Editorial

ANNALS OF MEDICINE & SURGERY

OPEN

Ethics in scientific research: a lens into its importance, history, and future

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Introduction

Ethics are a guiding principle that shapes the conduct of researchers. It influences both the process of discovery and the implications and applications of scientific findings[1]. Ethical considerations in research include, but are not limited to, the management of data, the responsible use of resources, respect for human rights, the treatment of human and animal subjects, social responsibility, honesty, integrity, and the dissemination of research findings[1]. At its core, ethics in scientific research aims to ensure that the pursuit of knowledge does not come at the expense of societal or individual well-being. It fosters an environment where scientific inquiry can thrive responsibly[1].

The need to understand and uphold ethics in scientific research is pertinent in today's scientific community. First, the rapid advancement of technology and science raises ethical questions in fields like biotechnology, biomedical science, genetics, and artificial intelligence. These advancements raise questions about privacy, consent, and the potential long-term impacts on society and its environment[2]. Furthermore, the rise in public perception and scrutiny of scientific practices, fueled by a more informed and connected populace, demands greater transparency and ethical accountability from researchers and institutions.

This commentary seeks to bring to light the need and benefits associated with ethical adherence. The central theme of this paper highlights how upholding ethics in scientific research is a cornerstone for progress. It buttresses the fact that ethics in scientific research is vital for maintaining the trust of the public, ensuring the safety of participants, and legitimizing scientific findings.

Historical perspective

Ethics in research is significantly shaped by past experiences where a lack of ethical consideration led to negative consequences. One of the most striking examples of ethical misconduct is the Tuskegee Syphilis Study[3] conducted between 1932 and 1972 by the U.S. Public Health Service. In this study, African American men in Alabama were used as subjects to study the natural progression of untreated syphilis. They were not informed of their condition and were denied effective treatment, even after penicillin became available as a cure in the 1940s[3].

From an ethical lens today, this is a gross violation of informed consent and an exploitation of a vulnerable population. The public outcry following the revelation of the study's details led to the establishment of the National Commission for the Protection of Human Subjects of Biomedical and Behavioural Research[4]. This commission eventually produced the Belmont Report in 1979[4], setting forth principles such as respect for persons, beneficence, and justice, which now underpin ethical research practices[4].

Another example that significantly impacted ethical regulations was the thalidomide tragedy of the late 1950s and early 1960s[5]. Thalidomide was marketed as a safe sedative for pregnant women to combat morning sickness in Europe. Thalidomide resulted in the birth of approximately ten thousand children with severe deformities due to its teratogenic effects[5], which were not sufficiently researched prior to the drug's release. This incident underscored the critical need for comprehensive clinical testing and highlighted the ethical imperative of understanding and communicating potential risks, particularly for vulnerable groups such as pregnant women. In response, drug testing regulations became more rigorous, and the importance of informed consent, especially in clinical trials, was emphasized.

The Stanford Prison Experiment of 1971, led by psychologist Philip Zimbardo is another prime example of ethical oversight leading to harmful consequences[6]. The experiment, which aimed to study the psychological effects of perceived power, resulted in emotional trauma for participants. Underestimating potential psychological harm with no adequate systems to safeguard human participants from harm was a breach of ethics in psychological studies[6]. This case highlighted the necessity for ethical guidelines that prioritize the mental and emotional welfare of participants, especially in psychological research. It led to stricter review processes and the establishment of guidelines to prevent psychological harm in research studies. It influenced the American Psychological Association and other bodies to refine their ethical guidelines, ensuring the protection of participants' mental and emotional well-being.

Impact on current ethical standards

These historical, ethical oversights have been instrumental in shaping the current landscape of ethical standards in scientific research. The Tuskegee Syphilis Study led to the Belmont Report in 1979, which laid out key ethical principles such as respect for persons, beneficence, and justice. It also prompted the establishment of Institutional Review Boards (IRBs) to oversee research

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Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

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Annals of Medicine & Surgery (2024) 86:2395–2398

Received 16 January 2024; Accepted 4 March 2024

Published online 21 March 2024

http://dx.doi.org/10.1097/MS9.0000000000001959

involving human subjects. The thalidomide tragedy catalyzed stricter drug testing regulations and informed consent requirements for clinical trials. The Stanford Prison Experiment influenced the American Psychological Association to refine its ethical guidelines, placing greater emphasis on the welfare and rights of participants.

These historical episodes of ethical oversights have been pivotal in forging the comprehensive ethical frameworks that govern scientific research today. They serve as stark reminders of the potential consequences of ethical neglect and the perpetual need to prioritize the welfare and rights of participants in any research endeavor.

One may ponder on the reason behind the Tuskegee Syphilis Study, where African American men with syphilis were deliberately left untreated. What led scientists to prioritize research outcomes over human well-being? At the time, racial prejudices, lack of understanding of ethical principles in human research, and regulatory oversight made such studies pass. Similarly, the administration of thalidomide to pregnant women initially intended as an antiemetic to alleviate morning sickness, resulted in unforeseen and catastrophic birth defects. This tragedy highlights a critical lapse in the pre-marketing evaluation of drugs' safety.

Furthermore, the Stanford prison experiment, designed to study the psychological effects of perceived power, spiraled into an ethical nightmare as participants suffered emotional trauma. This begs the question on how these researchers initially justified their methods. From today's lens of ethics, the studies conducted were a complete breach of misconduct, and I wonder if there were any standards that guided primitive research in science.

Current ethical standards and guidelines in research

Informed consent

This mandates that participants are fully informed about the nature of the research, including its objectives, procedures, potential risks, and benefits[7,8]. They must be given the opportunity to ask questions and must voluntarily agree to participate without coercion[7,8]. This ensures respect for individual autonomy and decision-making.

Confidentiality and privacy

Confidentiality is pivotal in research involving human subjects. Participants' personal information must be protected from unauthorized access or disclosure[7,8]. Researchers are obliged to take measures to preserve the anonymity and privacy of participants, which fosters trust and encourages participation in research[7,8].

Non-maleficence and beneficence

These principles revolve around the obligation to avoid harm (non-maleficence) and to maximize possible benefits while minimizing potential harm (beneficence)[7,8]. Researchers must ensure that their studies do not pose undue risks to participants and that any potential risks are outweighed by the benefits.

Justice

Justice in research ethics refers to the fair selection and treatment of research participants[8]. It ensures that the benefits and burdens of research are distributed equitably among different groups in society, preventing the exploitation of vulnerable populations[8].

The role of Institutional Review Boards (IRB)

Institutional Review Boards play critical roles in upholding ethical standards in research. An IRB is a committee established by an institution conducting research to review, approve, and monitor research involving human subjects[7,8]. Their primary role is to ensure that the rights and welfare of participants are protected.

Review and approval

Before a study commences, the IRB reviews the research proposal to ensure it adheres to ethical guidelines. This includes evaluating the risks and benefits, the process of obtaining informed consent, and measures for maintaining confidentiality[7,8].

Monitoring and compliance

IRB also monitors ongoing research projects to ensure compliance with ethical standards. They may require periodic reports and can conduct audits to ensure ongoing adherence to ethical principles[7,8].

Handling ethical violations

In cases where ethical standards are breached, IRB has the authority to impose sanctions, which can range from requiring modifications to the study to completely halting the research project[7,8].

Other agencies and boards enforcing standards

Beyond IRB, there are other regulatory bodies and agencies at national and international levels that enforce ethical standards in research. These include:

The Office for Human Research Protections (OHRP) in the United States, which oversees compliance with the Federal Policy for the Protection of Human Subjects.

The World Health Organization (WHO), which provides international ethical guidelines for biomedical research.

The International Committee of Medical Journal Editors (ICMJE), which sets ethical standards for the publication of biomedical research.

These organizations, along with IRB, form a comprehensive network that ensures the ethical conduct of scientific research. They safeguard the integrity of research using the reflections and lesson learnt from the past.

Benefits of ethical research

Credible and reliable Outcomes

Why is credibility so crucial in research, and how do ethical practices contribute to it?

Ethical practices such as rigorous peer review, transparent methodology, and adherence to established protocols ensure that research findings are reliable and valid[9]. When studies are conducted ethically, they are less likely to be marred by biases, fabrications, or errors that could compromise credibility. For instance, ethical standards demand accurate data reporting and

full disclosure of any potential conflicts of interest[9], which directly contribute to the integrity and trustworthiness of research findings.

How do ethical practices lead to socially beneficial outcomes?

Ethical research practices often align with broader societal values and needs, leading to outcomes that are not only scientifically significant but also socially beneficial. By respecting principles like justice and beneficence, researchers ensure that their work with human subjects contributes positively to society[7,8]. For example, ethical guidelines in medical research emphasize the need to balance scientific advancement with patient welfare, ensuring that new treatments are both effective and safe. This balance is crucial in addressing pressing societal health concerns while safeguarding individual rights and well-being.

Trust between the public and the scientific community

The relationship between the public and the scientific community is heavily reliant on trust, which is fostered through consistent ethical conduct in research. When the public perceives that researchers are committed to ethical standards, it reinforces their confidence in the scientific process and its outcomes. Ethical research practices demonstrate a respect for societal norms and values, reinforcing the perception that science serves the public good.

Case studies

Case study 1: The development and approval of COVID-19 vaccines

The development and approval of COVID-19 vaccines within a short time is a testament to how adherence to ethical research practices can achieve credible and beneficial outcomes. Strict adherence to ethical guidelines, even in the face of a global emergency, ensured that the vaccines were developed swiftly. However, safety standards were compromised to some extent as no animal trials were done before humans. The vaccine development was not transparent to the public, and this fuelled the anti-vaccination crowd in some regions. Ethical compliance, including rigorous testing and transparent reporting, should expedite scientific innovation while maintaining public trust.

Case study 2: The CRISPR babies

What ethical concerns were raised by the creation of the CRISPR babies, and what were the consequences?

The creation of the first genetically edited babies using CRISPR technology in China raised significant ethical concerns[10]. The lack of transparency, inadequate consent process, and potential risks to the children can be likened to ethical misconduct in genetic engineering research. This case resulted in widespread condemnation from the scientific community and the public, as well as international regulatory frameworks and guidelines for genetic editing research[10].

Recommendation and conclusion

Continuous education and training

The scientific community should prioritize ongoing education and training in ethics for researchers at all levels, ensuring awareness and understanding of ethical standards and their importance.

Enhanced dialogue and collaboration

Encourage multidisciplinary collaborations and dialogues between scientists, ethicists, policymakers, and the public to address emerging ethical challenges and develop adaptive guidelines.

Fostering a culture of ethical responsibility

Institutions and researchers should cultivate an environment where ethical considerations are integral to the research process, encouraging transparency, accountability, and social responsibility.

Global standards and cooperation

Work toward establishing and harmonizing international ethical standards and regulatory frameworks, particularly in areas like genetic engineering and AI, where the implications of research are global.

Ethics approval

Ethics approval was not required for this editorial.

Consent

Informed consent was not required for this editorial

Sources of funding

No funding was received for this research.

Author contribution

G.D.M. wrote this paper.

Conflicts of interest disclosure

The authors declare no conflicts of interest.

Research registration unique identifying number (UIN)

Not applicable.

Guarantor

Goshen David Miteu.

Data availability statement

Not applicable.

Provenance and peer review

Not commissioned, externally peer-reviewed.

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