LAC+USC Medical Center ASA 106-A
Brain Death Determination Syllabus

A. Background

The diagnosis of brain death is made according to criteria that are determined at the level of individual hospitals. Federal and state legislation defer to physicians regarding criteria and determination of brain death.

Most brain death laws in the United States are based on the Uniform Determination of Death Act, drafted by the National Conference of Commissioners of Uniform State Laws in 1980 at the Commissioner's Annual Conference in Kauai, Hawaii.

In its Prefatory Note the Act states: "this act is silent on acceptable diagnostic tests and medical procedures. It sets the general legal standard for determining death, but not the medical criteria for doing so. The medical profession remains free to formulate acceptable medical practices and to utilize new biomedical knowledge, diagnostic tests, and equipment".

The California legislature has delegated to hospitals responsibility for brain death determination and documentation “in accordance with accepted medical standards" when there is "irreversible cessation of all functions of the entire brain, including the brain stem."

The Brain Death Determination Policy ASA 106 was first approved by the Executive Committee of the Attending Staff Association at the LAC+USC Medical Center in April 2003.

B. Examiner Qualifications

License

California Law stipulates that brain death must be determined and independently confirmed by two California licensed physicians.

Attending Physicians

LAC+USC policy requires that attending physicians be specifically credentialed and be granted privileges to determine or confirm brain death. Attending members of one of the neuroscience departments, Neurology or Neurosurgery, and/or attending intensivists in one of the Medical Centers Intensive Care Units can be granted privileges upon completing a required reading of the policy and this syllabus and approval by the Medical Executive Committee. Proctoring must then be successfully completed under the direct supervision of another qualified attending with privileges.

Resident Physicians

Licensed resident physicians can be deemed competent by their department chair to perform the brain death examination via accepted departmental procedures. Such procedures will also require at a minimum a reading of the policy and syllabus as well as successful completion of the competency exam with a score of at least 80% and successful completion of proctoring by a qualified attending.

C. Principles

Documentation of brain death must certify that each of the following areas of concern have been appropriately addressed:

1. Etiology of coma
2. Interfering confounding factors ruled out
3. "Whole brain" neurologic examination
4. Irreversibility

1. Etiology of coma

A mechanism of injury consistent with the level of coma should be documented. Examples of etiologies include: “motor vehicle accident”, “gunshot wound to the head”, “brain abscess”, “meningitis” or “intracerebral hemorrhage”.

2. Confounding factors

Prior to initiating a brain death evaluation the examining physician must assess for the presence of reversible factors that could be significantly contributing to coma such as metabolic abnormalities, presence of toxins, central nervous system depressants, hypoxia, and hypercarbia. In addition, two specific stipulations are included in the brain death declaration form:

1) the patient's body temperature must be greater than 35^0C and

2) the patient must have a normal blood pressure for age.

A determination of Brain Death can be made in the presence of minor abnormalities but the examining physician must document on the Brain Death Form or in an accompanying Progress Note that he or she feels the abnormality is not significantly contributing to the absence of brain function on neurological examination.

3. Whole brain neurologic examination

The function of the entire brain including brainstem must be absent. This is demonstrated by a comprehensive examination that tests for cerebral and brainstem function.

Each of the following must be documented in the list of neurologic findings reported in the brain death note: **Test**	**Technique**	**Finding**	**Anatomy**	**Criterion for death**
Motor response to noxious stimulation (central and peripheral)	Firm pressure to supraorbital nerve, supratrochlear nerve, etc	Movement of face, body, or an extremity	Spinal, brainstem, basal ganglia, and cortical pathways	Absence of non-reflexive movement
Pupil response to light	Light shown onto retina	Pupil constricts or dilates	Midbrain	Fixed, mid position
Fifth and seventh nerve sensory and motor reflex	Light touch to cornea	Eye blinks	mid pons	No eye blink
Gag reflex	Touch oropharyngeal wall	Elevation of uvula and cough	IX, X: lower pons	No gag
Oculovestibular (caloric) reflex	Irrigation of tympanic membrane with ice water. Observe for eye movement.	Absence of nystagmoid eye deviation	VII, VIII: lower pons	No eye movement
Oculocephalic reflex * * This test is not required and should be omitted when a C-spine injury is suspected	Turn head side to side while observing for movement of eyes.	Doll's eyes (painted on): stay fixed forward No doll's eye	VIII: lower pons	Doll's eyes (no oculo-cephalic reflex)
Apnea The apnea test need only be performed once for adult pts when performed by an attending physician. Two apnea tests are required for pediatric patients < 18 years of age The test should be started from a baseline PCO_2 of ~35 – 45 mmHg	Maintain oxygenation, induce hypercarbia / respiratory acidosis to stimulate breathing center	Absence spontaneous breaths	Medulla	Absence of spontaneous breath in spite of severe acidosis (pCO_2 $\geq$ 60mmHg AND 20mmHg above starting point

Pitfalls:

SPINAL REFLEXES - The most common confusing finding on examination for brain death is the presence of "spinal reflexes" where the patient moves an extremity in response to noxious stimulation. This is why a central noxious stimulus, for example to the supraorbital nerve, is preferred over peripheral stimulation alone. Rarely, it has been reported that a brain dead person may even sit up in bed and perform a complex set of movements such as crossing the arms across the chest (Lazarus phenomenon) in the absence of any brain activity. If there is any question about the significance of movements or other responses an objective confirmatory test should be performed.

APNEA TEST - Another common mistake is failure to correctly perform the apnea test. The apnea test is performed by pre-oxygenating the patient with 100% oxygen and then allowing the patient's pCO_2 to rise to 60mmHg or greater AND 20mmHg above the starting point. In the un-ventilated patient pCO_2 rises approximately 3mmHg per minute. Assuming that a patient's pCO_2 is 40mmHg at the time that the ventilator is disconnected, a pCO_2 of 70mmHg should be reached after 10 minutes (3mmHg/min x 10 minutes = 3mmHg). Occasionally, the apnea test will not be tolerated by some patients whose cardiopulmonary status is unstable. In these patient's brain death cannot be determined on clinical grounds alone. See "Inability to perform a complete examination" below. The test should be started from a baseline PCO_2 of ~35 – 45 mmHg.

ISOLATED BRAIN STEM INJURY - Patient with brain stem injury without evidence of higher cortical injury warrant very careful evaluation because they may present with signs and symptoms consistent with a locked in syndrome. Consultation with neurosciences is recommended.

4. Irreversibility

Irreversibility can be defined either by an objective confirmative test or by an appropriate time interval between two clinical exams. The interval between two clinical exams at LAC+USC Medical Center is:

2 hours for adults
24 hours for pediatric patients age 37 weeks gestational age to 30 days12 hours for children >30 days through 17 years

Time interval requirements do not apply if ancillary confirmatory testing is diagnostic in the presence of a physical exam as complete as possible that is consistent with brain death.

D. Use of Approved Ancillary Tests

A number of ancilary tests are available for confirming the absence of brain activity or absence of intracranial perfusion. These include diagnostic angiography radionuclide flow study, and EEG. These tests are used in two ways: either to confirm the results of a complete clinical examination or todemonstrate a clinical state, i.e., absence of cerebral blood flow or electrical activity, consistent with brain death in situations where a complete clinical examination cannot be performed.

When two complete physical clinical examinations are diagnostic, the use of these tests in a confirmatory manner is optional.

If a patient receives an ancillary test that shows either cerebral blood flow or electrical activity, brain death can not be diagnosed at that time.

In the event a complete clinical examination cannot be performed the following approach should be conducted:

1. The first examiner will perform a clinical exam as complete as possible given individual patient circumstances. If no contraindication to the diagnosis of brain death is found an approved ancillary study should be performed.
2. The results of the approved ancillary study should be read by an attending specialist and documented in the medical record.
3. The first examiner can then complete the brain death declaration form, explaining the limitations of the clinical exam and the results of the ancillary study.
4. The second examiner can then perform a clinical exam as complete as possible, document review of the ancillary study results and document these as confirming the diagnosis of brain death. No time limit is required between examinations after an ancillary study is confirmatory.
5. The time of death will then correspond to the time of the signed second, clinical examination note.

E. Documentation

Brain Death Documentation Form

Use of the approved Brain Death Determination Form, electronic or paper is the preferred method for documenting the results of examinations for brain death. Each item on the checklist form adopted by the Brain Death Committee must be addressed. The time and date of the second independent clinical examination will configure the official pronouncement of death in the medical record. See Attachment ASA 106-C for the paper form.

F. Family Notification and Period of Accommodation

An evaluation for brain death is considered established standard of care when indicated and does not require consent. Medical teams are required to inform the healthcare decision maker that an evaluation for brain death will take place. The Notice of the Initiation of Brain Death Declaration (Appendix D) should be given to family/surrogate whenever possible.

As soon as the decision is made to initiate an evaluation for brain death, a member of the patient's treatment team shall inform the patient's legally recognized health care decision maker, if any, or the patient's family or next of kin, if available, that if brain death is diagnosed and confirmed according to hospital procedure all ongoing medical interventions, including mechanical ventilation will be stopped at that time. Use of the Notice of the Initiation of Brain Death Declaration should be given to family/surrogate whenever possible. See Attachment ASA 106-D.

It is often difficult for family members to fully understand the diagnosis of brain death and it is very important for medical providers to use language that clearly communicates the fact that a loved one, if declared dead by neurologic criteria, is truly dead. Avoiding terms like removal of “life support” when mechanical ventilation is to be removed is essential to avoid further familial confusion.

Furthermore, California law grants that a family may request a period of accommodation to facilitate personal, cultural or spiritual needs after the diagnosis has been made and prior to the removal of medical support. They are also entitled to a written statement of hospital policy in this regard upon request. The period of accommodation should be reasonably brief (generally on the order of hours, not days) and is determined by both familial needs and the existing circumstances within the hospital at the time of the request. If providers encounter a difficulty in finding an agreeable time to remove mechanical support, the case should be referred to the unit director for resolution.

G. Challenges

Challenges to a Brain Death Determination will be mediated by the Brain Death Committee. In the event that a committee member is not accessible the Medical Officer of the Day (MOD) or Medical Director will mediate.

Risk Management should be notified of all Brain Death declaration challenges.

H. Review

All determinations of brain death may be reviewed for Quality Improvement purposes by the Brain Death Committee.

References

1. Whole-brain criterion of death first proposed by the "Ad Hoc Committee of the Harvard Medical School to Examine the Definition of Brain Death" in a "Special Communication" published in JAMA in 1968.
2. Guidelines for the determination of death: Report of the medical consultants on the diagnosis of death to the president's commission for the study of ethical problems in medicine and biomedical behavioral research. JAMA 1981; 246 (19): 2184-2186.
3. Practice parameters for determining brain death in adults in 1995 by the Quality Standards Subcommittee of the American Academy of Neurology (Neurology, 45:1012, 1995). The Academy qualifies this protocol as "an educational service... [not] intended to exclude any reasonable alternative method" of brain death determination.
4. The diagnosis of brain death. New England Journal of Medicine 2001, 344 (16): 1215-1221.
5. Variability in brain death determination practices in children. JAMA 1995, 274 (7): 550-553. ASA 106-A Declaration of Brain Death Syllabus 5-1-08 Page 5 of 5
6. California Health and Safety Code: (sections 7180-7182). An individual who has sustained irreversible cessation of all functions of the entire brain, including the brain stem, is dead. (Section 7180) (a)(2) When an individual is pronounced dead by determining that the individual has sustained an irreversible cessation of all functions of the entire brain, including the brain stem, there shall be independent confirmation by another physician (Section 7181) When a part of the donor is used for….transplantation…and the death of the donor is determined by determining that the individual has suffered an irreversible cessation of function of the entire brain, including the brainstem, there shall be an independent confirmation of the death by another physician. Neither the physician making the determination of the death under Section 7155.5 nor the physician making the independent confirmation may participate in the procedures for removing or transplanting a part.