

Ethical Decision-Making in Biomedical Engineering Research

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INTRODUCTION

To be ethical and professional are terms that are synonymous with being an engineer. The work of engineers frequently affects public safety and health, and can influence business, and even politics. Professional Engineering Associations provide ethical guidelines so that engineers will know how to avoid misconduct, negligence, incompetence, and corruption, which could lead to formal complaints and discipline. Knowledge about ethical decision-making guides engineers facing complex and difficult moral dilemmas (Andrews, 2005, pp. 46). Biomedical engineers doing research and development will undoubtedly be involved in projects that impact humans and/or animals, and thus must be informed on all aspects of ethics that guide such research. They should be particularly aware of the specific guidelines of the institution where the work is to be carried-out and be familiar with the application process to obtain a certificate, allowing the research to proceed. There is clearly a need to guide biomedical engineering students and practitioners in performing a balanced analysis of difficult questions and issues, while respecting societal values that may differ greatly from their own (Frize, 1996; Frize, 2005; Saha & Saha, 1997; Wueste, 1997). There exists a number of articles discussing biomedical engineering and ethics specifically aimed at clinical engineers (Goodman, 1989; Saha & Saha, 1986). These are helpful readings for anyone involved in biomedical research or clinical engineering.

RELEVANCE OF ETHICAL THEORIES FOR DECISION-MAKING IN BIOMEDICAL ENGINEERING RESEARCH

Morality is defined as what people believe to be right and good, and the reasons for it. There are typical rules of conduct describing what people ought and ought not to do in various situations. Ethics is the philosophical study of morality. It is a rational examination into people's moral beliefs and behavior, the study of right and wrong, of good and evil in human conduct.

Several ethical theories exist, but some are more relevant for decision-making for engineers than others. For example, theories of Subjective Relativism and Cultural Relativism have limited utility in ethical decision-making, as they encourage decisions based on individual or cultural perspectives. The Divine Command Theory, based on particular religious beliefs which can vary from one religion to the other, also has limited value for this type of decision-making. Theories such as Kantianism, Act Utilitarianism, Rule Utilitarianism, Social Contract, Rights Theory, and Rawls's Theory of Justice appear to be more helpful for decision-making related to biomedical research.

Subjective Relativism (SR): SR is a theory where different individuals or groups of people can have completely opposite views of a moral problem, and both can be considered right. Persons decide right and wrong for themselves. The case for supporting this point of view is that well-meaning and intelligent people can have opposite opinions about moral issues, but the line

between doing what you think is right and doing what you want to do is not sharply drawn. For example, we can rationalize bad behavior or allow persons to decide right and wrong for themselves. SR makes no moral distinction between the actions of different people, as, for example, between Hitler and Mother Teresa. SR is based on the idea that there are no universal norms. However, as we see in several of the theories described further, there are some universal moral principles and norms. Examples are: not to kill, not to break promises, to be fair and honest. The self-defeating nature of SR does not make it a workable theory for ethical decision-making in biomedical engineering research (Quinn, 2005, pp. 53–55).

Cultural Relativism (CR): CR is the ethical theory where the meaning of right and wrong rests with a society's current moral guidelines. Folkways get institutionalized into these guidelines. This is based on the fact that in the distant past, survival was a group activity. This can still be true in some instances, as in situations of security against crime, war, or terrorism. CR is folkways turned into customs, traditions which are uniform, universal for the group. But with time, they can become more and more arbitrary and imperative. Morality of the group is the sum of the taboos and prescriptions in the folkways by which right conduct is defined for a particular time. For example, 10,000 years ago, most activity was food gathering. Today, population explosion has created huge environmental problems which can destroy the planet. So we need different rules of conduct in various eras. Anthropologists have documented important differences on what is proper conduct in various epochs and regions. However, just because two societies have different views about right and wrong does not imply that they ought to have different views. Perhaps one society has "good" guidelines, and another has "poor" ones. CR does not explain how an individual determines the moral guidelines of a particular society. Another consideration is the concept of human rights. If CR allows acts that fundamentally breach human rights, then this should not be tolerated. This leads to the next objection to this theory: CR does not explain how moral guidelines evolve. CR suggests there are no universal moral guidelines, and gives tradition more weight in ethical evaluations than facts or reason; it does not provide a framework for reconciliation between cultures in conflict. The value of each society can lead to actions that harm the other, yet cultural relativism says each society's moral

guidelines are right. CR does not provide a way for the two sides to find common ground. All societies, in order to maintain their existence, must have a set of core values; for example, caring for helpless newborn babies; telling the truth; prohibition of assault, rape, and murder. CR has significant weaknesses as a tool for constructing ethical evaluations for a diverse audience (Quinn, 2005, pp. 55–59).

Divine Command Theory (DCT): Judaism, Christianity, and Islam are religions based on a god, and DCT is based on the idea that good actions are those aligned with the will of God; bad actions are those contrary to the will of God; we owe obedience to our Creator, and God is all-good and all-knowing, the ultimate authority. There exist many holy books, and some of their teachings disagree with each other. It is unrealistic to assume that a multicultural secular society (separation of state and church) can adopt a religion-based morality. A society's moral guidelines should emerge from a secular authority. Moreover, some moral problems are not addressed directly in scriptures, as, for example, those arising from Internet or information technology. Even if an analogy was to be used, who interprets it? This becomes a subjective process. The fact that the ethical guidelines are not the result of a logical progression from a set of underlying principles is a significant obstacle. So the DCT is not a powerful tool for ethical debate in a secular society, and not a workable theory for our purpose of ethical decision-making in this context (Quinn, 2005, pp. 59–62).

Kantianism (Kant, 1724–1804): This theory, also referred to as the categorical imperative, pertains to actions that are universally considered to be good, and involve good will and duty. We are compelled to act in a certain way because of some moral rule. In his first formulation, Kant defines the categorical imperative: "*Act only from moral rules that you can, at the same time, will to be universal moral laws*" (Quinn, 2005, pp. 63). An example is: Do not make a promise with the intention of breaking it. If everyone broke promises, they would become meaningless. Kant's second formulation states: "*Act so that you always treat both yourself and other people as ends in themselves, and never only as a means to an end*" (Quinn, 2005, pp. 64). This aspect applies well to the question of self-interest in overly ambitious researchers, or to the fact that some researchers do not tell the whole truth to human subjects about the experiments they will perform on them. It is wrong for a person to use another; all interactions must

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