Canada-Canadian Blood Services-World Health Organization

International Guidelines for the Determination of Death

CCCFC Toronto Oct 29th 2012

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Mourning the death of Dorothy the Chimp, National Geographic, 2009
Challenges

• Philosophical, religious and cultural differences in concept and definitions of death

• Difficulties in performing research in this field and resulting deficits in information and evidence on a number of aspects of the dying process

• Lack of understanding and/or awareness of public and health professionals

• Emotional, sensitive subject matter
Brain Death is a social construct created for utilitarian purposes, primarily to permit organ transplantation.  

Brain Death is driven not by a clear understanding of death, but by a need for organs.  

The Neurological Determination of Death: What Does it Really Mean?  

Ari Robin Joffe, M.D., FRCP(C)*
Patients wrongly certified dead

Patients in five English hospitals have been incorrectly diagnosed as being dead over the past five years, the BBC has discovered.

The information was obtained under the Freedom of Information Act by the Donal MacIntyre programme.

In each case the mistake was later realised, the programme reports.

Doctors says that cases of an incorrect diagnosis are rare.
Departure of the Soul

http://www.prints-online.com/pictures_577754/SOUL-LEAVES-BODY.jpg

Premature Burial

‘Dead Ringers’

‘Saved by the Bell’
Scaring Us To Death?
Alarming Language & the Need for Responsible Scholarship

Naffine et al, J Law Med, 2009

• Fear of death
• Fear of mistaken diagnosis of death
• Fear of premature declaration of death

Academia and Media
‘truly dead?’
“almost dead?”
“as good as dead?”
“nearly but not quite dead?”
“not completely dead but dead enough?”
What is Responsible Scholarship?

• Address concept and practice based on existing scientific evidence

• Develop an achievable research agenda to respond to gaps in knowledge
Dying is a **Biological Process**

Death is a **biological event** in that process
Evolution of Biological Understanding

• Cardiopulmonary physiology and resuscitation
• Cardiac surgery and cardiopulmonary bypass
• ICU life support
• Extracorporeal life support and ECMO
• Cell biology
• Organ donation, preservation, transplantation
Biology of Life

Organs as Functioning Parts

Lungs oxygenate
Heart circulates
Blood vessels are conduit pipes
Liver metabolizes
Kidney filters
Extracorporeal Life Support Technology from Biology

Kiki Smith, *Untitled*, inv. 89.2000, with thanks, Musée des beaux-arts de Montréal
Complete and Irreversible Arrest of Heart Function

Is not death if you have a machine to provide oxygenated circulation
Asystole

Electrical Versus Mechanical
Ex-Vivo Organ Resuscitation
Stockholm to Berlin
Decompressive Craniectomy
Prevention of Fatal Herniation
ICP & Unilateral Decompression in Children

Hejazi et al Eur J Pediatr 2002
“Complete and Irreversible”
Irreversible Loss of Function

Variable Definitions:

1. Cannot be restored by under any circumstances at a time now or in the future

2. Cannot be restored by those present at the time

3. Will not resume and/or will not be restored (permanent)
A call for government accountability to achieve national self-sufficiency in organ donation and transplantation

Prof Francis L Delmonico MD, Beatriz Domínguez-Gil MD, Rafael Matesanz MD, Luc Noel MD

Summary

Roughly 100,000 patients worldwide undergo organ transplantation annually, but many other patients remain on waiting lists. Transplantation rates vary substantially across countries. Affluent patients in nations with long waiting lists do not always wait for donations from within their own countries. Commercially driven transplantation, however, does not always ensure proper medical care of recipients or donors, and might lengthen waiting times for resident patients or increase the illegal and unethical purchase of organs from living donors. Governments should systematically address the needs of their countries according to a legal framework. Medical strategies to prevent end-stage organ failure must also be implemented. In view of the Madrid Resolution, the Declaration of Istanbul, and the 63rd World Health Assembly Resolution, a new paradigm of national self-sufficiency is needed. Each country or region should strive to provide a sufficient number of organs from within its own population, guided by WHO ethics principles.
2/3 of organ donors in China are executed prisoners
Profitable black market trade
Transplants = privilege of the rich - domestic and imported
Opportunities to deter transplant tourism exist before referral for transplantation and during the workup and management of transplant candidate.
Gill et al, Kidney Int, 2011

Prasad et al, Transplantation, 2006

Commercial renal transplantation: A risky venture? A single Canadian centre experience
Kapoor et al, CUAJ, 2011
How This Came About

• International calls for countries to increase donation in ethical, legitimate ways, to fulfill the needs of their population and to minimize illegal organ trade.

• The World Health Organization (WHO) and The Transplantation Society have had requests from various countries to provide guidance on leading practices for death determination

• The WHO held a meeting in Geneva Dec 2010 to generate interest in this global challenge

• Canada and Canadian Blood Services took the lead to organize and host
Global Differences in Health Care & Conditions

World Population

Poverty

Physicians

Unhealthy Life

www.worldmapper.org
Meeting Purpose

• Promoting safe practices and minimizing diagnostic errors in the determination of death
• Protecting patients and health care professionals
• Improving public and professional confidence in the deceased donation process
• Upholding the Dead Donor Rule
• Increasing the availability of organs obtained by ethically legitimate donation and procurement practices
International Guidelines for the Determination of Death

Canadian Planning
Sam Shemie, Kimberly Young, Jeanne Teitelbaum, Andrew Baker
Laura Hornby, Sylvia Torrance, Dorothy Strachan, Debra Cadelli

International Advisory
James Bernat, Alex Capron, Luc Noel, Frank Delmonico

Expert Speakers
Sam Shemie, Eelco Wijdicks, Alex Capron, James Bernat, Charles Sprung Luc Noel
Participating Organizations
Funding Disclosures

• Funded by Canadian Blood Services
  • National, not-for-profit charitable organization
  • Funded by provincial and territorial Ministries of Health and the federal government, through Health Canada
  • Oversees development of an integrated system in donation and transplantation
  • Not responsible for the management or funding of any Canadian Organ Procurement Organizations or Transplant Programs

• Professional organizations provided travel funding for their delegates

• No funding or involvement of transplant programs or transplant societies at the meeting
Traditional Construct for Death Determination

Concept of Death
(Religious, Spiritual, Philosophical, Cultural, etc)

Definition of Death

Criteria of Death

Tests

Out of Scope:
Abstract
Not provable

In Scope:
Biological
Medical
Evidence-based
Meeting Construct for Death Determination

Operational Definition of Human Death

Neurological and Circulatory Dying Sequences

Tests
Function:
The primary and fundamental purpose and responsibility of that organ

Activities:
Physiologic properties of cells and groups of cells that can be measured by laboratory means

Cessation of organ function

With thanks, J Bernat
Generic Spectrum of the Dying Sequence

Vital function is lost

Resumption can occur spontaneously

Resumption can occur with intervention

Resumption cannot occur either spontaneously or with intervention
Catastrophic brain injury

Withdrawal of life-sustaining treatments

Circulatory-respiratory arrest

Refractory to treatment

No CPR

Failed CPR

Cessation of brain function

Cessation of circulation
Neurological Dying Sequence

1. Preconditions & Confounders
2. Minimum Acceptable Clinical Standard
3. Additional Testing

Catastrophic Brain Injury (CBI)

Mechanical ventilation (may occur prior to CBI) and neuro-protective interventions

Continuing deterioration despite intervention, with potential to evolve to brain death

Cessation of brain function

Cessation of brain function with no possibility to resume by any means

Biological events after death
A. Cardiorespiratory arrest without CPR (end-of-life care / withdrawal / withholding of life sustaining therapies)

B. Cardiorespiratory arrest following termination of CPR (hypoxic or primary cardiac arrest)

C-1 Cessation of circulation and breathing

C-2 Cessation of circulation and breathing with no possibility to resume spontaneously

C-3 Cessation of circulation and breathing with no possibility to resume

If CPR provided, resumption of circulation theoretically possible

1. Preconditions, Confounders
2. Minimum Acceptable Clinical Standard
2. Additional Testing

Biological events after death
Neurological and Circulatory Dying Sequence

A. Cardiorespiratory arrest without CPR
   (end-of-life care / withdrawal / withholding of life sustaining therapies)

B. Cardiorespiratory arrest following termination of CPR
   (hypoxic or primary cardiac arrest)

C-1 Cessation of circulation and breathing

N-2 Cessation of brain function

Increasing likelihood over time of no possibility to resume brain function

C-2 Cessation of circulation and breathing with no possibility to resume spontaneously

C-3 Cessation of circulation and breathing with no possibility to resume

N-3 Cessation of brain function with no possibility to resume spontaneously

Biological events after death
Key Areas of Consensus

1. Precise terminology to improve clarity in death determination discussions and debate.

2. Clinical criteria based on direct, measurable observation or examination of the patient.

3. The physiological sequences of the cessation of circulatory and neurological functions leading to death.

4. Preconditions, confounding conditions and clinical tests that fulfill the minimum clinical standard.

5. Ancillary and/or complementary laboratory tests where clinical testing cannot be performed or where confounding conditions are present.
Key Areas of Consensus
Operational Definition of Human Death

Based on measurable biomedical standards with emphasis on:

• Movement away from anatomically-based terms such as brain death or cardiac death that erroneously imply the death of that organ.

• Cessation of neurological or circulatory function

• Predominance of brain function for determination of death.
Key Areas of Consensus
Operational Definition of Human Death

“Death occurs when there is permanent loss of capacity for consciousness and loss of all brainstem functions.

This may result from permanent cessation of circulation and/or after catastrophic brain injury.

In the context of death determination, ‘permanent’ refers to loss of function that cannot resume spontaneously and will not be restored through intervention.”
The Architecture of Death Determination

Research agenda to inform practice and address information gaps:

• Assembly of existing knowledge:
  • comprehensive review and grading of existing evidence
  • review of qualifications for clinical and ancillary testing

• Development of achievable new knowledge:

Advance the development and implementation of via work with a broader international group of stakeholders and public communication strategy.
What is Responsible Scholarship?

• Address concept and practice based on existing scientific evidence

• Develop an achievable research agenda to respond to gaps in knowledge
A. Cardiorespiratory arrest without CPR (life care / withdrawal / withholding of life sustaining therapies)

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C-3 Cessation of circulation and breathing with no possibility to resume

Vital Sign Changes

Autoresuscitation

Biological events after death
Determination of Death Practices in Intensive Care

www.ddepict.com

CIHR, PSI, CHEO RI, CCCTG
With thanks
International Guidelines for the Determination of Death

END
Background

- In response to commercial organ trade, WHO and TTS have called on governments to improve organ availability within their own countries, through the Istanbul Declaration (May, 2008), the WHO Madrid Resolution (March 2010), and the World Health Assembly Resolution (May, 2010)

- The WHO has had requests from many countries to provide guidance on various aspects of the recommendations, including death determination

- Canada, led by Canadian Blood Services, is pleased to host this initial meeting for the development of international guidelines for the Determination of Death
Intracranial Pressure after Decompression Craniectomy
Animal Model of Cortical Impact

Zweckberger et al, J Neurotrauma 2003
K. Trickey with thanks
“Complete and Irreversible”
Cell and Organ Resuscitation and Preservation after Death

- Brain cells - within 8 hours
- Skins cells - > 24 hours post-mortem
- Cornea cells >7 days can provide viable cells for transplantation
- Organs??

With thanks to Frank Van Gelder

Merten MD, Faculte de Medecine, Marseilles
The Stacey Matrix
First and foremost, throughout history and in current practice death is a CLINICAL DETERMINATION

Guidelines that can be adapted in all countries, regardless of technology available

Clinical Test:
A bedside test typically based on physical examination of the patient, but may include the use of a stethoscope and vital signs monitors.
END
Effects of Cerebral Ischemia

Nominal Cerebral blood flow = 100 ml/min/100g

- $K^+$, $Ca^{++}$ (Infarct)
- EEG suppressed (Penumbra)
- Selective neuronal loss
- Glutamate release
- Selective gene expr.
- Protein synthesis

Cerebral blood flow (ml/min/100g)

International Guidelines for the Determination of Death
International Guidelines for the Determination of Death
• Humanity has struggled with death for millennia and the ‘line’ between life and death continues to be contested

• Science and technology have profoundly changed our understanding of life, death and human identity

• Need to refine the architecture for the understanding of the determination of death:
  – Definition
  – Practice
  – Research