The New HKSC CM
Brain Death Guideline

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The specialty of intensive care started in Copenhagen in 1952, when Bjørn Ibsen got a relay of doctors to manually ventilate a dying 12-year-old patient with polio.
Le coma depasse
(The depassed coma)
Resuscitation techniques, being extra-ordinary means, could be withdrawn before circulatory arrest occurred. The precise moment of death cannot be deduced from any religious or moral principle, and is therefore a matter for the competence of clinicians.
Dr. Joseph Murray  
Peter Bent Brigham Hospital  
721 Huntington Avenue  
Boston, Massachusetts 02115

Dear John:

At a recent meeting of the Standing Committee on Human Studies, Dr. Henry K. Beecher reviewed some basic material on the ethical problems created by the hopelessly unconscious man. Dr. Beecher's presentation re-emphasized to me the necessity of giving further consideration to the definition of brain death. As you are well aware, many of the ethical problems associated with transplantation and other developing areas of medicine hinge on appropriate definition.

With its pioneering interest in organ transplantation, I believe the faculty of the Harvard Medical School is better equipped to elucidate this area than any other single group. To this end I ask you to accept appointment to an ad hoc committee. Assuming your acceptance of this added responsibility for the School, the committee membership will be as follows:

Dr. Raymond D. Adams  
Dr. A. Clifford Barger  
Dr. William Curran  
Dr. Derek Denny-Brown  
Dr. Dana L. Farnsworth  
Dr. Jordi Folch-pi  
Professor Everett I. Mendelsohn  
Dr. John F. Merrill  
Dr. Joseph Murray  
Dr. William Sweet  
Dr. Henry Beecher, chairman

Sincerely yours,  
Robert H. Ebert, M. D.  
Dean
DIAGNOSIS OF BRAIN DEATH

Statement issued by the Honorary Secretary of the Conference of Medical Royal Colleges and their Faculties in the United Kingdom on 11th October 1976
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 and Behavioral Research

ABC of Brain Stem Death


Ten years ago when I lectured on brain death, the audience reaction was often hostile. Most of the criticisms were based on conceptual grounds and emotional anxieties. Over the years the audiences have become quieter and the questions fewer, until now if there are doubts, they are generally about some minor technical detail. The ethical and physiological concepts of brain death, its diagnosis and what follows are now widely accepted. The process leading up to this milestone in medical practice has been long, controversial, sometimes ill-tempered, and once even tainted with deceit. But the outcome has been worth the struggle and the final chapter has almost been written.
GUIDELINES ON
CERTIFICATION OF BRAIN DEATH

INTRODUCTION

Brain death is established by the documentation of irreversible coma and irreversible loss of brain stem reflex responses and respiratory center function or by the demonstration of the cessation of intracranial blood flow. Despite philosophical arguments, the concept that brain death is equivalent to death is accepted legally and within the medical community in Hong Kong. Once brain death has occurred, artificial life support is inappropriate and should be withdrawn. It is good medical practice to recognize when brain death has occurred and to act accordingly, sparing relatives from further emotional trauma of futility.
GUIDELINES ON CERTIFICATION OF DEATH
FOLLOWING THE IRREVERSIBLE CESSION
OF BRAINSTEM FUNCTION

INTRODUCTION
The irreversible cessation of brainstem function ("brainstem death") is established by the documentation of irreversible coma and irreversible loss of brain stem reflex responses and respiratory center function or by the demonstration of the cessation of intracranial blood flow. Despite philosophical arguments, the concept that brainstem death is equivalent to death is accepted legally and within the medical community in Hong Kong. Once brainstem death has occurred, artificial life support is inappropriate and should be withdrawn. It is good medical practice to recognize when brainstem death has occurred and to act accordingly, sparing relatives from further emotional trauma of futility.

The purposes of this document are:
1. To provide recommendations for qualified medical practitioners (with input) in relation to certification of death following the irreversible cessation of brainstem function for patients who are 2 year of age or older; and
2. To provide a reference for the Hong Kong community to reassure them that certification of death following the irreversible cessation of brainstem function is performed with diligence and in accordance with prevailing medical evidence and opinion.

The diagnostic criteria presented for certification of death following the irreversible cessation of brainstem function are based on the following documents:

The Statement issued by the Honorary Secretary of the Conference of Medical Royal Colleges and their Faculties in the United Kingdom on 11 October 1976

Criteria for the diagnosis of brain stem death. Review by a working group convened by the Royal College of Physicians and endorsed by the Conference
Issues to Discuss

• Purpose and Scope
• Brain stem death vs Whole brain death
• Preconditions
• Details of brain stem reflex tests
• Observation time
• Investigation
• Documentation
• Qualification
• Ethical issues
  - Conflict of interest
  - Preemptive ventilation
  - Confidentiality
• Transplant Coordinator
Guidelines on Certification of Death Following the Irreversible Cessation of Brainstem Function

A Code of Practice for the Diagnosis and Confirmation of Death. Academy of Royal Colleges, UK, 2008
Brain death
Brain stem death
Whole brain death

It is agreed that permanent functional death of the brainstem constitutes brain death …
death of the brain stem was the necessary and sufficient component of whole brain death.

If we accept the concept of brain stem death it might be wise to change the words we use and no longer speak of “brain death” when we mean “brain stem death.”
2. Diagnosis and Confirmation of Death

2.1 Death following the irreversible cessation of brain-stem function.

2.2 Death following cessation of cardiorespiratory function.
Brain death cannot be determined when the condition causing coma and loss of all brain-stem function has affected only the brain-stem, and there is still blood flow to the supratentorial part of the brain.
Australian Law

Death be defined as:

a) irreversible cessation of all function of the brain of the person;

or

b) irreversible cessation of circulation of blood in the body of the person.

The concept that brainstem death is equivalent to death is accepted legally and within the medical community in Hong Kong.
To provide recommendations for qualified medical practitioners in relation to certification of death following irreversible cessation of brainstem function for patients who are 2 years of age or older.
Preconditions

- Diagnosis of severe brain injury which is consistent with progression to brain death
- Apnoeic patient on a ventilator
- Exclusion of potentially reversible causes of coma
Exclusions

- Depressant drugs or poisons
  - *Peripheral nerve stimulator should always be used* to confirm intact neuromuscular conduction
- Primary hypothermia
- Metabolic and endocrine disturbances
- Arterial hypotension
Observation

- Minimum of 4 hours
  - 24 hours after cardiorespiratory arrest
- 2nd examination can be performed any time after the 1st
Clinical Tests

Pupils $\geq 4$mm
Apnoea Test

- Perform last
- $\text{PaCO}_2 > 8.0\text{kPa, pH}<7.3$
- Disconnect when $\text{PaCO}_2$ close to normal
- Prevent hypoxaemia
Observations Compatible with Brainstem Death

- Movement of limbs in response to a stimulus outside distribution of cranial nerves
- Sweating, blushing, tachycardia
- Normal BP without pharmacological support
- Absence of DI
- Deep tendon reflexes
- Extensor plantar reflex
Observations Incompatible with Brainstem Death

- Decerebrate or decorticate posturing
- Seizures
Confirmatory Investigations

• No clear cause of coma
• Possible metabolic or drug effect
• Cranial nerves cannot be adequately tested
• Cervical vertebral or cord injury
• Cardiovascular instability precluding apnoea test
• Severe hypoxaemic respiratory failure precluding apnoea test

Hong Kong Society of Critical Care Medicine Ltd. Guidelines on Certification of Death Following the Irreversible Cessation of Brainstem Function. 3rd Ed. 2009
Confirmatory Investigations

- 4 vessel radio-contrast angiography by digital subtraction
- Radionuclide examination
  - $^{99m}$Tc-HMPAO or $^{99m}$Tc-EC D
  - SPECT
- 4 hour period of observation and brainstem reflexes which can be tested should precede investigation
Time of Death =
2\textsuperscript{nd} Set test or Investigation completed
Who can certify brain death?

Knowledge & skill
Conflict of interest
Intensivist, critical care physician, neurologist, or neurosurgeon

Registry
The intensivist caring for an intensive care patient who is a potential recipient of organ from the potential donor should not discuss donation with the family of the potential donor.
**BRAIN DEATH CERTIFICATION FORM**

**INSTRUCTIONS**
Diagnosis is to be made by the separate examination of two doctors:
- One of the medical practitioners must be a specialist recognized by the appropriate College as having demonstrated skill and knowledge in the performance of brain death certification. This should usually be an intensivist, critical care physician, neurologist or neurosurgeon.
- The other medical practitioner should preferably be of the same qualification as described in (a) but should be at least 5 years after registration and possess the skill and knowledge in the performance of brain death certification.
- The person authorizing removal of tissues and the person removing tissues MUST NOT be responsible for determining brain death. The intensivist caring for an intensive care patient (e.g., with acute liver failure who is listed for urgent transplantation) who is a potential recipient of organs from the potential donor should not discuss donation with the family of the potential donor.
- Each of the two practitioners must independently perform one of the examinations.

**DIAGNOSIS**
(Specify the nature of the irreversible structural brain damage.)

<table>
<thead>
<tr>
<th>Determination of brain death by clinical examination</th>
<th>Dr. A</th>
<th>Dr. B</th>
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<tbody>
<tr>
<td>Preconditions</td>
<td></td>
<td></td>
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<tr>
<td>1. Hypothermia is not present – temperature is &gt; 35°C (please specify temp.)</td>
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<td>2. Blood pressure is adequate (e.g., MAP &gt; 60 in an adult)</td>
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<td>3. Sedative drug effects are excluded</td>
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<td>4. There is no severe electrolyte, metabolic or endocrine disturbance</td>
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<td>5. Neurovascular function is intact</td>
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**Clinical testing**

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<tr>
<th></th>
<th>Dr. A</th>
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<tbody>
<tr>
<td>1. There are no pupillary responses to light and pupils are ≥ 4 mm</td>
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<td>2. There are no corneal reflexes.</td>
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<td>3. There is no eye movement on cold caloric testing.</td>
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<td>4. There is no tracheal or gag reflex.</td>
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<tr>
<td>5. There is no motor response in the cranial nerve distribution to stimulation of face, limbs or trunk</td>
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<td>6. There is no respiratory movement with arterial PaCO₂ &gt; 8 kPa and pH &lt; 7.50</td>
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**CERTIFICATION**
We certify that we have assessed this patient and that he/she meets the necessary clinical criteria for the diagnosis of brain death.

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<tr>
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<th>Dr. A</th>
<th>Dr. B</th>
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<tbody>
<tr>
<td>Name</td>
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<tr>
<td>Position/Role</td>
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<td>Signature</td>
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<td>Date of assessment</td>
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<tr>
<td>Time of assessment</td>
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<tr>
<td>Date and time of brain death</td>
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Evening Symposium

BRAIN DEATH AND ORGAN DONATION