

**Guidance for Resumption of Routine Electrodiagnostic Testing during
the COVID-19 Pandemic**

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Abstract:

As the world accommodates to the COVID-19 pandemic, routine in-person medical services are resuming. The resumption of non-urgent electrodiagnostic (EDX) testing faces unique challenges due to the long duration of the procedure and direct close contact with patients, including studies with risk of exposure to oropharyngeal secretions. We provide consensus guidance for resumption of EDX testing, addressing scheduling, patient arrival and registration, use of personal protective equipment, COVID-19 screening and testing, the performance of EDX in outpatient and inpatient settings, cleaning and maintenance of the EDX equipment and laboratory, balancing trainee safety and training requirements, and patient care issues. These are broad recommendations which need to be adapted to local COVID-19 risks, institutional guidelines and policies, and changing federal, state and local regulations, and to changes in the pandemic over time.

1. Introduction

The coronavirus disease-2019 (COVID-19) pandemic has necessitated several measures to contain or limit spread of the disease. Social distancing and the use of personal protective equipment (PPE) are two frequently used measures. In healthcare, balancing the risk of infection and the demand for healthcare resources to treat COVID-19 affected patients has resulted in a significant reduction of non-urgent in-person healthcare delivery. Alternative modes of healthcare delivery such as telephone visits or video platforms (“telemedicine”) are being increasingly utilized to provide healthcare.^{1, 2} However, non-urgent healthcare cannot be delayed indefinitely. Unique challenges with electrodiagnostic (EDX) testing in this context include the long duration of testing, close, direct patient contact (including studies with risk of exposure to oropharyngeal secretions), and potential for contamination of the EDX equipment.

The goals of this consensus guidance are to minimize disease transmission in patients and healthcare personnel (HCP), to identify and appropriately triage persons with possible COVID-19 infections, and to balance efficient use of PPE with protecting HCP, while providing EDX services to patients.³

2. Methods

In response to member requests, the AANEM Quality and Patient Safety Committee (QPSC) developed this practice guidance for resumption of routine EDX services in the COVID-19 pandemic. At an initial video-call of the QPSC members and AANEM staff on May 8, 2020, we considered the document scope and identified a writing group. We reviewed available institutional guidance and Centers for Disease Control (CDC) recommendations and drafted a document. We held video-calls on May 14 and May 15, 2020 and finalized the document with input from QPSC members and AANEM staff. The draft was approved by the AANEM Board of Directors on May 17, 2020.

3. Results

1. General Operations

i. Patient Scheduling:

1. Lengthening intervals between EDX appointments, staggering appointments, and reducing the number of appointments should be considered based on availability of space for social distancing, time required for appropriate cleaning of EDX equipment/ laboratories between visits, and accommodation of a potentially reduced workforce. A reduction in initial volume of routine EDX studies with

gradual escalation of the number of scheduled visits per day may be required.

2. Extended hours (evenings and weekends) may be required to adjust for changes in scheduling.
3. The EDX clinician should consider evaluating all EDX requests to prioritize the scheduling of patients.⁴
4. When scheduling EDX appointments, patients should be instructed to call if they develop symptoms of COVID-19 prior to the appointment.
5. Consider collecting co-payments over the telephone or using contactless methods.

ii. *Patient Arrival and Registration:*

Modifications to patient arrival and registration processes should be aimed at avoiding overcrowding and facilitating social distancing.

1. Points of entry to the testing facility should be monitored to limit entry and enforce social distancing.
2. Patients can be asked to wait in their cars upon arrival and present for registration at their appointment time. Alternatively, the patient may check in by telephone from the parking lot and be

escorted by staff to the EDX laboratory or called to report for check-in just before their appointment time.

3. If clinic waiting areas are used, the chairs should be rearranged at 6-foot intervals. Social distancing markers 6 feet apart should be placed in the waiting room and around the registration area. There should be clear signage to instruct patients.
4. Discrete entrances and exits should be designated and clearly marked, with the option of using escorts to guide patients in and out of the facility.
5. Accompanying persons should be asked to wait outside the institution unless their presence is necessary to perform EDX testing (e.g., in young children, patients with cognitive impairment).

2. Safety and PPE

- i. All patients should wear face masks.
- ii. All patients should perform hand hygiene before EDX testing with alcohol-based hand sanitizers (containing 80% ethanol or 75% isopropanol) or soap and water.
- iii. All HCP in contact with patients should wear PPE.

- iv. In persons not suspected of having COVID-19 infection, the recommended PPE includes clean non-sterile gloves, surgical masks, and goggles or face shields. Disposable N95 filtering facepiece respirators (“N95 masks”) or an approved equivalent mask are alternative options.
- v. For high risk EDX studies (e.g. facial studies, laryngeal EMG) isolation gowns and N95 masks or an approved equivalent are additionally recommended (Figure 1).⁵
- vi. The same surgical mask may be worn throughout the workday but should be changed if it is visibly soiled.
- vii. HCP must be educated about proper procedure and sequence for donning and doffing of PPE. Guidance regarding this is available from the CDC.⁶

3. Patient and HCP Screening

- i. All HCP with direct patient contact should be screened daily for COVID-19. At present, most institutions in the US use a symptom checklist to identify personnel who require COVID-19 testing. Table 1 provides a suggested checklist.
- ii. All patients should be screened the day prior to their appointment using a symptom checklist. The check-list responses should be documented in the medical records.

- iii. Because of potential inaccuracies in the responses to the screening checklist, temperature screening at the entrance to the hospital or clinic may also be used.
- iv. There is no CDC or other federal guidance at this time for pre-procedure COVID-19 testing. State and local mandates are broad, leaving testing decisions to the treating clinician. Institutional policies vary, with some institutions in the US leaning towards pre-surgical and pre-procedural testing for COVID-19. Because of the risk of asymptomatic transmission, COVID-19 testing using Food and Drug Administration (FDA) Emergency Use Authorized polymerase chain reaction (PCR) assays of nasopharyngeal or oropharyngeal swabs should be considered in all patients 24 to 48 hours prior to EDX testing and strongly considered prior to high risk EDX studies.⁷
- v. A protocol for urgent management of patients who report symptoms on screening or have a positive test for COVID-19 should be readily available, and EDX testing should be postponed in these patients.
- vi. Scheduling of EDX testing in patients who have tested positive for COVID-19 or have a history of symptoms that are suggestive of COVID-19 in the recent past requires evidence that the infective phase has passed. Replication-competent virus is usually not present by 10 days after the onset of illness, even if PCR is positive.⁸ General recommendations to discontinue isolation

include all of: an afebrile period of at least 72 hours without anti-pyretic medications, improving respiratory symptoms, and at least 10 days since the first appearance of symptoms.⁹ For immunocompromised and hospitalized patients, two consecutive FDA Emergency Use Authorized assays on upper respiratory swabs collected at least 24 hours apart should be negative.¹⁰

4. Outpatient EDX Studies

- i. Limit the number of HCP in the EDX laboratory. Observers (e.g., medical students or visiting trainees/faculty) should be avoided.
- ii. Plan the study to obtain data efficiently and minimize study duration. Avoid studies that may not add meaningful diagnostic information.
- iii. There is a risk of contamination of EMG supplies if handled during the procedure (e.g., when replacing the ground electrode with a new one). This may be reduced by using a pre-assembled single-use kit for each study. The kit should contain alcohol wipes, electrode paste if required, disposable electrodes, a measuring tape, adhesive tape, a small pack of gauze, one EMG needle, and a marker pen.
- iv. Because supplies may need to be replenished during the procedure, a “secondary kit” with an extra needle and electrodes may be useful, while keeping the bulk of supplies outside of the EDX room.

- v. Strongly consider using disposable electrodes.
- vi. Use disposable markers or clean and disinfect the markers after each use.
- vii. Use disposable tape measures or clean and disinfect measuring tapes after each use.
- viii. Use disposable heating packs or an alternative method of warming such as heat lamps.
- ix. Cover the patient with a sheet/blanket to minimize direct contact.

5. Inpatient EDX Studies

- i. For inpatient EDX studies on patients who are not suspected of having COVID-19 infection, we recommend following the procedures in section 4.
- ii. Inpatient EDX studies on Covid-19 positive patients, patients on ventilators, and patients using non-invasive positive pressure ventilation (NIPPV):
 1. The critical need for the study and the potential utility of EDX results in changing management should be discussed with the ordering clinician.⁴ In some instances, the information may be obtained by other testing modalities such as imaging, and in others, the study may be postponed until patient is not infectious. In patients on ventilators or using NIPPV, the study should be postponed until two

consecutive FDA Emergency Use Authorized assays on upper respiratory swabs collected at least 24 hours apart are negative.

2. If the EDX study is deemed necessary, the following additional steps are recommended:

- a. PPE should include isolation gowns, N95 masks or an approved equivalent mask, face shields or goggles and gloves.⁵
- b. If possible, perform the study at the patient's bedside to avoid patient transport.
- c. Only essential EDX personnel should be physically present during the study.
- d. Consider performing the study at the end of the day so that there is sufficient time to thoroughly clean and disinfect the EDX equipment without immediate need to re-use it.

6. **EDX Equipment/ Laboratory Cleaning/Disinfection and Maintenance^{11,12}**

i. EDX Equipment:

1. Clean and disinfect the EDX machine, reusable cables and electrodes thoroughly after each procedure as per manufacturer

guidance. Solutions containing bleach may damage sensitive equipment. The equipment may be cleaned with a cloth moistened with water and detergent, followed by disinfection with 80% ethanol or 75% isopropanol wipes, allowing the alcohol to evaporate.

2. Consider using protective plastic covers that can be wiped for the keyboard, computer mouse, and protective plastic barriers between the patient and machine.
3. Minimize furniture and other non-essential objects in the laboratory.
4. Remove furniture that is upholstered with fabric or other material that cannot be disinfected.

ii. *Cleaning of the EDX Laboratory:*

1. Custodial services may not be available to clean EDX laboratories between procedures, and EDX laboratory staff will have to perform room cleaning. Use soap and water to clean surfaces where feasible prior to disinfection.
2. Wipe down all hard surfaces including, but not limited to doorknobs, kiosks, elevator buttons, handrails, light switches, chairs, stools, beds, computer keyboards, mouse, screens, telephones, sinks/faucets, counter spaces with disinfecting wipes following product label instructions for duration of surface contact, etc.

3. Place “Cleaned and Sanitized Room” signs on the door after cleaning.

7. Training of Fellows and Residents

The training of fellows and residents is a balance between fulfilling training program requirements and trainee safety.

- i. EDX in-person training should continue with modifications to minimize exposure risk to trainees.
- ii. All recommended PPE must be available to trainees, who must be educated about their proper use.
- iii. Review of trainee reports should maintain social distancing between the attending and trainees. Alternatively, virtual technologies can be used.
- iv. Other formats of EDX training such as virtual EDX case discussions should be used to supplement hands-on training.

8. Patient Care

- i. Reassure patients that stringent cleaning and disinfecting procedures are followed to minimize their risk of COVID-19.
- ii. It may be useful to prominently display the cleaning and disinfecting protocols in the EDX laboratory.

- iii. Consider a specific discussion of the benefits of EDX testing versus the potential risks of COVID-19 infection when obtaining informed consent for EDX testing .

Conclusions:

The above recommendations should be used in conjunction with changing CDC and other federal, state, and local regulations. The recommendations may require modifications in the context of local infection rates, institutional policies and guidelines, and the availability of workforce, equipment and other resources. The landscape of the pandemic is changing rapidly, and these recommendations should be adapted to meet those changes.

List of Abbreviations:

CDC – Centers for Disease Control
COVID-19 – Coronavirus Disease-2019
EDX – Electrodiagnostic testing
FDA – Food and Drug Administration
HCP – Healthcare personnel
PCR – Polymerase chain reaction

PPE – Personal Protective Equipment

QPSC – Quality and Patient Safety Committee

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Figure Legend:

Figure 1: Personal Protective Equipment. COVID-19 Personal Protective Equipment (PPE) for Healthcare Personnel. https://www.cdc.gov/coronavirus/2019-ncov/downloads/COVID-19_PPE_illustrations-p.pdf, Accessed May 14, 2020

Table 1: Example of screening checklist for COVID-19

1. Have you been within 6 feet of a person with lab-confirmed COVID-19 for at least 5 minutes, or had direct contact with their mucus or saliva, in the past 14 days?
2. In the last 48 hours, have you had any of the following symptoms?
 - a. Fever $>100.4^{\circ}$ F
 - b. Feeling feverish
 - c. Cough
 - d. Sore throat
 - e. Trouble breathing, shortness of breath, wheezing
 - f. Unusual fatigue
 - g. Chills or shaking

- h. Body ache
- i. Vomiting
- j. Diarrhea
- k. Nausea
- l. Abdominal pain
- m. Loss of smell or taste
- n. Headache

<https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html>

<https://www.mayoclinic.org/covid-19-self-assessment-tool>

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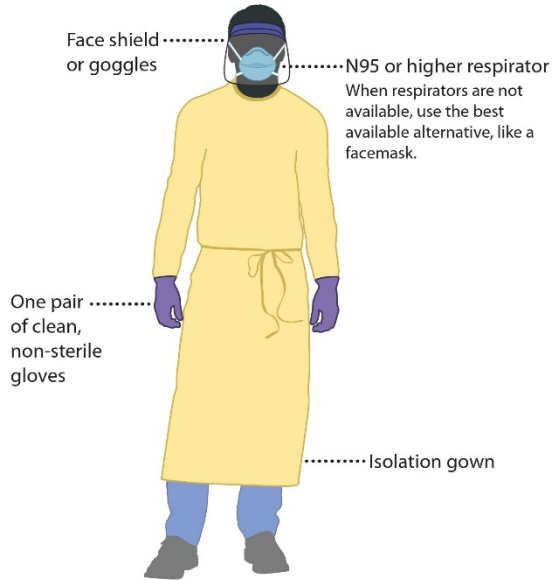
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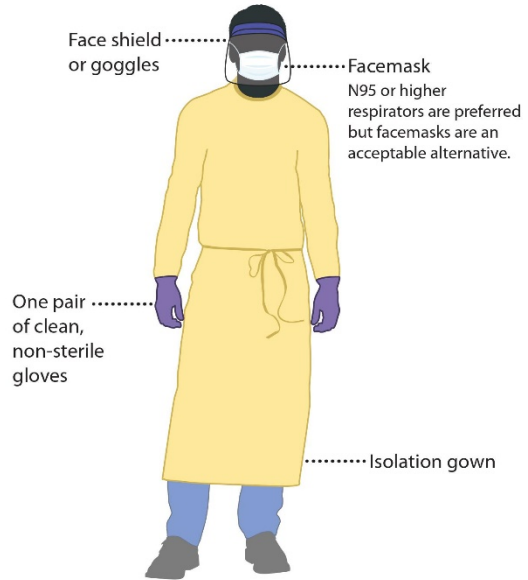
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COVID-19 Personal Protective Equipment (PPE) for Healthcare Personnel

Preferred PPE – Use N95 or Higher Respirator



Acceptable Alternative PPE – Use Facemask



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