Addendum to Emory Healthcare's Brain Death Determination Policy effective 04/17/2020

Brain death testing in the setting of COVID-19

Last Updated: 4/17/2020

Emory Healthcare's Brain Death Determination Policy is the guiding document for evaluating patients for brain death. In order for faithfully evaluate a patient for brain death determination, all prerequisites for testing must be met, which include identifying a cause of irreversible coma and ruling out confounding processes. Only in this setting can the clinical examinations required, be conducted. In the setting of COVID-19, the process of determining brain death presents several issues in meeting both the prerequisites for brain death testing and in conducting the necessary clinical examinations.

First, irreversible neurologic injury must be established. This often requires neuroimaging that is consistent with severe brain injury. Even in the setting of cardiac arrest or severe hypoxemia—where a mechanism of injury is clearly established—neuroimaging demonstrating severe neurologic injury is still recommended. If appropriate neuroimaging cannot be obtained, establishing injury supporting brain death is problematic.

Second, confounders to brain death must be ruled out. In the setting of multiorgan failure, ensuring clearance of analgesia and sedation can be difficult. Additionally, the impact of on-going metabolic dysregulation contributes to depressed consciousness and must be reasonably addressed prior to brain death testing.

Finally, the clinically exam requires apnea testing. In the setting of severe respiratory failure or in patients with unstable hemodynamics, an apnea test is unable to be conducted. Further, in those who may be clinically able to undergo an apnea test—the risk of aerosolizing viral particles during ventilator disconnection presents an additional risk. In patients able to undergo apnea testing, a modified approach using a filtered exhalation circuit will be used.

In cases where apnea testing cannot be performed, an ancillary study such as a nuclear medicine cerebral blood flow study and/or transcranial dopplers are typically utilized to establish loss of cerebral blood flow. Utilization of these technologies requires highly-trained technologists to work around an intubated patient for an extended time period. Currently, this is felt to present an unnecessarily high risk of exposure to the technician and a contamination risk to the equipment. Alternative ancillary tests such as cerebral angiogram and EEG are not utilized in the Emory system and present similar high risks.

Given the complexities of determining brain death in patients with COVID-19, we recommend to following guidance:

Recommendations:

1. In the setting of a neurologic exam that suggests profound brain dysfunction, a consultation to the neurocritical care or neurology service is strongly advised.

2. Positive COVID-19 test results must be obtained before applying these recommendations.

3. If the patient is COVID-19 negative, the usual Brain Death Determination policy must be utilized.
4. The consult team will help establish brain function, identification of persistent confounders, and recommend further studies if possible and appropriate.

5. Additional recommendations for studies (lab, imaging, etc.) will be guided by the principle of minimizing harm to health care colleagues in addition to the benefit that establishing a diagnosis may bring to the patient and their family.

6. For patients in which irreversible brain injury has been established and confounders have been carefully ruled out, an apnea test may be conducted. A modified approach to apnea testing has been developed for patients actively infected with coronavirus*. This modified apnea test should be conducted with a respiratory therapist, the neurointensivist, and an ICU nurse (to obtain ABGs from the arterial line).

7. If the results of the history, brain death clinical exams**, and the apnea test are consistent with loss of brain function, the patient will be considered brain dead.

8. The results of the history, examinations, and any obtained studies may suggest a loss of all brain function and that a diagnosis of brain death is likely. However, this diagnosis may be unable to be established given the inability to complete formal testing. In this situation, these findings will be discussed with the critical care team and the consultant or a member of the consulting team will be available to discuss these findings with the patient's family per Palliative Care recommendations.

These recommendations will be reviewed and updated as our understanding of the clinical care and pathophysiology of COVID-19 evolves.

***Modified Apnea Testing for patients infected with coronavirus**

1. At least one clinical exam consistent with brain death should be documented prior to Apnea testing.

1. No clinical concern for cardiopulmonary arrest during the apnea test.
2. Normothermia: Core temperature > 36o C or 97o F.
3. Normotension: Systolic blood pressure > 100 mm Hg.
4. Euvolemia. Option: positive fluid balance in the past 5 hours.
5. Eucapnia: PaCO2 35 – 40 mmHg. Option: arterial pCO2 > 40 mm Hg.
6. Absence of hypoxia. Option: Preoxygenation to obtain arterial pO2 > 200 mm Hg.
7. No prior evidence of COPD or CO2 retention.

2. Procedure

1. Preoxygenate on 100% FiO2 for 10 minutes
2. Obtain baseline arterial blood gas (ABG) and check for normalized pCO2 and paO2>200 mg Hg
3. Attach a PEEP valve set at 5, to a bag valve manual resuscitator with reservoir (Ambu-bag). Connect to wall oxygen at 15L/min.
4. Attach a Pulmodyne HEPA filter to the end of the Ambu-bag.
5. Disconnect the ventilator and attach the HEPA filter-Ambu-bag set up to the endotracheal tube.
6. Look closely for respiratory movements (abdominal or chest excursions that produce adequate tidal volumes)
7. Abort if systolic blood pressure drops <90mmHg (titration of vasopressors is allowable).
8. Abort if oxygen saturation measure by pulse oximetry <85% for >30 seconds

9. Abort if significant arrhythmias develop.
10. Obtain an ABG at approximately 5-8 minutes, and a repeat at 10-12 minutes if tolerated.
11. The apnea test can be continued until the ABG meets criteria or the patient becomes hemodynamically unstable.
12. Reconnect the ventilator.

3. Results

a. If respiratory movements are absent and arterial pCO2 is >60mm Hg **OR** there is 20mm Hg increase in pCO2 over the baseline pCO2 –the apnea test is positive and supports the diagnosis of brain death.

b. If respiratory movements are observed and/or arterial pCO2 is < 60mm Hg **OR** there is < 20mm Hg increase in pCO2 over a baseline pCO2 –the apnea test is negative and **DOES NOT** support the diagnosis of brain death.

c. If the test is negative due to lack of appropriate rise in pCO2, repeat the apnea test, but now draw the ABG at approximately 12-15 minutes after disconnection from the ventilator.

****Brain Death Clinical Exams for patients infected with coronavirus.**

1. Two Clinical Brain Death Examinations must performed by two Qualified Providers, one examiner must be a Qualified Provider who is an Attending physician from a Neurocritical Care, Neurology, Neurosurgery or Critical Care Medicine service. A Qualified Provider is one privileged to determine brain death within Emory Healthcare.

2. The clinical examinations can be performed in tandem or simultaneously by the two separate providers in order to reduce risk of exposure.

This addendum was drafted by Casey L Hall, MD MAT, and reviewed and approved by Owen B. Samuels, MD, Wendy Wright, MD, JM, Prem Kandiah, MBBS, and Casey L Hall, MD, MAT for the EHC Brain Death Determination Committee on April 17, 2020.