time scheduled in between patients to allow for deep cleaning of patient rooms. Prior to seeing patients again, cytopathologists underwent nasopharyngeal swab COVID-19 polymerase chain reaction testing. Patients were screened with a series of questions about the possibility of COVID-19 symptoms or contacts prior to appointment scheduling and received a temperature check with a no-touch temporal thermometer and answered additional symptom screening questions on the day of the appointment. Patients wore masks during procedures. Cytopathologists and radiologists wore N95 masks as well as face shields, gowns, and gloves. Face shields were sanitized after each procedure, and N95 masks were preserved in a brown paper bag in between procedures. To date, there have been no new cases of COVID-19 among our interventional cytopathologists.

Cytotechnologist assisted fine needle aspirations. Cytotechnologist assisted FNAs saw a similar decline. Our Cytopathology division offers a rapid on-site assessment service in which cytotechnologists perform on site adequacy assessments for deep-seated FNAs performed by interventional radiologists, bronchoscopists, and endoscopists. In comparing 2019 to 2020 month-to-month data, cases decreased in March by 25% and then by 74% in April with a return and steep increase of 85% beginning in August. Cytotechnologists wore N95 respirators, lab coats, and gloves with a full protective suit worn when entering the operating room. A face shield was added for procedures in the bronchoscopy suite.

Autopsy service. Prior to the COVID-19 pandemic, all autopsies our health system laboratories were performed using standard safety protocols by a junior resident and a senior supervising resident, under the supervision of the attending pathologist. During the pandemic, the Centers for Disease Control and Prevention (CDC) published new safety guidelines, and all autopsy examinations were performed strictly in accordance with those recommendations. Specifically, in an effort to conserve PPE and limit the overall exposure to COVID-19, including the number of individuals in the room and the total time in the autopsy suite, all initial autopsy dissections were performed by 2 autopsy pathologists. In order to obtain credit for the autopsy examination, as per newly published ACGME guidelines, the junior residents were required to review all gross photographs, participate in the organ dissection and tissue sampling following a period of formalin fixation (not less than 48 hours), and complete the remainder of the written report. The CDC guidelines also discouraged the use of a standard oscillating saw to avoid possible aerosolization of viral particles, and recommended an oscillating saw with a vacuum attachment. Although this saw was ordered at the start of the pandemic, given the high demand, it was on back order and unavailable. The neuropathological portion of the autopsy examination was not performed until the vacuum attachment was received in August.

Departmental Policy Revisions

Gross room policy changes. After consultation with our health care network laboratories Environmental Health & Safety and Infection Prevention & Control departments several changes went into effect. Operating rooms were required to stipulate whether specimens were from patients under investigation for, or patients with confirmed positive COVID-19 on the pathology requisition. Known COVID-19 specimens were fixed 24 hours prior to grossing except for samples sent for frozen section. We began to utilize an ultraviolet lamp in the cryostat after frozen sections for 30 minutes to inactivate possible coronavirus. All lung and specimens from known COVID-19 positive patients received for frozen section were treated with standard tuberculosis infection precautions, as is our standard practice. Briefly, N95 masks were used during the dissection which was done under a biological safety hood. After utilization, the cryostat was decontaminated. Cryospray was not used in any of these cases.

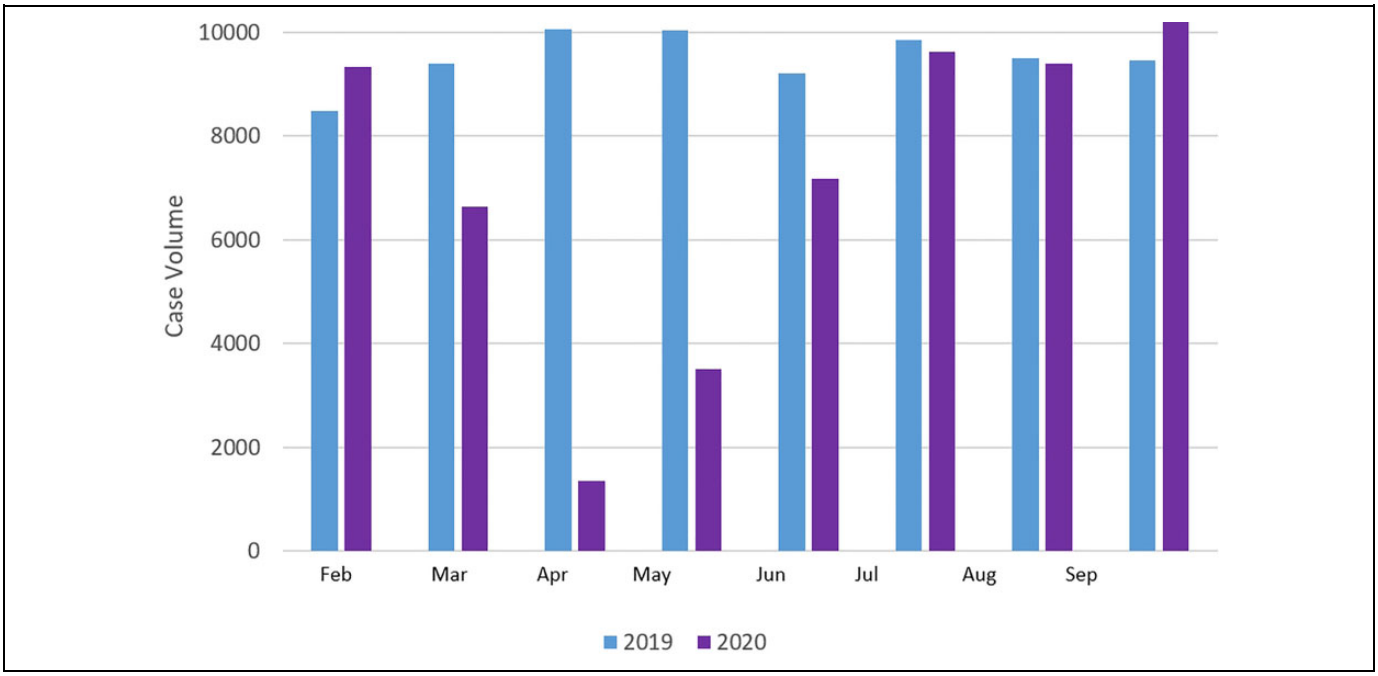

Figure 4. Surgical pathology and cytology case volume, 8-month comparison, 2019 and 2020.

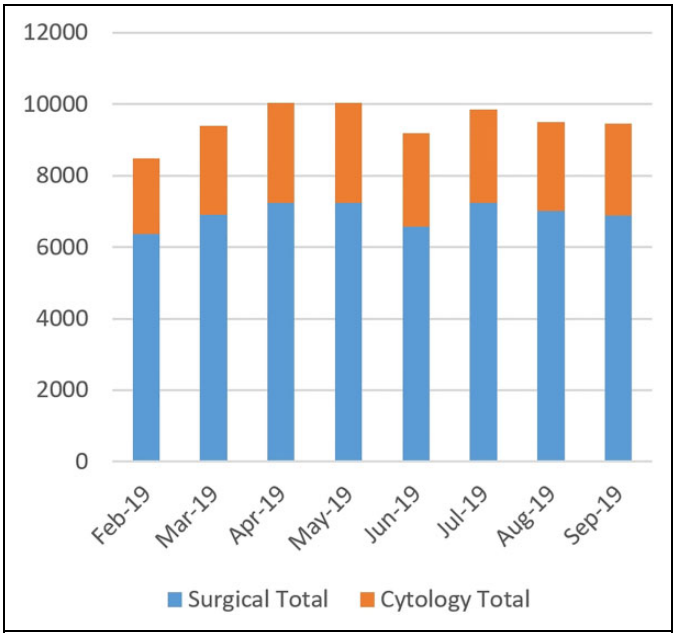

Figure 5. Surgical pathology and cytology case volume February to September 2019.

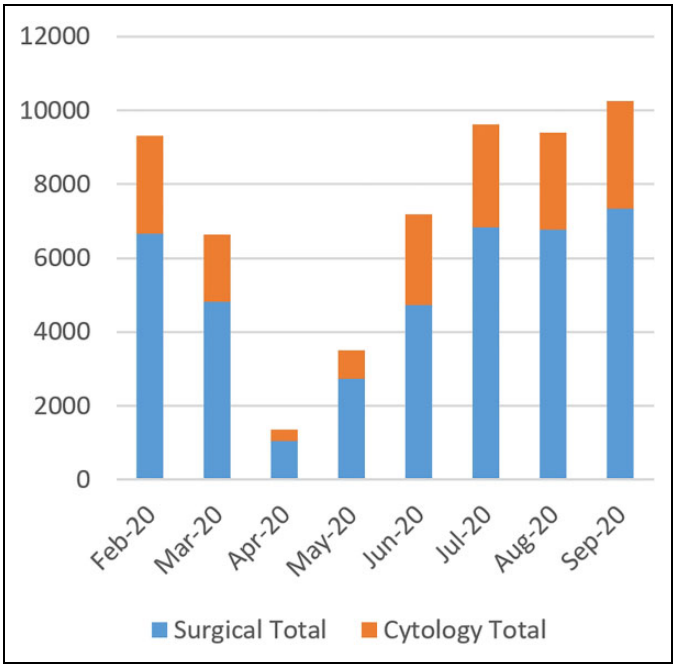

Figure 6. Surgical pathology and cytology case volume February to September 2020.

Pathologists, physician assistants, and staff were required to wear surgical masks when at the frozen section station, grossing room, and common areas.

Personal protective equipment. Beginning in early March, staff was asked to conserve PPE, including masks, gowns, gloves, and eye protection including full face shields. Detailed information about proper extended use and reuse of masks and information about conserving N95 respirators was shared with hospital staff. Distribution of masks was centralized by the hospital and issued on a weekly basis. An N95 recycling program began in late March but no recycled masks have been

distributed to date. Employees were instructed to wash their hands regularly for 20 seconds, and to avoid touching their faces. By the end of April, wearing a mask was mandatory for all patients, providers, and staff would all need to wear a mask in all doctors' offices. By mid-May, it was announced that all of our health system staff, faculty, students, trainees, and non-traditional volunteers must wear a mask in all locations in the health system. Detailed information and pictures were distributed on how to wear a mask properly. Employees were allowed to remove masks only when alone in a room and for eating/drinking, but instructed to maintain a 6 foot distance from others whenever possible.

Impact on Faculty

Travel. Beginning early March, our institution issued travel restrictions for 60 days for business and academic travel with 14-day quarantine stipulations for personal travel to countries endemic with COVID-19 (ie, China and Italy). All foreign and domestic travel were to be registered with Occupational Health Services (OHS), and all employees were to check in with OHS upon return from travel for a health screen prior to returning to work. In late April, the travel restrictions were extended until further notice, to be monitored based on the changing situation.

As the COVID rates began to increase in many states across the country, additional travel policies were instituted including the requirement of 2 COVID-19 tests, one within 24 hours after return to the NYC metro area, and the second between 5 and 7 days (no later than 10 days) after return. Individuals returning from a high-risk state or international travel were required to immediately inform supervisors and answer a COVID-related questionnaire. Return to work was permitted for asymptomatic employees after the first negative COVID-19 test result.

Meetings. Over 2 weeks, the initial recommendation for banning meetings over 50, quickly changed to a cap of classes and seminars to 20 to 30 people and then a ban of in-person meetings. Meetings were shifted to virtual meetings through Webex. This included all tumor boards, staff meetings, seminars, journal clubs, and other educational sessions. Noncritical contractor and vendor meetings were also conducted virtually. Consensus conferences were cancelled and shifted to either Webex or situations where one pathologist would leave a case in the cubby of another pathologist for them to pick up and review and provide concurrence or second opinion. Additionally, multiheaded scope spaces became stocked with virucidal wipes to be used before and after microscope use. This was also extended to all pathologist and common space areas.

Workforce Staffing

Pathologist volunteers. As workload declined in early April, pathologists were invited to volunteer for our health care network's Family Connect program. This program began with radiologists at our institution, and the opportunity was then extended to pathologists and other specialties. In order to fill the gaps in communication between patients and their loved ones who were not permitted to visit, our health care network Family Connect trained 20 pathologist volunteers to participate remotely (via WebEx) in clinical rounds of COVID-19 patients on the floors. These pathologist volunteers would gather the daily updates including patient clinical status and laboratory values via chart review and discussion with the clinical team for 5 to 6 patients. The pathologists would then place a daily call (7 days a week) to family members of their assigned patients in order to update the loved ones and discuss the clinical plan of care. This program was founded to both relieve the clinical team on the frontlines of one of their numerous demanding jobs during the surge of the pandemic and to help provide patients families with some solace and connection to their loved one during this unprecedented time.

One attending and one fellow redeployed to serve in the frontline on the internal medicine floors. Both were assigned separately to the night shift for a 2-week period. Shifts were 12 hours per day, 6 days per week, and both wore full PPE include N95 masks while in contact with patients.

Symptomatic staff and those with known exposure. Few members of the AP staff tested positive for COVID-19 during the early weeks of the pandemic. The mode of infection was not clearly related to their professional functions and appeared to represent a similar infection rate as the one seen in the community. Those testing positive were quarantined at home during the symptomatic period as well as for an additional 72 hours from the last symptoms or fever. Asymptomatic staff testing positive for COVID-19 were quarantined at home for 10 days (up from 7 days during the early days of the pandemic). Staff who had symptoms or confirmed COVID-19 were instructed to stay out of the office until fever-free for 72 hours, and to wear a mask for 14 days (from the onset of symptoms) upon return. Additionally, employees who were exposed to someone with COVID-19 symptoms or confirmed COVID-19 were instructed to wear a mask for 14 days from the date of exposure or from the date of return from a "restricted" location and to work from home where possible. When not at home, exposed asymptomatic individuals were instructed to maintain self-isolation and monitor for fever every 12 hours with daily entry of symptoms and temperature in our institution's health care app. Though, ultimately, mask wearing became a widespread requirement throughout our health care network for both patients and health care staff.

Staffing. In early March, staggering of the AP staff began. Laboratory staff such as Pathologist assistants (PAs), histotechnologists, and cytotechnologists, working five 8-hour shifts per week were staggered into three 12-hour shifts per week in order to facilitate social distancing in the work place per CDC guidelines. Office staff worked 10-hour shifts 4 days per week. Management worked 1 to 2 days per week from home in April and May. Pathologists worked remotely when not covering the diagnostic services. The health care network issued resources for telecommuting and remote access in late March. By late

May, all staff were required to self-report daily temperature checks and COVID-19 symptoms through the health center app, or have a temperature check via no-touch temporal thermometer and answer questions about whether or not they were experiencing symptoms, upon entry into all health care network locations. Employees with a temperature greater than 99.5° or 2 or more COVID-19 symptoms would need to stay home until COVID-19 infection was ruled out.

Impact on Educational Programs

Residency program. In late March, one-to-one microscope sign-out with pathology trainees (residents and fellows) was suspended. Residents were instructed to preview cases and complete their typical case workup with a preliminary pathology diagnosis followed by either feedback from an attending pathologist or a WebEx sign-out session. Virtual sign-out was used heavily during the peak months of the pandemic with a transition back to predominantly in-person sign-out over the summer months. Although the overall feeling was that this was not as effective as in person sign-out, a comparative assessment was not performed. Residents who did not have enough material to review while on subspecialty rotations used elective time to make up for the loss. Additionally, during the few months in which AP case volumes were low, learning was supplemented with teaching sets and online didactic educational series which were compiled into an easy access share file. Residents kept a daily log of activities which was monitored by the program director to ensure that residents were pursuing the appropriate amount and assortment of educational activities (Table 1).

Because the onboarding time is critical for resident learning, in-person sign-out continued with the use of appropriate distancing and projection of images on a wall screen using the camera software. Although low specimen volumes and remote sign-out was not ideal and may have had some negative impact of education, it is too early to know whether there is any long-term negative impact as residents have yet to take the next resident in-service examination (RISE) the most recent RISE examination was taken during the peak coronavirus months and therefore reflected the prepandemic education. Nonetheless, residents have been evaluated positively as progressing in overall knowledge and in the pathology milestones.

Due to both the decrease in volume in AP and the increase in volume in COVID-19 testing in the clinical laboratory, many (and eventually all) residents volunteered to redeploy and help the clinical laboratory with the increased amount of COVID-19 testing. The health care network Graduate Medical Education (GME) office declared an ACGME "pandemic emergency stage 3" the third week of March which required a suspension of academic activities and redeployment of residents to support the institutions efforts relating to COVID-19.[5] All 23 residents became involved in validating and implementing COVID-19 testing platforms, working shifts to run testing for SARS-CoV-2 as well as aiding in other laboratory areas in need of support (ie, hematology thromboelastography testing, COVID-19-related research, decedent management).

In order to encourage social distancing between residents while in their own workspace, residents were provided with additional satellite resident rooms. Residents continued to be engaged in resident didactics (journal club, autopsy conferences, and didactic lectures) via WebEx. Additionally, due to the challenges faced by residency programs due to the current pandemic, many pathology societies offered free access to online resources during the crisis including, CAP (College of American Pathologists), United States and Canadian Academy of Pathology, and American Society of Cytopathology (Table 1). The resources were greatly utilized by the residents.

There was limited negative impact on onboarding of post graduate year 1 (PGY-1) residents. Our incoming class has 5 residents, one of whom started 2 months late due to credentialing issues related to the pandemic. In the initial onboarding period in July, there was a limitation of no more than 6 people in a room (of the appropriate size) which allowed us the flexibility to provide the majority of the onboarding activities, including grossing, intraoperative consultation, autopsy, and key didactics in person. Personal safety concerns of faculty and residents were taken into account however, the majority of the didactic and hands-on sessions occurred in person that month with only one cancellation.

Wellness. Wellness was addressed in a multitiered fashion at the institutional, departmental, and residency/fellowship program level. At the institutional level, there is a Physician Wellness Committee (PWC), with house staff representatives from the pathology department. The PWC circulated a house staff wellness survey early on in the pandemic to assess overall feelings of house staff wellness and to identify target areas to address. Available mental health resources were circulated to house staff by blast email and via program directors. Program directors were reminded of these resources at GME committee meetings. The Pathology program directors checked in with all residents and reminded them of these resources both in person and virtually during monthly resident meetings and via email. A number of institutionally sponsored remote events occurred including resilience rounds, listening sessions with hospital, and GME leadership and fitness classes.

At the department level, Pathology Department leadership held a town hall in order to obtain a sense of how the faculty were doing and identify areas to address. Plexiglass barriers were purchased and installed at all multiheaded scopes in public areas and in private offices. Sanitizing surface wipes, hand sanitizers sand masks were distributed to all faculty, staff, and house staff.

At the program level, a number of resources, many of which were already established were capitalized on. Residents were individually checked on by the program director and mentors and encouraged to seek help when necessary. Available mental health resources were circulated as above. Residents were surveyed anonymously to gauge their feelings of safety and satisfaction with the learning environment.

There is a structured pathology department wellness curriculum for residents and fellows that has been established for

Table 1. Free Educational Resources.*

Organization	Title	Type of material	Web address
ASC	Live Online Educational Series 2020	Series	https://cytopathology.org/page/liveonlineseries2020
ARUP Laboratories	Video Lectures	Video Lectures	https://arup.utah.edu/education/videoIndex.php
ASCP	Online CE Portal	Course Library	https://store.ascp.org/productlisting/productdetail?productId=66979568
ASCP	Featured Education	Course Library	https://www.ascp.org/content/learning/featured-education
CAP	CAP Virtual Lecture Series	Series	https://www.gotostage.com/channel/capvls
CAP	Free CAP CME Offerings for Residents	Course Library	http://appsuite.cap.org/appsuite/learning/HomePage/FreeCME_Residents.pdf?_ga=2.62745068.1726420969.1585917381-1253810532.1516209088
PathCast	PathCast Seminars	Series	http://pathologycast.com/
USCAP	USCAP Interactive Microscopy:	Course	https://www.pathlms.com/uscap/courses/15552
USCAP	Second Edition: Modern Surgical Pathology Through the Expert Eyes of APSS-USCAP	Course	https://www.pathlms.com/uscap/courses/14759
USCAP	Common and Challenging Diagnostic Dilemmas on Frozen Section Service	Course	https://www.pathlms.com/uscap/courses/13962
USCAP	Update in Hematopathology	Course	https://www.pathlms.com/uscap/courses/5127

Abbreviations: ARUP, Associated Regional and University Pathologists, Inc.; ASC, American Society of Cytopathology; ASCP, American Society for Clinical Pathology; CAP, College of American Pathologist; USCAP, United States and Canadian Academy of Pathology pathologists.
* Some access expires.

Table 2. Lessons Learned and Potential Solutions.

Category	Challenge	Potential solution
Case volume	Low case volume in pathology	Pathologist volunteers on clinical floors, in family connect team, in clinical laboratory
Travel	Business and academic travel banned during COVID-19	Pathologists encouraged to participate in online CME courses
Meetings	Staff meetings, tumor boards, and education meetings cancelled during COVID-19	Continue meetings using a virtual platform- Webex
Staffing	Difficulty of social distancing in the office	Stagger and consolidate staff shifts Work remotely when possible
PPE	PPE conservation	N95 masks only to be used when in contact with potential threat of COVID-19 N95 masks stored in brown paper bag between use face shield sanitized between uses
Residency training	Low case volume, pandemic emergency stage 3, redeployment	Residents redeployed to other areas within pathology (microbiology, hematology, molecular laboratory) and can focus on these rotations during the pandemic WebEx sign-out, didactics, seminars, and journal clubs Online resources including institutional study cases and pathology society online resources
Cytopathology FNA Clinic	Patients being rescheduled now	Increase appointment time lengths, to allow for additional cleaning of patient room between patients Patients wear masks during procedure and are prescreened for COVID-19 symptoms Pathologist and radiologist wear PPE during procedure

Abbreviations: FNA, fine needle aspiration; PPE, personal protective equipment.

several years and is facilitated by wellness specialists employed by our GME office. The curriculum is varied slightly year to year and is designed to specifically combat issues relating to burnout. Resident and fellows generally meet monthly to engage in these sessions, most of which begin with a general check-in with the group about overall and program-related wellness and move on to interactive sessions on wellness-related topics. These sessions continued throughout the pandemic, although they have been remote. Additionally, an introduction to wellness session is included in the onboarding month for PGY-1 residents in July. Topics from March 2020 through December 2020 have included:

- Recognizing and managing fatigue
- Expectations, priorities, and time management
- Healthy relationships and skillful communication
- The path ahead, navigating transitions
- Introduction to wellness (PGY-1 only)
- Wellness brainstorm
- Giving feedback
- Psychiatric resources
- HeartMath
- Using mindfulness to cultivate well-being.

In addition, remote wellness activities to promote social interaction outside of work were facilitated and included food and socialization using the platform Gather (https://gather.town) and Zoom (https://zoom.us) as well as a trivia game. Residents have reported that meaningful redeployment to support institutional needs related to COVID19 was important to them during the peak of the pandemic in NYC and positively impacted their overall feelings of wellness.

Discussion

Many state-wide, city-wide, and hospital-wide changes have been implemented due to the ongoing COVID-19 situation. As the situation remains fluid, we must be prepared, as health care providers to step up and fill in the gaps wherever necessary (Table 2). Although the volume of COVID-19 testing had grown leading to increased demands on the clinical pathology laboratory, during the peak of the pandemic, the volume of AP cases was on the decline.

As illustrated in Figures 1 to 3, our case volume in 2019 demonstrated a steady month over month increase in both cytopathology and surgical pathology cases. Of note, the case volume was increased across the total surgical pathology and total cytopathology cases from February 2019 to February 2020 with a 4.6% and 26.4% increase, respectively. By April 2020, however, the case volume numbers had plummeted. The decline began during March 2020 but was most apparent in the total volume observed in April 2020. Our overall April 2020 surgical pathology and cytopathology volumes were down by 85.6% and 88.7% from the April 2019 volumes, respectively. Within surgical pathology, biopsy volume demonstrated the highest level of decline—91% from April 2019 to April 2020—whereas majors were down by 76.3%. This may be explained by a higher number of urgent and emergent surgical cases requiring an operation, over the number of cases requiring a diagnostic biopsy.

Within cytopathology, Pap smears suffered the largest volume decrease, that of 97.6% from April 2019 to April 2020, with non-GYN hospital cases showing the "smallest" decline, that of 69.8%. As Pap smears are a screening test and would be considered nonessential, they had become the lowest volume of case types in cytology during the pandemic. Whereas, hospital non-GYN cases remained at a higher volume due to the performance of medically necessary procedures (ie, thoracenteses and lumbar punctures) during the time of the pandemic.

As the AP workload began to decrease in March 2020, many pathologists began to volunteer in other parts of the health system that were in need. As part of our health care network Family Connect program, pathologists were able to keep COVID-19 patients' loved ones informed. Pathologist volunteers found this work enriching and rewarding, because of the increased involvement in bedside patient care, clinical teamwork, and a renewed understanding of clinical medicine that some had not encountered since their own medical school clinical rotation years. Pathologist volunteers did not merely pass along medical information to the family members, rather, they served as a bridge between the patient, the patients' health care team, and the patient's family member.

The CAP lobbied the Centers for Medicare & Medicaid Services and the Department of Health and Human Services to allow pathologists flexibility during COVID-19, and on March 26, a temporary waiver of Clinical Laboratory Improvement Amendment (CLIA) regulations was issued.[6] Although this waiver allowed for pathologists to work remotely without obliging them to perform diagnostic tests in CLIA-licensed facilities, our institution did not have the capability for remote diagnoses. Remote pathology diagnoses would have entailed either pathologists obtaining microscopes for the home, and glass slides being shipped to their homes and subsequently returned, or a virtual telepathology/digital pathology platform for pathologists to be able to diagnose remotely. This would have required a validated telepathology platform as well as the ability to scan and upload all slides into the system via whole slide imaging. This type of workflow currently exists for frozen sections only but a wide scale telepathology implementation is now being considered.

As the COVID-19 state-wide and hospital-wide numbers declined, the health system began initiatives for reopening in-person services in stages. Beginning May 1, our cytopathology team began to see patients for ultrasound-guided FNAs in our joint clinic with radiology. Abundant caution was taken to keep patients and providers safe. As we proceeded with a slow reopening, pathologists were aware that the situation was fluid, as more and more services and businesses began to reopen in NYC. In light of the notion that there may be a second wave of COVID-19 to follow, we cannot continuously push off patient care for those with non-COVID-19-related disease. Patients will continue to need diagnostic tests and medical/surgical treatments to continue whether the peak has passed or has yet to come. Therefore, as pathologists, we must make ourselves available to our patients and our clinical colleagues during this unique time.

Following the slow reopening in May, our health system's patient volume and pathology case numbers began to increase during the late spring and summer, and eventually began to soar during the fall. Our health system has had to adapt to continued social distancing and PPE precautions due to the ongoing risk of a second wave and continued underlying risk of infection within the population while accommodating the newfound increase in patient numbers with the influx of patients for missed or pending visits. With the addition of nonemergent surgeries and procedures.

During the peak of the pandemic in NYC, despite the stresses all around us at work, and at home, whether we were caring for elderly family members or children who were experiencing distance learning for schools, our pathology staff continued to serve our patients. Our residents continued to serve dual roles as volunteers and as trainees until late May, and it is our duty to ensure the best training possible given the situation, and to continue to reinforce their academic exposure.

Although the specimen volumes were low during the peak of the pandemic in NYC, most pathologists were able to work from home during off-service days. Since the return of specimen volumes this is no longer possible and pathologists have had to adapt to training residents and fellows as safely as possible. The hospital facilities department was able to construct Plexiglass barriers to be placed at all department multiheaded scopes to allow the resumption of one-on-one sign-out. The Plexiglass barriers were put in place in June, prior to the start of the new academic year in July and the arrival of the new PGY-1 residents.

Onboarding and training of new residents posed a unique challenge in the era of mandated social distancing. Macroscopic and microscopic evaluation of pathology specimens is traditionally taught in a hands-on, apprenticeship style. Typically, residents begin their training with a month of "bootcamp" where they participate in a series of introductory didactic lectures and develop relationships with key faculty and staff. Therefore, N95 masks and face shields were issued to be used at all times for key hands-on instruction that could not be adequately performed remotely, that is, macroscopic evaluation of gross specimens. The small size of the PGY-1 class, 5 residents, allowed for compliance with the health care network's limitation of up to 10 people in a room (of adequate size) at a time for many of the sessions. Plexiglass barriers were used for teaching at the microscope and remote platforms were used for the remaining didactic sessions. Remote didactic education had been implemented in March during the initial surge of COVID-19 cases in NYC so by the time the PGY-1 residents started, the process was virtually seamless.

There have been several benefits to switching to a remote platform for didactic education. Firstly, the ability to log into a lecture from any location has eliminated lost time due to travel between hospital sites for those rotating at a different location from the site of the lecture. Additionally, the remote platform allows for easy recording of lectures which are now being saved in a repository for posterity and can also be used to provide feedback to the lecturers on their performance.

One-on-one teaching at the microscope is a core component of resident education. Our department has adapted to a combination of in person teaching with Plexiglass barriers at a multiheaded scope and remote teaching using a camera attachment and sharing the screen. The routine use of remote platforms for slide teaching has facilitated increased collaboration and consensus between geographically separated faculty and residents within our extensive pathology department; however, the loss of resolution with these systems limits their utility. Ultimately, the need for established digital pathology platforms to support telepathology has become increasingly clear and is an option that our department is now implementing. We must learn from our experiences thus far in order to move forward, and we hope that our experiences in an AP department in the epicenter of the COVID-19 pandemic can help other pathology departments across the country.

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