

Introduction to Biomedical Ethics

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Key concepts, principles, and applications for health?care professionals and students

1. What Is Biomedical Ethics?

Aspect	Description
Definition	The systematic study of moral issues arising from the practice of medicine and biomedical research.
Scope	Clinical care, public?health policy, research involving humans, genetics, end?of?life decisions, resource allocation, and emerging technologies (e.g., AI, CRISPR).
Goal	Provide a framework for making justified, transparent, and compassionate decisions that respect patients, families, and society.

2. Historical Milestones

Year	Event	Ethical Impact
1947	Nuremberg Code (post?WWII trials)	First formal statement on voluntary consent and the duty to avoid unnecessary suffering in research.
1964	Declaration of Helsinki (World Medical Association)	Global guidelines for clinical research ethics.
1979	Belmont Report (U.S.)	Introduced the three core principles: Respect for Persons, Beneficence, Justice.
1990	The Ethics of Human Genome Project	Sparked debate on privacy, consent, and genetic discrimination.
2000s	Rise of bioethics committees and institutional review boards (IRBs)	Institutionalized ethical oversight in hospitals and universities.
2020? 2024	COVID?19 pandemic	Highlighted issues of equitable vaccine distribution, triage, and data privacy.

3. Core Ethical Principles (Beauchamp & Childress)

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Principle	Core Idea	Typical Questions
Respect for Autonomy	Individuals have the right to make informed choices about their own bodies and health.	• Has the patient received adequate information? • Are there coercive influences?
Beneficence	Actively promote the well-being of patients and research participants.	• Does the intervention provide a net benefit? • How can we maximize positive outcomes?
Non-maleficence	"Do no harm." Avoid causing injury or unnecessary risk.	• What are the potential harms? • Are risks proportionate to benefits?
Justice	Fair distribution of benefits, risks, and resources.	• Who gets access to a new therapy? • Are vulnerable groups protected from exploitation?

Note: In practice, these principles often conflict; ethical deliberation seeks a balanced resolution.

4. Key Ethical Domains in Biomedicine

Domain	Typical Issues	Ethical Tools
Clinical Decision-Making	Informed consent, refusal of treatment, advance directives, surrogate decision-making.	Shared decision-making models; decision aids.
End-of-Life Care	Palliative care, physician-assisted dying, withdrawal of life-support.	"Four-principle" analysis; palliative ethics frameworks.
Genetics & Genomics	Genetic testing, prenatal screening, gene editing, data privacy.	Genetic counseling ethics; "right not to know."
Research Ethics	Human subjects protection, placebo use, data falsification, conflict of interest.	Institutional Review Boards (IRBs); Good Clinical Practice (GCP).

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Domain	Typical Issues	Ethical Tools
Public Health	Vaccination policies, quarantine, resource allocation during pandemics.	Utilitarian reasoning; “least restrictive means” principle.
Emerging Technologies	AI diagnostics, nanomed	