

The World Brain Death Project: Implications for Canadian Practice

Summary

“Brain Death/Death by Neurologic Criteria around the World: The World Brain Death Project” was published in the *Journal of American Medical Association* (JAMA) on August 3, 2020 (<https://jamanetwork.com/journals/jama/fullarticle/2769149>).

This special communication with 17 supplements is an extraordinary publication. It represents the work of a multidisciplinary international collaboration that developed a comprehensive, minimum standard for brain death determination. Its goal is to harmonize practices and improve the rigour of brain death determination across the world.

At present, this global work does not change current brain death determination practices in Canada. However, these recommendations will be used in the clinical practice guideline development process that seeks to update the Canadian determination of death by neurologic criteria as part of the Organ Donation and Transplantation Collaborative funded by Health Canada. The project, “*Developing A Brain-Based Definition of Death and Criteria for its Determination After Arrest of Circulation or Neurologic Function in Canada*”, is being led by Canadian Critical Care Society in partnership with Canadian Blood Services and the Canadian Medical Association. The goal is to establish a brain-based definition of death as well as evidence-based and expert-informed criteria for death determination after arrest of neurologic or circulatory function. Once completed, the updated guideline will then be available for nationwide implementation.

The World Brain Death Project

Key Messages

- There are inconsistencies in criteria and practice of brain death/death by neurologic criteria both internationally and within countries. The World Brain Death Project was created to achieve international harmonization, to improve the rigour of and minimize diagnostic errors in brain death/death by neurologic criteria.
- Recommendations were developed based on extensive reviews of the literature and expert opinion of a large multi-disciplinary, international panel, including representation from intensive care (adult and pediatric), critical care nursing, neurocritical care, neurology and neurosurgery.
- The scope of the work includes prerequisites and confounders to clinical testing, clinical testing including apnea testing, ancillary testing, and qualifications/documentation for brain death/death by neurologic criteria. Additional guidance is provided for brain death/death by

neurologic criteria in infants and children, and those treated with ECMO or targeted temperature management. The document also discusses religious and legal issues and identifies future research ideas to advance knowledge in this area.

- The full article summarizes the recommendations and suggestions from each of the 17 supplements that provide the evidence base and detailed discussions related to each topic (See Appendix 1).
- These recommendations have received widespread international society endorsement. This document can serve to guide professional societies and countries in the revision or development of their own protocols and procedures.
- While these recommendations have been designed to be as pragmatic as possible and applicable to all types of hospitals, it is recognized that countries will need to review and adopt based on their own legal, health care resource, and technological situations.
- Tools (flow diagrams, sample checklist) are provided to help countries implement the recommendations and suggestions.

Contributors

- The project was led by a Steering Committee (Dr. David M. Greer, Dr. Sam D. Shemie, Dr. Gene Sung, Dr. Ariane Lewis, Ms. Sylvia Torrance). Recommendations were developed and reviewed by 45 clinical and academic experts from 20 different countries.
- The recommendations have been endorsed by five world federations (World Federation of Critical Care Nurses, World Federation of Intensive and Critical Care, World Federation of Neurology, World Federation of Neurosurgical Societies, World Federation of Pediatric Intensive and Critical Care Societies) and 27 medical societies from across the globe. This includes the Canadian Neurological Sciences Federation, which represents the Canadian Neurological Society, Canadian Neurosurgical Society, Canadian Society of Clinical Neurophysiologists, Canadian Association of Child Neurology, and the Canadian Society of Neuroradiology.
- Canadian contribution to the project was provided by:
 - Dr. Sam Shemie (Montreal Children's Hospital, McGill University, Canadian Blood Services)
 - Ms. Sylvia Torrance (Canadian Blood Services)
 - Dr. Andrew J. Baker (St. Michael's Hospital, Unity Health Toronto, University of Toronto)
 - Ms. Rosanne Dawson (Canadian Blood Services)
 - Ms. Sarah Quayyum (University Health Network, Toronto)
 - Dr. Jeanne Teitelbaum (Montreal Neurological Institute, McGill University)

Developing A Brain-Based Definition of Death and Criteria for its Determination After Arrest of Circulation or Neurologic Function in Canada

Background

In Canada, death determination legal statutes have been embedded in provincial organ and tissue gift acts, reflecting the need for clarity in the definition and determination of death when proceeding with organ donation. A key component of this legislation was delegating the criteria for determining death to the medical community. The Canadian Council for Donation and Transplantation and subsequently Canadian Blood Services were instrumental in facilitating the development of community derived, expert- and evidence-informed leading practices, for both neurological determination of death (“brain death”) in 2003 and 2007 and donation after circulatory determination of death in 2005 and 2017 (pediatrics).

While these documents were based on scientific evidence and the legal reasoning of the time, there continue to be medical, legal and ethical debates. These have escalated over the last decade, for a number of reasons:

- Substantial variability and inconsistency in concepts, practices and documentation for diagnosing death using neurologic or circulatory criteria;
- Diagnostic errors, and the validity of ancillary testing as part of neurologic determination of death;
- Legal cases citing differences in cultural, philosophical and religious perspectives on when death occurs, ultimately opposing “brain death” as death;
- Advancements in technology are challenging existing concepts of death that are based on the permanent cessation of circulation to the body (versus cessation of circulation specifically to the brain);
- Emerging evidence has broadened our understanding of physiological activities peri- and post-mortem.

Given these factors, there is a need to review and update the current Canadian medical guidelines, to align practices with current scientific evidence and address evolving legal and ethics issues.

Project Overview

This project is funded by Health Canada and led by the Canadian Critical Care Society in partnership with Canadian Blood Services and the Canadian Medical Association. The objective is to deliver a clinical practice guideline that includes a brain-based definition of death as well as evidence-based and expert-informed criteria for death determination after arrest of circulation or neurologic function. An updated determination of death guideline should have the following benefits:

- clarify the medical, ethical, legal practices in death determination;
- minimize diagnostic errors;
- foster trust and integrity in the definition and determination of death in all cases;
- foster confidence in physicians and organizations in their ability to provide clarity in the definition and determination of death;
- protect physicians and organizations against legal action;
- protect the integrity and trust in the deceased organ donation system;
- provide national and international leadership in death definition and determination; and
- respond to advances in knowledge and technology.

The development of a brain-based definition of death and updated criteria for death determination will follow standard guideline development practices, using a systematic process to review and analyze available evidence. A guideline development group with stakeholder representation from a multitude of areas has been established to: review best practices; formulate clinical questions; analyze available evidence (using GRADE where appropriate); and generate recommendations that are evidence-based, and expert-informed. Input will be sought from the public, including patient and family partners, and a variety of health care professionals affected by death and its determination.

The project will also include a number of activities to build awareness, educate health care professionals, and implement the outputs of the guideline development process across Canada.

The timeline for this project is September 2019 until approximately March 2022.

For Further Information

Contact Lindsay Wilson, Senior Program Manager, Canadian Blood Services (lindsay.wilson@blood.ca) or Dr. Sam Shemie, Medical Advisor, Canadian Blood Services (sam.shemie@mcgill.ca).

Appendix 1: Brain Death/Death by Neurologic Criteria Supplements

The full article published in JAMA summarizes the recommendations and suggestions from each of the 17 supplements. Each supplement provides the evidence base and detailed discussions related to separate topics:

- [Supplement 1](#): *Worldwide variance in brain death/death by neurologic criteria* reviews both the inter- and intra-national variability across the world.
- [Supplement 2](#): *The science of brain death/death by neurologic criteria* reviews the underlying pathology and pathophysiology of the various mechanisms and progression to brain death.
- [Supplement 3](#): *The concept of brain death/death by neurologic criteria* focuses on the historical concepts of death: whole brain death, brainstem death and higher brain death.
- [Supplement 4](#): *The minimum clinical criteria for determination of brain death/death by neurologic criteria* outlines the core tenets of brain death determination and details recommendations and suggestions for prerequisites and confounders and clinical testing (including apnea testing).
- [Supplement 5](#): *Beyond minimum clinical determination of brain death/death by neurologic criteria* assesses the numerous ancillary tests and the conditions for their use.
- [Supplement 6](#): *Pediatric and neonatal brain death/death by neurologic criteria* reviews considerations for brain death determination in infants and children.
- [Supplement 7](#): *Determination of brain death/death by neurologic criteria in patients on ECMO* reviews ECMO principles and provides guidance for apnea testing in patients on ECMO.
- [Supplement 8](#): *Determination of brain death/death by neurologic criteria after treatment with targeted temperature management (TTM)* provides recommendations and suggestions to avoid erroneous determinations of brain death in those who have been treated with TTM.
- [Supplement 9](#): *Documentation of brain death/death by neurologic criteria* looks at current variance and highlights the need for improved documentation practices.
- [Supplement 10](#): *Qualifications for and Education on determination of brain death/death by neurologic criteria* discusses the training and qualifications for those who are making brain death determinations.
- [Supplement 11](#): *Somatic support after brain death/death by neurologic criteria for organ donation and other special circumstances* describes how to maintain systemic organ function and respond to complications after brain death/death by neurologic criteria.
- [Supplement 12](#): *Religion and brain death/death by neurologic criteria: Managing requests to forgo a brain death/death by neurologic criteria evaluation or continue somatic support after brain death/death by neurologic criteria* outlines strategies to minimize and manage these types of requests.

- [Supplement 13](#): *Brain death/death by neurologic criteria and the law* describes legal issues associated with brain death and provides recommendations to address these.
- [Supplements 14](#), [Supplement 15](#), and [Supplement 16](#), provide supporting material, including a process flow, a sample checklist and an abbreviations list.
- [Supplement 17](#) lists questions related to knowledge gaps, to facilitate the development of a research agenda about brain death/death by neurologic criteria.