



Ethical Issues in Neurotrauma: Challenges and Solutions

Ahtesham Khizar¹  Abdul Ghafoor¹ Inaam Elahi¹

¹Department of Neurosurgery, Punjab Institute of Neurosciences, Lahore, Pakistan

Address for correspondence Ahtesham Khizar, MBBS, FCPS, Department of Neurosurgery, Punjab Institute of Neurosciences, Lahore, 54000, Pakistan (e-mail: arwain.6n2@gmail.com).

Indian J Neurotrauma

Abstract

Keywords

- ▶ ethics
- ▶ traumatic brain injuries
- ▶ nervous system trauma
- ▶ decompressive craniectomy
- ▶ regenerative medicine

Neurotrauma is a medical field that deals with the treatment and prevention of serious injuries to the brain, spinal cord, or peripheral nerves. It presents complex ethical issues that require careful consideration and balance between individual autonomy, public health, patient preferences, and clinical outcomes. In this review, we examine several ethical dilemmas in neurotrauma, including the prevention of traumatic events, obtaining informed consent and respecting patient preferences in situations of impaired cognition and communication, determining the appropriate use of life-saving interventions, and communicating with patients and families about prognosis and outcomes. Our analysis highlights the need for a nuanced and evidence-based approach that takes into account the unique circumstances of each patient and balances the potential benefits and risks of various interventions.

Introduction

Neurotrauma is the field of medicine that treats and prevents serious injuries to the brain, spinal cord, or peripheral nerves.¹ These injuries can have devastating consequences for the patients and their families, as well as significant implications for the health care system and society. Neurotrauma is a field that requires not only scientific and technical skills but also ethical and moral sensitivity and wisdom.¹ By addressing the ethical issues in neurotrauma, we hope to improve the quality of care and outcomes for neurotrauma patients, and to advance the field of regenerative neurosurgery. In this review, we will explore some of the ethical issues that arise in the context of neurotrauma, focusing on the following questions:

- How can we prevent neurotrauma and balance individual autonomy and public health?
- How can we obtain informed consent and respect patient preferences in situations of impaired cognition and communication?

- How can we determine the goals of care and the appropriate use of life-sustaining or life-saving interventions, such as decompressive craniectomy (DC)?
- How can we communicate with patients and families about the prognosis and outcomes of neurotrauma, especially when there is uncertainty or disagreement?
- How can we evaluate the potential benefits and risks of novel technologies, such as deep brain stimulation (DBS) or regenerative medicine, for neurotrauma patients?

Neurotrauma Prevention: Individual Autonomy versus Public Health

One of the ethical issues in neurotrauma is how to prevent it from occurring in the first place. Prevention strategies may include education, legislation, enforcement, or engineering measures to reduce the risk of traumatic events, such as road accidents, falls, violence, or sports injuries. However, some of these measures may also infringe on individual autonomy or personal freedom, such as mandatory helmet use by motorcycle riders or seat belt laws for car drivers. Some people may argue that they have the right to choose whether

DOI <https://doi.org/10.1055/s-0043-1771227>.
ISSN 0973-0508.

© 2023. The Author(s).

This is an open access article published by Thieme under the terms of the Creative Commons Attribution License, permitting unrestricted use, distribution, and reproduction so long as the original work is properly cited. (<https://creativecommons.org/licenses/by/4.0/>)

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

to wear protective devices or not and that they are willing to accept the consequences of their actions. Others may contend that such choices affect not only themselves but also others who may be harmed by their actions or who may have to bear the costs of their care if they are injured.¹

The ethical dilemma here is how to balance respect for individual autonomy with the promotion of public health and safety. One possible approach is to adopt a harm principle, which states that individuals are free to do whatever they want as long as they do not harm others. This would imply that individuals should be allowed to opt out of preventive measures if they do not pose a significant risk to others, but they should also be held accountable for their choices and bear the consequences if they are injured. Another possible approach is to adopt a paternalistic principle, which states that individuals may be coerced or restricted for their own good if they are unable to make rational decisions or if they are likely to harm themselves.¹ This would imply that individuals should be required to follow preventive measures if they are proven to be effective and beneficial for their own health and well-being, regardless of their preferences.

Informed Consent and Patient PREFERENCES: Impaired Cognition and Communication

Another ethical issue in neurotrauma is how to obtain informed consent and respect patient preferences in situations where the patient's cognition and communication abilities are impaired by the injury. Informed consent is a process of communication between the patient and the health care provider that involves disclosing relevant information about the diagnosis, prognosis, treatment options, benefits, risks, alternatives, and uncertainties; ensuring that the patient understands the information; eliciting the patient's values, goals, and preferences; and obtaining the patient's voluntary agreement or refusal. However, this process may be challenging or impossible when the patient has a severe brain injury that affects their memory, attention, reasoning, judgment, language, or consciousness.²

The ethical dilemma here is how to respect the patient's autonomy and dignity when they are unable to express or exercise their preferences. One possible approach is to rely on advance directives, which are documents that allow individuals to state their wishes for future medical care in case they become incapacitated. Advance directives may include living wills, which specify what types of treatments the individual wants or does not want; or durable powers of attorney for health care (DPAHC), which designate a surrogate decision-maker who can act on behalf of the individual. However, advance directives may not always be available, applicable, or consistent with the current situation.² Another possible approach is to rely on substituted judgement, which involves trying to infer what the patient would have wanted based on their previous statements, values, and beliefs.

Goals of Care and Life-Saving Interventions: Decompressive Craniectomy

A third ethical issue in neurotrauma is how to determine the goals of care and the appropriate use of life-saving or life-sustaining interventions, such as DC. DC is a surgical procedure that involves removing a portion of the skull to allow the brain to swell without increasing the intracranial pressure (ICP), which can cause further brain damage or death. DC is usually performed as a last resort when other medical treatments have failed to control the ICP or when there is a risk of cerebral herniation. DC can save lives, but it can also result in severe disability and poor quality of life for some patients.¹

The ethical dilemma here is how to balance the potential benefits and harms of DC for each individual patient. One possible approach is to use evidence-based guidelines and prediction models to inform the decision-making process. For example, some studies have suggested that DC may be more beneficial for patients with malignant middle cerebral artery infarction than for patients with diffuse brain injury. Other studies have developed outcome prediction models based on clinical and radiological factors, such as age, Glasgow Coma Scale score, pupillary reactivity, and midline shift. However, these guidelines and models may not be applicable or accurate for all patients, and they may not reflect the patient's values and preferences. Another possible approach is to use shared decision-making and involve the patient or their surrogate in the discussion about the goals of care and the risks and benefits of DC. However, this may be challenging or impossible when the patient is unconscious or unable to communicate, or when the surrogate is unavailable or uncertain about the patient's wishes.¹

Communication and Prognosis: Uncertainty and Disagreement

A fourth ethical issue in neurotrauma is how to communicate with patients and families about the prognosis and outcomes of neurotrauma, especially when there is uncertainty or disagreement. Prognosis is an estimate of the likely course and outcome of a disease or condition based on available evidence. However, prognosis is not an exact science, and there may be variability and uncertainty in predicting the outcomes of neurotrauma patients. Some factors that may affect prognosis include the type, location, and severity of the injury; the age and health status of the patient; the availability and quality of treatment; and the presence of complications.²

The ethical dilemma here is how to convey accurate and honest information about prognosis without causing false hope or despair. One possible approach is to use probabilistic language and ranges of outcomes rather than categorical or deterministic statements. For example, instead of saying "the patient will never walk again," one could say "the patient has a very low chance of walking again" or "the patient may have

some degree of mobility impairment.” Another possible approach is to tailor the communication style and content to the needs and preferences of each patient or family member. For example, some people may want more detailed or technical information, while others may prefer more general or emotional support. However, these approaches may not always be sufficient or satisfactory for some patients or families who may have unrealistic expectations or conflicting opinions about prognosis.²

Novel Technologies: Benefits and Risks

A fifth ethical issue in neurotrauma is how to evaluate the potential benefits and risks of novel technologies, such as DBS or regenerative medicine, for neurotrauma patients. DBS is a technique that involves implanting electrodes in specific areas of the brain and delivering electrical impulses to modulate neural activity. DBS has been used to treat various neurological disorders, such as Parkinson’s disease, epilepsy, dystonia, obsessive-compulsive disorder, and depression. Recently, some studies have explored the use of DBS for neurotrauma patients who are in vegetative or minimally conscious states (VS/MCS), with some promising results showing improved arousal, awareness, or motor function.³ Regenerative medicine is a field that aims to restore or replace damaged tissues or organs by using various strategies, such as stem cells, gene therapy, biomaterials, or tissue engineering. Regenerative medicine has been applied to various diseases and injuries affecting the nervous system, such as spinal cord injury, stroke, Parkinson’s disease, amyotrophic lateral sclerosis, and traumatic brain injury.⁴

The ethical dilemma here is how to balance the potential benefits and risks of these novel technologies for neurotrauma patients. One possible approach is to use rigorous scientific methods and ethical principles to assess the safety and efficacy of these technologies before applying them to humans. This may include preclinical studies in animal models, clinical trials in human volunteers or patients, and postmarketing surveillance and evaluation. Another possible approach is to use ethical frameworks and guidelines to address the social and moral implications of these technologies for neurotrauma patients and society. This may include respect for autonomy, beneficence, nonmaleficence, justice, dignity, privacy, consent, and accountability.

Conclusion

Neurotrauma is a complex and challenging field that poses many ethical issues for patients, families, health care providers, and society. In this article, we have discussed some of the ethical issues related to the prevention, treatment, communication, prognosis, and innovation of neurotrauma. We have also suggested some possible approaches to address these issues based on evidence-based guidelines, prediction models, shared decision-making, probabilistic language, and ethical frameworks. However, these approaches are not definitive or comprehensive, and they may not apply or work for all cases or contexts. Therefore, we recommend that each case of neurotrauma be evaluated individually and holistically, taking into account the medical facts, the patient’s values and preferences, the family’s perspectives and expectations, the health care provider’s expertise and judgment, and the ethical principles and standards. We also recommend that neurotrauma patients and families be involved and informed in the decision-making process as much as possible and that they be provided with adequate support and resources to cope with the challenges and uncertainties of neurotrauma. Finally, we recommend that neurotrauma research and innovation be encouraged and supported, but also regulated and monitored, to ensure that they are conducted in a safe, ethical, and responsible manner, and that they ultimately benefit the neurotrauma patients and the society.

Funding

None.

Conflict of Interest

None declared.

References

- 1 Babu MA. Ethical issues in neurotrauma. In: Siegler M, Rogers S Jr, eds. *Violence, Trauma, and Trauma Surgery: Ethical Issues, Interventions, and Innovations*. Cham: Springer; 2020:199–209
- 2 Honeybul S, Gillett GR, Ho KM, Lind CR. Neurotrauma and the rule of rescue. *J Med Ethics* 2011;37(12):707–710
- 3 Harris JP, Burrell JC, Struzyna LA, et al. Emerging regenerative medicine and tissue engineering strategies for Parkinson’s disease. *NPJ Parkinsons Dis* 2020;6:4
- 4 Burns TC, Quinones-Hinojosa A. Regenerative medicine for neurological diseases—will regenerative neurosurgery deliver? *BMJ* 2021;373(955):n955