Medical Technology Assessment and Ethics
Ambivalent Relations

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The current model of technology assessment treats ethics itself as just another problem-solving technology. Ethics should resist this model to play a more critical role in technology assessment by better understanding the complex relationship between society, medicine, and technology—and by recasting how problems are defined.

Not long ago, the New York Times reported that the National Association of the Deaf in the U.S. protested against cochlear implants in children. This is a new technology, translating sounds into signals through a minicomputer that transmits electric impulses to an electrode in the acoustic nerve within the cochlea. The promise is that with the aid of implants deaf children can learn to communicate by interpreting the auditory signals transmitted. What could be more valuable than restoring hearing capacities in erstwhile deaf children?

The major objection of the National Association of the Deaf is that new technology threatens the continued existence of the specific culture of the deaf, namely, the sign language and communication systems developed within the world of the deaf. The availability of implants will be a setback in the gradual process of destigmatization and appreciation of the idiosyncratic value system of deaf people. What the Association fears is that the new technology will lead to pressure, however subtle and implicit it may be, upon the deaf to accommodate to the world of hearing people. After a long struggle it has gradually been accepted that the deaf are physically inconvenienced but not handicapped or disabled; now, the use of implants may reintroduce the idea that deafness is a defect that is repairable with technology. Learning to communicate with implants is more difficult than learning sign language, and the result is always imperfect.

Therefore, instead of creating their own world and being accepted as normal in a shared culture, the deaf now will be pressured into adapting to the world of the hearing—an adaptation that will necessarily be partial and incomplete, and that will continuously reinforce the marginality of those who cannot meet the standards of the hearing world without technical aids.

Although several assessment studies of implant technology are undertaken, this kind of critical perspective is not brought to bear; it does not fit well into the usual format of technology assessment programs. Usually it is argued that the host of social, legal, and ethical questions raised by the application of new technology, particularly in health care, can be systematically examined with a metatechnology, consistent use of which will clarify such nontechnical issues and make them amenable to policy and management. For example, the Dutch government's Committee on Choices in Health Care argued that not everything in medicine that is technically possible ought necessarily to be introduced into the health care system. New technologies should be evaluated before they are applied. That implies systematic research (identifying, selecting, testing, and evaluating specific technologies), which includes consideration of the ethical, legal, and social implications of a new technology as well as rational decision-making based on the results.

The call for evaluation has indeed led to a growing number of technology assessment (TA) studies and programs. Yet despite concern for the ethical implications of technological development, it is rare to see TA programs in which systematic analysis of such implications is an integral and substantial component. Though intended to be attentive to a variety of dimensions of new technologies (namely, medical, economical, social, psychological, ethical, legal), in practice research focuses almost exclusively on its biomedical implications. Here we have a curious paradox. Wishing to control the processes by which medical technology is developed, introduced, and used, and being concerned about the moral implications of new technologies, governments, agencies, and individual scholars have developed programs of technology assessment; however, such programs largely focus on effectiveness and safety, and hardly address in a systematic way the moral concerns that were part of their genesis. The aim of this article is to elucidate this paradox. That ethical analysis is rarely incorporated in technol-
ogy assessment studies has to do with the particular conceptualization of technology assessment and the demarcation of technology prevailing in current evaluation practices. However, it also has to do with the tendency to consider ethics as a specific technology itself, which can be applied to resolve the moral consequences of the use of medical technologies. A repositioning of ethics will be necessary to uncover and analyze the moral dimension of practices of developing, testing, and using technologies in the context of health care.

The Concept of Technology Assessment

Some argue that the popularity of technology assessment should be regarded as a response to the wave of criticism toward science and technology in the 1960s and 1970s. Initially, the term technology assessment was employed in the areas of environmental problems and developments in the physical sciences; later, the emphasis was increasingly on medical technology. One of the most important objectives of TA is to anticipate and analyze the moral dimension of practices and to facilitate positive effects. Joseph Coates, for example, defines the concept of technology assessment as "the systematic study of the effects on society that may occur when a technology is introduced, extended, or modified, with special emphasis on the impacts that are unintended, indirect, and delayed."5

In this definition, the relationship between technology and society is regarded as unilateral. Emphasis is on the effects upon communal life and the social repercussions that may accompany the introduction of a new technology; the various influences of social conditions upon technological change itself are disregarded. The definition also conceptualizes the social effects in a specific way; research should primarily be directed toward the unintended and indirect effects of technological change that are less significant and only become manifest in the long run. The moral dimensions of new technologies therefore are considered secondary or "second-order consequences." Similar tendencies may be observed in the Office of Technology Assessment's definition:

Medical technology assessment is, in a narrow sense, the evaluation or testing of a medical technology for safety and efficacy. In a broader sense, it is a process of policy research that examines the short- and long-term consequences of individual medical technologies.6

Here, also, a distinction is drawn between a central and a peripheral assessment process. The core of evaluation studies has to do with the question of whether the technology can be applied safely and effectively. Special problems arise when the technology is applied within a social context, requiring a more encompassing evaluation design. The definition at least suggests that such a broader study has a secondary status: it is only feasible when the core processes have been studied. Studies that are restricted to these core processes, however, may also be called technology assessment studies.

The OTA definition refers, furthermore, to another important aspect of technology assessment studies: they intend to produce data to facilitate more informed policy decisions.7 Thus as Coates has noted, technology assessment is a class of policy studies, a rational contribution to present-day health care policy confronted with the need to control rising costs and regulate the use of medical technologies. For some authors, however, the relationship between technology assessment and health care policy is not that stringent. They prefer a two-phase approach to assessing medical technology. The first phase of assessment is "systematic information generation to support societal decisions on medical technologies."8 Only when reliable and preferably quantitative data are available is the second level relevant: developing health care policy and making practical decisions concerning the use of technologies. Ethical issues will only arise at this second level when the data of technology assessment studies must be implemented in medical practice.

Presumptions about Technology

Such definitions of technology assessment sequester ethical questions as second-order concerns that are significant only at the level of policymaking. Such delineation originates from a restricted view of technology that presupposes a set of specific relations between technology and society, knowledge and its application, information and decisionmaking, and the medical and nonmedical domains that are problematic philosophically.

The current concept of technology assessment radically divorces technology from social context and assumes that we are initially confronted with a new technology and only secondarily with the effects of this technology on society. It is argued, for example, that changes in health care under the influence of technology have led to increasing concern about "societal side effects."9 This terminology is significant: a new technology is introduced, applied in health care practice, and then produces "side effects." Technology and society are considered independent entities; problems arise because the first entity has a particular impact upon the second.

The philosophical literature and data from science studies indicate that the relationship of technology and society is much more intricate.10 Technology is not only a cultural product, but itself a producer of culture. The construction of a new technology always requires a specific setting, the concomitant construction of a world in which the technology can be applied appropriately. In other words, instead of assuming that technology has social effects, it is better to say that a technology constitutes a particular practice which is medical and social at the same time. For example, new technologies in medical testing (such as chemical analysis of urine) will only "work" when a particular examination practice has been established with rules and prescriptions that determine how doctors must proceed and how patients must be treated.12 It is not the case that, once obtained, new knowledge is simply available for introduction into existing practices. Rather, development and application of knowledge go together with redefinition of those
practices in any of several ways: by changing the objectives of intervention (not treatment but testing), transforming normative status (chemical analysis detects an underlying disorder in a patient who superficially seems healthy), or modifying social interactions (newly demarcating duties among physicians or between medical advisor, examining doctor, and insurance agent, as well as between doctor and patient).

The definitions of technology assessment assume that knowledge comes first and application follows, and that it is therefore possible to identify innovations and to evaluate them prior to their general use. This presupposition is reflected in the well-known idea of the life cycle of a technology, as well as in the notion that there is a critical moment for initiating an assessment study. It is taken as common knowledge that the process of innovation, research and development, and diffusion of new technologies has a fixed pattern. A familiar graph, representing the scale of use of a technology over time, shows a typical phase model: first, the discovery of new knowledge (the phase of fundamental research); second, the incorporation of this knowledge into a new technology (the phase of applied research prototype development); third, the evaluation of safety and effectiveness (the phase of clinical trials); fourth, the development of programs to demonstrate the applicability for worldwide implementation (the phase of demonstration programs); fifth, diffusion and general acceptance (the phase of adoption by professionals); sixth, training in use and application in several categories of patients. The model finally assumes that the scale of use stabilizes and levels off over time, as the particular technology becomes obsolete, discredited, or replaced through new, more promising technologies. Such a life-cycle model implies that technology assessment studies must be executed at the right moment. Evaluation is most important when the diffusion process of the technology is beginning to unfold. Early in the developmental life of the technology, evaluation data are usually scarce and incomplete; evaluation of a technology when it is already disseminating in medical practice, however, is too late to be of any support for policymaking.

Recent studies have criticized this linear model, showing the complex simultaneity of knowledge and application. In his analysis of the 1952 poliomyelitis epidemic in Copenhagen, Ger Wackers showed how in clinical practice, changes occur simultaneously in scientific knowledge, medical technology, moral evaluation, and social context. In the Copenhagen hospital for infectious diseases, consultation of a free-lance anesthesiologist led to the reduction of the high mortality rate of bulbar polio: this outsider interpreted the patients' lethal condition not as a metabolic acidosis, but as a respiratory acidosis, transforming the condition into a ventilation problem, manageable by manual positive pressure ventilation.

The effectiveness of the intervention was so obvious that medical students were mobilized in shifts to ventilate manually (up to 700 patients at the same time, twenty-four hours per day). This case illustrates how an existing technology (manual positive pressure ventilation was known for centuries) is applied as soon as a problem is identified for which it is a solution. Knowledge is application. Application, however, also requires the creation of a social network for the appropriate use of the technology, such as the establishment of anesthesiology as a medical discipline or the discovery of useful actors who can easily learn to apply the technology. At the same time, efforts are undertaken to control this network better—in this case, by making "mechanical students," namely, building respirators. Wacker's study finally shows how a technology will "find" another practical setting as soon as the initial problem has become less urgent. By the time the polio epidemic was extinguished and effective vaccination available, the first intensive care units had been established; respirators were already being transferred to other medical areas in which respiratory failure was a significant problem. The technology's success in

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Technology assessment studies connect themselves with policy as well as medical practice, however, either as integrated components or as supportive elements of the policymaking process. Such connection is based on certain presuppositions about both technology assessment and decision-making processes. In particular, technology assessment is presented as a scientific activity that produces empirical and objective data; ideally, it is "a technology for the safe, effective, and economical use of technology." Such metatechnology can be used as an "early warning system" to forecast the impact of technological change. The process of decisionmaking is also conceptualized in a specific way. First, it is presupposed that policy decisions are rational: the more and better knowledge, the better decisions. The usual flow chart is as follows: a new technology is available; technology assessment studies evaluate it; evaluation data present various policy options; one of these options is selected. However, in daily practice, rational weighing and balancing of objective information seem to have hardly any influence on how technologies are actually used. For example, in 1973 the Dutch insurance companies introduced a detailed list of medical indications for childbirth in a hospital to counter declining rates of home births. Despite the clear demarcation of normal and pathological birth, and despite reliable data indicating that delivery in a hospital is associated with unnecessary use of technology, the percentage of hospital deliveries increased from 15 to 44 percent between 1973 and 1988. When medical technology is available, it seems inevitably to be used, even in the face of objective data that it is inappropriate.

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A second presupposition concerns the goal of policy decisions. Social control of technology through policy processes is primarily interpreted as a matter of regulation and restriction. The negative aspect of control is emphasized: the objective of policy is to anticipate, moderate, or suppress the potential dangers of technological change. Much attention is therefore given to questions of authority and decisionmaking power. In this view of policy as "being in control" socially, more positive dimensions are relatively neglected. On another interpretation, control refers to guiding, managing, or steering, and gives rise to a different set of questions, for example, how the dynamics of technological change can be guided in desired directions, or how technology can be steered toward a specific goal or set of goals. A problem, of course, is that technological development itself seems to make it impossible to take a positive approach. Obstetric technology, for instance, obliterates the difference between nature (normal delivery) and culture (medically assisted delivery). That would imply that medical and natural reality are indistinguishable, and that there is no longer any criterion to distinguish between physiology and pathology, unless such a distinction is made through outside, nonmedical intervention. Yet such delineation will only be temporary, since technological change will tend to eliminate it.

Technology assessment, finally, presupposes that a clear demarcation can be made between the medical and the nonmedical. The definitions above take more or less for granted that there is a predetermined medical domain, delimited by a specific set of concepts, methods, and techniques that are applied in the diagnosis and treatment of disease and illness. New technologies are thought to originate outside this domain; after prototyping and adequate testing in basic research laboratories, they are then introduced into the medical domain for clinical application. This presupposition is not substantiated when the actual development of new technologies is studied. Instead of being introduced into a predetermined domain, technologies themselves bring about new demarcations between what is medical and what is nonmedical; they in fact reorder, change, recreate, and redefine the domain of medicine. This shaping and reshaping of medical reality is perhaps most conspicuous in the area of reproductive technologies. Childlessness has been more and more transformed into a medical problem through the availability of these technologies. The experience of infertility as suffering cannot be separated from increasing control over the reproductive process. Problem and solution are not unrelated. Now that, for instance, it is possible to create postmenopausal pregnancies, it has become more difficult to accept the condition of postmenopausal childlessness. To a certain extent, this condition has been transformed into a state of suffering because infertility is seen merely as a biological defect that can be overcome by technical intervention. The expanding use of human growth hormone gives another example of shifting boundaries between the medical and the nonmedical domains. Initially developed to treat children with growth hormone deficiency, the wider availability of hormones produced through recombinant DNA technology transforms the physical characteristic of short stature into a potential medical problem, bringing it into the medical domain as a possible object of intervention.

Technology and Ethics

The presuppositions underlying the current concept of technology assessment have the effect that technology has hardly any inherent rela-
tionship with moral issues. Technology is not considered an integral component of society; it is not studied as a social practice. When social and moral problems arise, they are understood to be secondary to the introduction of the technology, and related to the application phase of new knowledge, abilities, and instruments. For the analysis and resolution of these problems, a new type of technology—technology assessment—has been developed that generates objective information to facilitate rational decisionmaking. According to this conception, technology is not a problem, but rather itself a solution to problems. In a decontextualized view of technology like this, moral issues necessarily come to belong to the periphery of scientific interest. Thus the ambivalent relationship between technology assessment and ethics has to do in part with the narrowness of the current view of technology.

Yet this is only one part of the story. Ethics itself is not untouched by technological change. In a certain sense, ethics has become part and parcel of the technological order. It has been professionalized as an autonomous discipline external to medical practice. It is dominated by an engineering model of moral reasoning and impregnated with the idea of technical rationality, applying principles to practices.2

In theory, medical technologies offer three separate possibilities for ethical research, depending on when in the process of technology development moral questions arise. Preliminary and preconditional moral questions concern moral issues that must be clarified before an innovation can be examined in clinical circumstances (for example, informed consent, burdens and benefits). Usually, review boards address these questions when scrutinizing research protocols. Practical moral questions arise during the execution of an assessment study. They concern, for example, the interactions between professional and patient/client, or the definitions, descriptions, and data presented to invite cooperation in research or therapy. Moral issues that might arise during advertising, applying, and perfecting new technologies are rarely explored in assessment studies.

Finally, consequential moral questions concern the impact of the introduction and application of a technology. When ethical analysis is connected with technology assessment, it is usually focused on questions of this type. For example, when in vitro fertilization is applied in medical practice and leads to the production of spare embryos, the moral question is what to do with these embryos. Similar questions concern the criteria for application of the technology: should IVF be used for postmenopausal women? Such moral questions are generally accepted as legitimate components of a technology assessment study. Analyzing these questions is useful since it may help to demarcate the applications of the technology that are acceptable within a particular society. However, given the other points at which moral questions may arise, in the practice of technology assessment the exploration of ethical issues remains quite restricted.

A proposal to promote the examination of moral issues in technology assessment has recently been published by a committee of the National Hospital Council in the Netherlands, which made a plea for systematic “ethical assessment” of medical technology.25 The committee also distinguishes three categories of ethical questions: preliminary questions, application questions, and regulatory questions. This categorization, however, does not depart significantly from current practice. The first set of questions is ex ante, the other two are ex post. The design of technology assessment studies can remain unchanged: certain moral issues relating to foreseeable consequences have to be settled prior to the start of study (using the help of IRBs); other issues will follow from the application and introduction of the technology in clinical practice, and they can be resolved by defining what is responsible application and how the technology should be applied. By adding a few questions to the standard protocol, the “ethical aspects” can therefore easily be accommodated in an evaluation study.

The committee suggests what kind of questions are relevant. Nearly all of these questions regard the appropriate use of a technology, the technology as such is never considered to be a problem. The committee ultimately transforms ethics itself into a technology. When ethical issues are just one aspect of the technology, they should indeed be examined in basically the same way as any other. The questions intended to identify the ethical aspects can be arranged within a checklist that may be used by everyone who wants to make “a generally accepted ethical judgment on the good usage of health care technology”26 (p. 14). In fact, the list presents a simple framework, with the principles of respect for autonomy, beneficence, nonmaleficence, and justice on one side, and the three categories of relevant questions on the other. Ethics is nothing but a technology to make a particular set of (potential) problems manageable and controllable.

Repositioning Ethics in Technology Assessment

A rather different approach emerges when a somewhat different distinction is drawn among ethical issues in connection with medical technology.27 There is first the category of moral questions arising within the framework of the technology. Examples are debates about the moral status of the embryo or the conditions for surrogate motherhood. Questions of this type remain inside the framework of the technology; they proceed from an acceptance of the technology as a datum, trying to define its responsible and appropriate use. The second category consists of moral questions concerning the technology itself. Under this category analysis focuses on the question of whether the technology as such is justified in light of moral values. Technologies are expressions of fundamental values, such as the search for knowledge or the relief of suffering; however, these values are no longer taken as implicitly given, but as the starting point for a debate on (other) motivating values in society.

Usually, only the first type of moral question is addressed in technology assessment studies—in those studies that include any ethical analysis at all. This restriction shows not only that the focus of ethical analysis is too narrow, but also that it is not self-critical.
The fact that we are confronted with more and more moral problems is basically related to the penetration, domination, and “colonization” of our life and world by science and technology. The answer to such problems cannot be given (at least not solely) by an ethics that is itself technologically oriented. In fact, when moral problems are primarily approached in an engineering way, technically applying principles to cases and dilemmas, ethics itself becomes another manifestation of the same basic problem.

The fundamental objection against focusing upon the first type of ethical questions, then, is that in doing so ethics is incorporated into a technological model to evaluate and calculate effects, and to control and eliminate problems. Within such a model, the criticism that this conception of “techno-ethics” is itself a component of the fundamental problem that brings us to moral debate in the first place can have no force.

A second contribution of ethics is explicitly to study the interwovenness of technology and society. Technology can only be applied when various nontechnical problems are resolved; technical issues can be settled only when an adequate context has been created. A single technology introduced retrospectively in a historical culture (such as a gasoline engine for a Roman trireme) has no purpose and function. In other words, technology exists within networks of social practices; without intrinsic connections between technical and nontechnical factors it will not function at all. To understand the moral dimensions of new technologies, ethical study should therefore also analyze the context within which these technologies exist and function. Diagnoses and disease entities, pathophysiological explanations and therapeutic rationales may vary depending on cultural values and normative traditions; so too medical technologies are embedded in networks of heterogeneous values.

The possibility of kidney transplantation in children and the better results with organs from living related donors place family relations in a different perspective. The availability of reproductive technologies is changing the meaning of female bodiliness; reproduction and fertility as body functions are reinterpreted against an implicit norm of productivity. The tendency of technology to reorient and dominate our experiences and practices has, of course, been known for a long time and has been the topic of much philosophical thought. However, modern health care ethics has only rarely taken this as an explicit theme of reflection. Instead of modeling itself on technology and adopting technology’s methods, ethics should explore and articulate the fundamental discontent evoked when medical technology becomes the basic source of moral issues, and should seek out new perspectives.
Such an approach need not proceed from pessimism concerning the overwhelming power of technical rationality; it should start from the notion that understanding the power of technology also yields insight into the limits of a technological world view. Not despite but because of technology, man is able to obtain a better understanding of the condition humaine. The power and dominance of technology stimulates us particularly to search for other aspects of being human than mere technical, instrumental action. The more the human body, human life, and suffering are molded and controlled by medical technology, the more we can discover that the meaning of human existence is not reduced to increasing regulation and control of life and world. In other words, precisely the dominance of technical rationality gives us cause for breaking out of the technological framework. If ethicists do not use this opportunity for philosophical reflection, who will?

References