

# QUALITATIVE FEATURES OF MEDICAL ETHICS

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## 1. INTRODUCTION

This is a first article introducing a different approach to analyze certain concerns of medical ethics. This important topic has been extensively examined, primarily in terms of particular cases. Examples from the literature of medical decision making include the contributions Hunink and Glasziou [4], from philosophy Cohen, Nagel, and Scanlon [3], Beauchamp and Childress [1], and in documents of legal cases Coggon and Miola [2] and Jennings [5].

Our approach differs; it is to explore whether lessons learned from these special cases can be extracted to identify basic principles and patterns that apply in general. In the first part of this discussion, the principal actor is the physician: This choice reflects the reality that, in many settings, the physician is the one who must decide among options. Then, we turn to the situation where advice comes from others such as colleagues or a board.

Among the many natural complications that arise in addressing this topic is the fact that different physicians, colleagues, and boards can have dissimilar value systems.<sup>1</sup> It is entirely feasible for some to place more value on helping a patient with a certain procedure even though the patient may voice objections based, perhaps, on cultural values. Then, other physicians may place a higher value on ramifications to society. A consequence of this reality is that rather than being able to make precise statements that hold universally, a more realistic objective is to identify qualitative properties.

A basic assumption is that the physician seeks the most favorable, most ideal approach. Is this possible? More precisely, with any given case:

- (1) Does there exist an optimal choice of action for the physician, whomever it is?

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<sup>1</sup>One of us (JZ) is a surgeon, so some of what follows is influenced by antidotal information obtained from experience and discussions among colleagues.

- (2) Circumstances about a patient's condition are not precisely known, which raises a question about the stability of any decision. Namely, can an optimal choice be found that persists in that small changes in the patient's condition require only small changes in the choice so that it remains optimal?
- (3) In general, can initial choices be improved?
- (4) Taking this one step further, is it possible for a continual improvement?
- (5) If so, what dangers (if any) are involved in doing so?

What we provide, then, are qualitative assertions that hold universally, but where the details for particular cases and physicians can differ significantly.

To capture these concerns, the approach introduced here is novel for this area: it involves mathematical modeling of the decision analysis. In doing so, we fully recognize that most readers are not versed in these technical techniques. Therefore, the lessons learned from this approach are discussed in a non-technical manner; the supporting mathematical arguments are relegated to the technical version of this paper (provide upon request).

## 2. BASIC PRINCIPLES

The Hippocratic Oath, which dates to the 5th century B.C., is accepted as the fundamental international code of medical ethics. It is a general action-guide for everyday medical practice that governs all the various rules and codes regarding all specific medical cases.

The modern version starts with the four basic principles

- (1) *Beneficence*: Do good.
- (2) *Nonmaleficence*: Do no harm.
- (3) *Autonomy*: Respect the views and concerns of the patient.
- (4) *Justice*: Respect the needs and concerns of society.

A common problem associated with these guidelines is that they can be inherently inconsistent. As a consequence, in conflicting situations, these ground rules may not offer a consistent action-guide for medical decisions. This reality has led to major criticisms in the literature of medical decision making, philosophy, and in documents of legal cases throughout the twentieth century.

It is not difficult to encounter settings for which actions satisfying one principle can compromise another. A standard example involves surgery where, while the objective is to do good, the invasion of the body can result in harm. Kattan [6] provides another illustration where a patient infected with HIV was having unprotected sex with partners

who were unaware of his condition. Based on the autonomy principle, which supports a policy of medical confidentiality prohibiting a doctor from revealing private information to others, the doctor should not inform his patient's partners about the disease. This choice (not telling the partners) is further supported by the nonmaleficence principle with the expectation that the negative reactions of people discovering the patient's condition may harm the patient psychologically, physically, economically, and socially. On the other hand, the justice principle requires the doctor to take steps to preserve societal health needs.

The conflict is further captured by the legal case *Washington v. Glucksberg* (1997) where the state of Washington prohibits assisted suicide. But the law specifically notes that withholding or withdrawing life-sustaining equipment is *not* suicide. The issue is whether a physician could legally follow the request of a terminally ill patient to withdraw life-sustaining treatment. The autonomy principle suggests a positive answer; the principle of nonmaleficence supports a negative response. In the cited legal action, the physician and patient petitioned to have the statute declared an unconstitutional violation of their liberty interests as protected by the due process clause of the Fourteenth Amendment. But the U.S. Supreme Court upheld the prohibition of the State of Washington with the decision that preserving human life and protecting the integrity of the medical profession justify violating the patient's autonomy (Jennings [5]).

Adding even more complexities is how, depending on the situation, each of the above four principles can be further subdivided into subprinciples, which admit more conflicts. A spinal surgeon treating a patient with disc hernia, for instance, may choose between an emergent or elective surgery, or a conservative treatment. The patient's spinal nerves may be severely pressured in need of surgery but, perhaps preferring a conservative approach, the surgeon may agree to a restrained plan through which the patient must strictly lie in bed for an extended period of time. Both plans share the common goal—to remove the nerve pressure in the spine—but whether this is done artificially and quickly or naturally and slowly involve different aspects of beneficence.

Our perspective is that the physician is the decision maker. This comment means that different physicians can have different interpretations of the importance of aspects of one principle over the other. It is reasonable to assume that, with each incident, a specified physician has an idealized position should the case be considered strictly from the perspective of each of the four (or more) principles. This can lead to conflict that the physician must resolve

To capture what we mean by referring to the surgery example,

- an optimal beneficence choice would be a procedure with the largest possibility of total success for health,
- an optimal choice for nonmaleficence would be the least invasive, least dangerous method;
- an optimal autonomy choice is where the patient has no concerns, the approach is consistent with personal cultural, religious, and other norms as well as costs to family; the patient is in total agreement,
- and the optimal justice choice would respect social norms of society, while respecting societal costs such as preventing possible contagion and societal expense.

The problem is that although each choice may be optimal from the perspective of the specified single principle, rarely do the four choices agree across all basic concepts.

A 1964 legal case illustrating a conflict between beneficence and autonomy involved Bernice Brooks, a hospitalized patient. Although Ms. Brooks needed an emergency blood transfusion in response to a severe peptic ulcer, she and her husband were Jehovah's Witnesses, which meant that she was against the procedure. She made her wishes clear to her family, the hospital physicians, and she signed a liability release document. Her doctors, however, petitioned the local court and received consent to perform the treatment from a legal guardian who was appointed by the judge. Even though this action saved her life, Ms. Brooks successfully challenged the court order, which created unresolved ethical and legal concerns when the autonomy principle is applied to particular categories of patients.

### 3. MODELLING

As these examples confirm, different principles can support competing options. In many situations, a final choice requires some form of compromise. These compromises and how they are made are of importance for medical ethics, and so they are central to our development. The actual modeling, formal statements, and technical material can be found in the technical version of our paper (provide upon request), but the basic ideas are outlined next.

The modeling was influenced by the personal experiences (a surgeon) of one of us (JZ) and her discussions with several physicians where, with a particular case, a frequent first step is to consider what would be the optimal choice with respect to each of the basic principles. So, in our modeling, we assume for a given case that a physician has an *ideal point* for *each* of the four (or more) principles. That is, with sole respect to a specific principle, the ideal point identifies the optimal course of action. With beneficence, for instance, initially

ignore all other considerations (from nonmaleficence, autonomy, and justice) by identifying what would be the best “beneficence” action. With the example of Ms. Brooks, this would be the particulars of an emergency blood transfusion.

The specificity of this choice is not important for our conclusions; all that is needed is that with a case there is an idealized approach with each principle; this choice does not take other principles into account. For sake of notation, let

$$\mathbf{i}_B, \mathbf{i}_N, \mathbf{i}_A, \mathbf{i}_J,$$

represent the case’s idealized option for, respectively, beneficence, nonmaleficence, autonomy, and justice. Realistically, a particular case may involve more than four competing needs. An example is the above spinal surgeon example, which could have two orthogonal beneficence ideal points where one represents the details for an ideal choice in terms of surgery and the other involves the specifics of a more conservative possibility. In this setting, let the added ideal points be  $\mathbf{i}_{B_1}$  and  $\mathbf{i}_{B_2}$ .

In any specific case, the admissible actions both constitute a continuum and are limited. This continuum comment reflects the fact that seemingly infinitely small changes always are possible, such as a minor change in dosages. As for limits, surgery would not be considered for treating a cold. The trouble with imposing the appropriate restrictions in the modeling requires analyzing and involving the specifics of each particular case, which runs against our objective of exploring general properties. For this reason, the modeling includes all possible actions, whether they would, or would not, be realistically considered. A convenient choice to handle all actions is a higher dimension  $\mathbb{R}^d$  space where  $d$  is at least as large (but, realistically, much larger because of the multiple dimensions of various actions) than the number of guiding principles. This modeling convenience does not affect our conclusions because unrealistic choices would not be seriously admitted in the decision process of one particular case, even though they may in another case.

With respect to a specified principle, say Justice, one course of action is preferred over the other if it is “closer” to the ideal  $\mathbf{i}_J$ . The term “closer” cannot be determined in terms of any distance, because a natural distance is not admissible and probably impossible to define. Instead, treat this as a personal value judgement that is being made by each physician, which means it can be expected to differ among the decision makers.

Because all possible acts are admitted, when they are evaluated with respect to a particular principle, say beneficence, two actions might be quite similar even though they could radically differ with respect to another principle, say autonomy. An illustration could be

where two different surgical procedures might yield essentially the same outcome, but one is more acceptable to a patient. With respect to beneficence and in the doctor's measure of similarity, both are close to  $\mathbf{i}_B$ . But even though they are similar with respect to beneficence, when judged in terms of autonomy, they can seriously differ. That is, in the doctor's perspective, one choice is much closer to  $\mathbf{i}_A$  than is the other. Similarly, two possible actions might be much alike with the justice principle but contrast from the nonmaleficence position.

It must be emphasized that when judging two actions from the perspective of a given principle, there is not a total disregard for the other principles. The effectiveness of a certain surgical procedure, for instance, must incorporate, at some level, the patient's reaction to what is being done. Related to this feature is a common modeling assumption of "convexity," which avoids unintended consequences. The condition is that if two actions are viewed as being the same with respect to a given principle, the average is more preferred. A reason is that this averaging mitigates features that causes disagreement with other principles.

Each action, then, is evaluated with respect to all governing principles. A measure of whether it is "good" is whether there is a better choice. A way to think of this is by treating each principle as an independent voter where the voter's top choice is the principle's ideal point. As with voting, the goal is to find the "optimal" choice with respect to some decision rule. In this first paper, we adopt the standard majority vote rule. That is, when considering two different actions, the better choice is the one that better satisfies a majority of the principles.

Of course, we might prefer a preferred choice to be one that better satisfies *all* criteria, but it is easy to show that this leads to unrealistic situations of a complete stalemate. This is illustrated with any of the conflicting examples, such as the above description of assisted suicide. Select any proposed action: any change move away from one of the principles—a choice altering the patient's options affects either autonomy or nonmaleficence, so, no matter what is proposed, it would not unanimously benefit all principles. Admitted, in some cases a universal improvement would be possible, and since this would satisfy the majority barrier, they are included.

Returning to the issues raised in the introductory section, an optimal course of action is one for which, with the majority vote, there is not a better choice. In spatial voting and game theory, this is called a "core point." That is, a core point is one for which there is no better choice with respect to the given decision process.

## 4. CONCLUSIONS

With respect to the above modeling assumptions, answers for the basic questions can be given. Support for these conclusions comes from the spatial voting literature.

*1. Does there exist an optimal choice of action for the physician, whomever it is?*

When stated in terms of the above, the concern is whether there exists a core point. Such a point has the properties that no other course of action can be proposed that would be an improvement. Here a result from Plott [8] is relevant. He showed, whatever the dimension of the space of option, it is possible for a core point to exist. Of importance is that for such a point to exist, the ideal points need to be quite special. In general, however, such a point does not exist.

*2. Circumstances about a patient's condition are not precisely known, which raises a question about the stability of any decision. Namely, can an optimal choice be found that persists in that small changes in the patient's condition require only small changes in the choice so that it remains optimal?*

A restatement of this question is whether a core point, if it exists, is structurally stable. This means that a particular choice of ideal points and the physician's sense of how actions are related allow a core point to exist, will even very small, arbitrary changes in these features allow the core point to persist. This condition does *not* require the same point to be a core point; it could be some nearby point.

The importance of this question is that all features of a case cannot be precisely known. For this reason, it must be expected that rather than a precise location of an ideal point is known, at best a general positioning of the specifics is possible. So, with the changed conditions, will a core now exist? In turn, this means, for any practical purposes, the structural stability of the existence of any core point is required.

Here the news is negative. As shown by Saari [9, 10], once the dimension of the underlying space exceeds two (and this is the situation for any realist medical concern that has any possible conflict), a structurally stable core point cannot exist with a majority vote. (Conclusions in [9, 10] describe what happens with any choice, such as a three-fourths or more demanding selection process. Results in these references support the earlier assertion about unanimity requirement.)

Relating this to the Plott configuration described above, this result shows that Plott's result truly does apply only to very special cases. In general, in realistic settings (where there are more than two relevant variables), the core does not exist.

Restating this conclusion,

*In general and under relaxed but realistic conditions about the circumstances and a physician's perspective of the options, even if a decision, or act is optimal in the sense that there are no preferred options to the the proposed action, even the slightest change in the environment can destroy its optimality.*

3. *In general, can initial choices be improved?*

The above statements prove that, in general, a core does not exist. The implication of not having a core point is that whatever is selected, it always is possible to make improvements. Stated more generally,

*Under relaxed but realistic conditions about the circumstances and a physician's perspective of the options, any conflicting medical ethical situation can be improved as based on the physician's preferences. That is, whatever happens to be a current proposed action, there is another action that the physician would find to be less conflicted and an improvement.*

With the surgery example, for instance, slight changes in operating room personnel, or a modification of the selected procedure, could reduce the possibility of harm, or increase the likelihood and character of the patient's health.

4. *Is it possible for a continual improvement?*

With reflection and an appreciation of the complexity of what must occur in many settings, the fact there are no absolutely optimal choices becomes realistic. But such a situation creates an obligation to consider whether improvements upon a current course of action is appropriate. Stated in another manner, perhaps a continual sequence of improvements is possible.

While this makes sense, it can run into troubles. A result by McKelvey [7] proves that if there is not a core, then it is possible for the "continual improvement" process to end up with a final outcome that is worse than the original starting point. As part of her PhD thesis, M. Tataru [12] extended McKelvey's result to a large collection of voting rules.

In other words, when a core does not exist, and this must be the expected situation in questions of medical ethics, the process of trying for an improvement could result in a conclusion that is not anywhere as desired as the initial choice.

5. *What dangers are involved in a continual improvement process, and are there ways to get positive conclusions?*



The dangers of a program of continual improvement already are described. More generally, the result asserts that when a core does not exist, it is possible to select a starting act and a final act, whereby *the initial choice is preferred over the final one with all principles*. Nevertheless, it is possible to find a sequence of actions, each of which is an improvement over the preceding one, which starts at the initial action and ends at undesired final act!

What remains is to find whether there are possible ways to minimize some of the difficulties. Here there is a positive answer; it is based on how various results are proved. Namely, any act can be improved upon. And the improved act can be improved, and so forth. *But* the measure of whether a new act is an improvement is with respect to the previous one. It is not compared with the history of proposed options!

Therefore, a process of continual improvement that avoids the above difficulties goes beyond a paired comparison of a particular choice, but the comparison is made *with all previous choices in the continual process*. If this is done, then it is impossible to have the above negative conclusion.

## 5. FINAL THOUGHTS

An interesting aspect of the medical ethics literature is how suggested improvements are offered for whatever act is being considered. As the above shows, this is unavoidable. For complex situations (and these are the settings in the literature) there are no optimal solutions: there is an improvement for whatever is proposed. This reality, combined with the fact that a decision must be made, suggests:

- (1) While it is reasonable to explore improvements over a first adopted course of actions, at some point an action must be adopted even though it can be improved upon.
- (2) One must never assume that current processes are an improvement over the past. And so the merits of a proposed action should be compared over a selection of other past practices.

## REFERENCES

- [1] Beauchamp, T.L., and Childress, J.F., *Principles of biomedical ethics, 7th ed.*, Oxford University Press, 2012.
- [2] Coggon, J., and J. Miola, Autonomy, Liberty, And Medical Decision-Making, *Cambridge Law Journal*, **70** (2013), 523–547,
- [3] Cohen, M., Nagel, T., and Scanlon, T., *Medicine and moral philosophy*, Princeton University Press, Princeton, 1981,

- [4] Hunink, M., and Glasziou, P., *Decision making in health and medicine: Integrating evidence and values*, Cambridge University Press, New York, 2001.
- [5] Jennings, B., *Bioethics, 4th ed.*, Macmillan, 2014.
- [6] Kattan, M.W.. *Encyclopedia of Medical Decision Making*, SAGE Publications, Inc, 2009
- [7] McKelvey, R., General conditions for global intransitivities in formal voting models. *Econometrica* **47** (1979) :1085-1112
- [8] Plott, C., A notion of equilibrium and its possibility under majority rule, *American Economic Review* **57** (4) (1967), 787-806.
- [9] Saari, D. G., The generic existence of a core for q-rules. *Economic Theory* **9** (1997), 219-260.
- [10] Saari, D. G., Geometry of stable and chaotic discussion, *Amer. Math. Monthly*, **111** (2004), 377-393.
- [11] Saari, D. G., *Disposing Dictators; Demystifying Voting Paradoxes*, Cambridge University Press, New York, 2008.
- [12] Tataru, M., Northwestern University PhD Dissertation, Department of Mathematics, 1997.