

## Pediatric COVID Testing with New Onset Neurological Symptoms:

**Situation:** There is emerging evidence that COVID-19 may manifest in the form of neurological symptoms in the presence or absence of respiratory symptoms.

**Background:** RNA viruses including coronaviruses are known to invade the CNS (ACE 2 receptor involvement). Neurological manifestations of RNA viruses are more prevalent in children than adults.<sup>1</sup> In a retrospective analysis in China, 36% of adults had neurological symptoms with COVID-19 infection<sup>2</sup> and there other reports of neurological manifestations<sup>3,4</sup>. The evidence in children is limited to case reports and anecdotal unofficial reports.

**Assessment:** COVID-19 infection may present or include neurological signs or symptoms in pediatric patients (adolescents seem to be higher risk, but infants may present with apnea).

**Recommendations:** There should be an index of suspicion to test for COVID-19 when children present with new neurological findings in the absence of other etiologies. Based upon review of limited scientific literature, below are recommendations when to test for COVID-19 in children with new neurological symptoms.

### Absolute Indications to Test for COVID

- Anosmia/hyposmia
- Impaired Taste
- Stroke alert

### Consider Testing for COVID-19

- New onset seizures without other etiology especially refractory seizures, absence of fever does not exclude possible COVID-19 infection
- Altered mental status without known etiology, even waxing and waning mental status
- New onset neurological symptoms without known etiology including but not limited to severe headache, dizziness, ataxia, visual impairment, nerve pain, neuromuscular weakness or pain

### Possible Associated Diseases and Syndromes with COVID-19

1. Acute Demyelinating Encephalomyelitis (ADEM)
2. Acute encephalitis
3. Acute necrotizing encephalitis
4. Meningitis
5. Guillain Barre Syndrome (GBS)
6. Transvers Myelitis
7. Ischemic stroke
8. Cerebral or sinus deep venous thromboses

### Diagnostic Considerations Depending on Clinical Situation:

1. Consult Neurology – may help guide additional testing such as radiological and EEG.
2. Radiological imaging – CT, MRI, MRA, MRV (though normal studies do not exclude presence of CNS disease)
3. EEG
4. CSF testing - indices are usually normal; CSF testing for COVID-19 is not validated currently
5. Inflammatory markers - CRP, Procalcitonin, ESR
6. Other labs – LDH, CPK, ferritin

7. If index of suspicion is high, then consider repeat COVID-19 NP swab in 24-48 hours; if repeat negative and/or symptoms > 5 days from onset of symptoms may consider sending for COVID Antibody test (see "AH COVID-19 Diagnostic Algorithm" for details)

**Informal list serves reporting of COVID+ pediatric patients with neurological disease:**

1. Altered mental status, intermittently aphasic, MRI neg, CSF neg, normal TFTs but elevated thyroperoxidase antibodies
2. Encephalitis (adolescent) with waxing and waning mental status, SIADH; also developed a DVT
3. Seizures, altered mental status, apnea, with associated respiratory failure and mildly elevated ferritin and LDH

**References:**

<sup>1</sup>Neurological Manifestations of Severe Respiratory Viral Contagions

Robinson C, et al *Crit Care Explor* 2020

<sup>2</sup>Hunag C, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China *Lancet* 2020

<sup>3</sup>Mao, L, et al. Neurological Manifestations of Hospitalized Patients with COVID 19 in Wuhan, China: a retrospective case series study. *MedRxiv* 2020

<sup>4</sup>Moriguchi T, et al. A first case of meningitis/encephalitis associated with SARS-Coronavirus-2. *International Journal of Infectious Diseases* 2020