

Declaration of Sydney

On the Ethical Use of Artificial Intelligence in Neurosurgery

Definition of Computational Neurosurgery

Computational neurosurgery is a transdisciplinary field that integrates computation, artificial and augmented intelligence, data science, and neurotechnology across the neurosurgical care pathway. Its applications include diagnosis, risk stratification and screening, clinical decision support, surgical planning, intraoperative support, postoperative management, research, education, and training. Computational neurosurgery aims to improve basic understanding, clinical decision-making, and patient outcomes in neurosurgery.

Goal of the Declaration

The goal of this Declaration is to establish a shared ethical foundation for computational neurosurgery. Without limiting the breadth of this goal, the Declaration seeks to embed ethical, responsible, and human-centred development and use of computational and AI-enabled technologies across all stages and levels of computational neurosurgery. Achieving this goal will help ensure that innovations advance beneficial patient care while minimising risks and harms, preserving professional accountability, and sustaining earned public trust.

Preamble

We recognise that:

- a. understanding the complexity of the human nervous system and its disorders remains among the most significant challenges in medicine and science;
- b. the convergence of computational science, artificial intelligence, neurotechnology, neuroimaging, data science, robotics, and clinical neurosurgery has created unprecedented opportunities to advance brain health and improve diagnostic and therapeutic precision;
- c. computational neurosurgery has emerged as a multidisciplinary field integrating scientific discovery with clinical practice to enhance patient outcomes and transform neurosurgical knowledge;
- d. computational technologies raise profound ethical issues and legal ramifications, including risks to privacy, autonomy, equity, trust, and the integrity of clinical decision-making;
- e. there is a need to ensure that computational advances are developed and deployed in ways that support clinical judgement, minimise risks and harms to patients, uphold patient safety, human dignity, and earn public trust;
- f. there is a moral imperative to ensure that AI-enabled innovations reduce global disparities in access to neurosurgical care;
- g. computational neurosurgery should be used to augment human expertise, and not to replace it.

We therefore present the Declaration of Sydney to identify and articulate shared values, guide responsible innovation, and establish an ethical foundation for the evolving field of computational neurosurgery.

Articles of the Declaration

Article 1 - Primacy of Patient-Centred Care and Respect for Human Dignity

The use of computational and AI-enabled tools in neurosurgery must always prioritise the avoidance of harm and the provision of beneficent and compassionate care to the individual patient, including, but not limited to, their safety, welfare, autonomy, and respect for their dignity.

Article 2 - Ethical Use of Artificial Intelligence in Neurosurgery

Computational methods, including artificial intelligence (AI) and their applications must be used responsibly, in conformity with established ethical principles, sound clinical judgment, and in accordance with the principle "First, do no harm".

Article 3 - Human Oversight and Clinical Accountability

Computational tools should support, not replace, professional judgment and accountability.

Article 4 - Data Rights, Privacy, and Mental Integrity

The collection, use, and analysis of neurosurgical and neural data must be undertaken and governed in accordance with legal and ethical frameworks that include requirements of respect for individuals' privacy, autonomy, and mental integrity, and mandate robust protections against misuse, discrimination, or exploitation.

Article 5 - Data Stewardship, and Informed Consent to Data Collection, Storage, and Use

All data collected and used in computational neurosurgery must be collected, stored, shared, and processed within rigorous frameworks that ensure accuracy, responsible governance, transparency of use, and compliance with ethical and legal requirements.

Article 6 - Accountability, Traceability, and Explainability

Computational systems should provide clear documentation of their capabilities and limitations, and, where possible, explainable decision pathways sufficient to support clinical understanding, accountability, and earned trust.

Article 7 - Responsible Development, Validation, and Deployment

AI systems used in neurosurgery must undergo rigorous scientific development, appropriate clinical validation, risk-aware deployment (including minimising ethical risks), and ongoing monitoring throughout their lifecycle.

Article 8 - Scientific Integrity and Research Responsibility

Research in computational neurosurgery must uphold high standards of scientific rigour, reproducibility, transparency, and ethical conduct, with responsible publication and independent evaluation.

Article 9 - Equity, Access, and Global Neurosurgery

Advances in computational neurosurgery should promote equitable access to care, support global capacity building, and contribute to reducing disparities in access to neurosurgical services, worldwide.

Article 10 - Education, Training, and Skill Preservation

AI-enabled educational tools should strengthen neurosurgical training while preserving foundational competencies, critical reasoning, professional autonomy, and earned trust in clinical expertise.

Article 11 - Transdisciplinary and Consumer Collaboration and Shared Governance

Ethical development and deployment of computational neurosurgery should involve collaboration among clinicians, scientists, engineers, ethicists, policymakers, patients, and society.

Article 12 - Sustainability

The development, validation, and deployment of computational neurotechnologies should be environmentally responsible and evaluated to minimise harmful impact on the planet's ecosystems.

Article 13 – Support of Simulation

The advancement of computational simulations and refinement of biomodels and biocomputation should be actively supported and prioritised to reduce and, where scientifically feasible, replace the use of animals in neurosurgical research and training.

Article 14 – Brain-Computer Interface Governance

The development, validation, and application of brain-computer interfaces (BCIs) and other forms of neurotechnology to advance patient care require informed consent for surgical intervention, rigorous regulatory oversight, and strong safeguards to prevent non-consensual data extraction, processing, and misuse, including manipulative, coercive, malevolent, or criminal interference.

Article 15 – Computational Neurosurgery and Human Enhancement

The neurosurgical implantation or application of computational and neurotechnological systems not required as therapy, but intended to enhance normal brain function, requires careful ethical, legal, and societal consideration prior to implementation.

Final Clause and Pledge

We, the undersigned, gathered at the 1st World Conference of Computational Neurosurgery in Sydney, Australia, on the 15th February 2026, affirm our shared commitment to the ethical, responsible, and human-centred advancement of computational and AI-enabled technologies in neurosurgical medical practice and research.

By endorsing this Declaration, we each pledge to uphold its principles within our institutions, practices, and communities; to promote patient welfare, professional integrity, and earned public trust; and to steward the continued ethical evolution of computational neurosurgery for the benefit of present and future generations.

In witness of this commitment, we hereby endorse and sign the "Declaration of Sydney on the Ethical Use of Artificial Intelligence in Neurosurgery".