Informed consent in fields of medical and technological practice: an explorative comparison

Lotte Asveld
Department of Philosophy
Delft University of Technology

Abstract: Technological developments often bring about new risks. Informed consent has been proposed as a means to legitimize the imposition of technological risks. This principle was first introduced in medical practice to assure the autonomy of the patient. The introduction of IC in the field of technological practice raises questions about the comparability of the type of informed consent. To what extent are the possibilities to include laypeople in making decisions regarding risks similar in the technological field to giving informed consent in the medical field and what does this imply for the design and implementation of IC in the technological field? Medical and the technological practice are clearly alike in that both fields are characterized by highly specialized, technical knowledge which can be quite inaccessible to the average layperson. However, a fundamental difference arises with regard to the *aim, knowledge of risks* and *exclusiveness* of the practices in each field. The differences in aim imply that the necessity for each practice is perceived differently by laypeople, thus leading them to assess the respective risks differently. The differences in knowledge of risks arise from the variability in the ways that can be used to describe a given risk. Definition of risk in medical practice is more homogenous in this respect than the risk definition in technological fields. Furthermore, medical practice tends to be more exclusive, leading laypeople immersed in that practice to necessarily embrace most of the fundamental underlying that practice. These differences result in divergent recommendations for the implementation of informed consent in the technological field, basically: there is a need for more extensive procedure and for less decisive authority for the individual.

Introduction

Informed Consent (IC) is a widely used procedure in medical practice where it serves to guarantee respect for the autonomy of the individual. Respect for autonomy requires that an individual can make and enact choices according to her own moral framework. Through the mechanism of informed consent, the patient is given the ultimate authority for deciding the acceptability of a given treatment for herself, after she has been informed by a physician of the risks and benefits attached to the particular treatment. Thus, the patient's autonomy is respected (Faden & Beauchamp, 1986).

The introduction of ICprocedures in the technological field has been proposed as a means to counter some of the ethical deficiencies related to the lack of autonomy for individuals with regard to decisionmaking involving risks (Martin & Schinzinger, 1983). The main aim of introducing IC in the technological field is to give laypersons a greater influence when decisions need to be made about the acceptability of technological risks, rather than, as mostly happens at present, assigning this responsibility entirely to experts.

Although IC has proved applicable in medical practice, its introduction in the field of technological practice would require some amendments. Some salient features of both practices are compared in this paper. The central question is: How do the similarities and differences between medical and technological ICpractice affect the accommodation of individual autonomy in decision procedures involving technological risk?

Technological practice is understood as all those activities that bring forth technological artefacts. Medical practice is understood as activities performed within the boundaries of modern medical science, which center on the human body. Technological practice focuses on the development and production of new artefacts which increase human welfare. Medical practice is concerned with developing artefacts and treatments that are intended to cure human beings and protect their health.

The distinction between the two forms of practice may not be so clear cut as presented here. Medical practice for instance is utterly technological in character, however such overlaps do not invalidate the search for distinctive qualities however. Granted there are similarities between the two fields, the interesting

question remains: Where do they differ. More specifically: How do such differences relate to the process of accommodating individual autonomy?

Specific aspects of the two practices that will be used to guide the comparison include: 1. aim, 2. knowledge of risk and 3. exclusiveness. How these aspects are understood is explained below. The aspect of scale is left out of the comparison. Scale is of course one of the most prominent differences between the two practices, as medical practice typically involves only one patient whereas technological practice affects many people at the same time. However, the issue of scale in relation to individual autonomy has been widely discussed. These three aspects may provide interesting insights that have not been considered elsewhere as much as the aspect of scale. Each of the above mentioned aspects will be discussed in in three consecutive parts.

1. Aim

A relevant distinction when comparing technological and medical practice can be discerned in their specific aims. The aim of the medical practice is much more narrowly defined than that of the technological practice. Technology is foremost a means that can be applied to serve a multitude of aims, most of which can be captured under the heading of human welfare. Taking care of people's health is one such aim which may be served by technological practice.

Medical practice, in contrast, serves one clearly identifiable goal, namely to promote human health. This goal is more refined than the sweeping statement human welfare. Moreover, it is a goal that is defined internal to practice. The professional group that practices the art of medicine, also provides the knowledge used to define human health. This is different for technological practice, where engineers aim to serve goals that they do not define by themselves, such goals are defined in communication with clients and regulatory instances that serve to protect the interest of the public at large. Furthermore, engineers rely strongly on other scientific fields when defining the content of such aims as safety, environmental friendliness and economic feasability (Airaksinen, 1994).

This difference implies that the definition and understanding of the aims of medical practice is much more confined to one discipline than that of technological practice. The implications of this for the procedure of Informed Consent will become clear further on.

Additionally, medical practitioners are commonly involved in a practice the main of which is generally unquestioned and the benefits of medical practice are embraced by most people. As Harris & Woods (2001) put it: "We all benefit from living in a society, and, indeed, in a world in which medical research is carried out and which uses the benefits of past research."

Although most people embrace the fruits of medical practice, dissenting voices can still be heard, such as the concerns voiced by Ivan Illich (1976), who questions the alleged achievements of new drugs and research. He points out that many improvements in our health may not be due to better medicine at all, but to better hygiene and food. Moreover, he states, instead of curing people, physicians basically make people (more) ill.

However valid these worries may be, they represent a minority perspective. In Western society in general, there is a strong faith in the beneficence of the medical practices. This strong faith is reflected in what Callahan (2003) describes as the 'research imperative' in the medical context. This imperative refers to the willingness of several actors: industry, government and patient organisations alike, to invest large sums of money in medical research without questioning the effectiveness of such research.

This unreflected faith appears to be much less widely embraced with regard to technological practice. As an illustration: genetic modification as a means to achieve health, i.e. genetic modification of micro-organisms, has remained outside the fierce discussion centering on genetic modification, implying that comparable technologies are assessed differently in different contexts. If it is true that the aim of medicine legitimizes its means more so than for technological practice, this will affect how the procedure of informed consent should be applied in the technological context. People will generally have more and stronger concerns about technology. Since respect for autonomy is the main objective of the procedure of informed Consent, it is necessary to find ways to take these stronger concerns of people with regard to technology into account.

Several reasons exist to suppose the technological practice and accompanying developments are less easily accepted than those of medical practice and the accompanying developments. The first has to do with multiplicity in aims, the second with perceptions of naturalness, the third with perceptions of immediacy and proximity, the fourth with the division of burdens and the fifth with the percieved motives of practitioners.

First, much of resistance against technological development can be explained with reference to disagreements about its aims. There is usually more discussion about the purpose of technological development than about the purpose of medical applications. Technology, in general, can be applied to a wide variety of goals, which might not always seem as pressing as the goal of combating disease. Medicine is a more-or-less one-aim practice as opposed to the multiple-aim practice of technology.

In the resistance to UMTS (3G)-antennas for instance, a technology that offers extended uses for the mobile phone, including watching video's on one's telephone screen, the opponents of UMTS (3G) antennas gave as one of their motivations a lack of need for such a product: "(…) because these UMTS antennas do not serve any other purpose but luxury: the GSMantennas are more than sufficient for the messages-mobiles; the new antennas are nothing but games-antennas for addicted consumers."[1] The intended benefits of this technological development were clearly not recognized as such by these opponents.

Although people might agree that technology spurs progress and that progress is generally thought to be a good thing, the exact implications of what is progress and what is good still leave much to interpretation. Different interpretations may clash. Does progress entail more functions on mobile phones or does it entail less telecommunication? Does progress entail more mobility for more people, or does it entail a healthier environment?[2]

It could be stated that it is not the *aim* of a new technological development that is subject to extensive debate, but rather the *means* available for achieving the goal of the technological 'progress'. So people might agree that alleviation of world hunger is a necessary element of progress, the main disagreement lies in the question whether genetically modified food is an appropriate way to achieve this. However, even if the appropriateness of means is a main cause of disagreement, can the disagreement still be expected to be less intense when the aim of the practice is unambigously defined. 'Health', in this respect, is more straightforward than 'progress'.

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[1] Text on pamflet calling for public action against UMTS-antennas, www.stopumts.nl,

[2] Of course, some technologies may be able to combine different interpretations of progress, such as an environmentally friendly car, but often, such aspirations are on a par.

Secondly, as said above, the aim of medical practice is to cure human beings. Let us have a closer look at this aim. What curing actually implies, is a contentious issue, a quogmire into which I will not venture at this point. I will stick to the concept of cure as reflected in Norman Daniels (1985) definition of health: "health is the absence of disease, and diseases (I include deformities and disabilities that result from trauma) are deviations from the natural functional organization of a typical member of a species." This definition implies that to cure is to restore the natural functional organization of a typical member of a species.

What is important here is the normative connotation cure holds for most people. The aim of medical practice to restore a natural function, as given in the definition above, is easier to accept than the pervasive alterations that are brought about by technological developments, which appear rather to lead to deviations from a natural state instead rather than restoring something to a natural state.

Again, naturalness is a contentious and often culturally biased notion, but nonetheless it is very appealing to those of us in developed societies. It carries with it a reference to a desirable, pure state of being, which is treathened by any kind of modern economical, political or technological progress.

An exception may be the practice of psychiatry where the strive for 'restoring natural functions' is less recognizable. It is also in this field that aim and methods used may spark more controversy than other branches of medical practice. While acknowledging this as a problematic instance, I will regard psychiatry as a-typical because the concept of cure and natural functional organization are highly contentious in this medical field. The case of psychiatry does support my thesis that viewing a practice as restoring a natural situation contributes to its acceptability, as a concept of naturalness seems more unattainable in the area of mental illnesses than in other fields of medical practice.

Thirdly, illness brings about a direct pressing need the alleviation of which often becomes a prime objective which dissolves other, more broad-ranging and abstract considerations. The perceived direct need for taking certain risks is stronger in medical practice than in technological practice.

If people are ill, or someone of their loved ones is ill, the prospect of cure may lead them to subject themselves or their loved ones to a system of expert knowledge without questioning the system too much. As Schermer (2001)

describes the situation in hospitals: "For patients, there was often not much real choice; a course of action was proposed or prescribed to them that they could either accept or refuse." (p.80). This situation appears to be regarded as unproblematic by most patients. "(…) for many patients, medical decision-making was not something they were very concerned about or wanted to take part in." (p. 85)
People heavily depend on physicians when they are ill and lack the strength or resources to question them.[3]

In the context of medical research, people are often motivated to contribute to a practice, which will eventually benefit themselves or others. In the case of biobanks for instance, people who were interviewed about their motivations to donate blood samples often stated they wanted to help others and the future generation (including their own children). People who did not donate their blood samples, because they thought biobanks might pose a threat to privacy, felt guilty because of this (Haims & Wong-Barr, 2004).
This willingness to contribute to expert health systems, the recognition even of this as a moral obligation, might be explained by the fact that many people have some experience with disease. Most of us have suffered or know someone who has suffered from a disease. The desirability of a healthy life is generally beyond doubt, especially when the negative effects of disease have been witnessed by first-hand experience.

So if we consider the costs and benefits associated with medical applications compared with those of purely technological applications in terms of money spent to achieve a state of well-being for as many people as possible, then medical applications possibly achieve just as much as technological applications. However, the benefits of medical applications may be deemed higher, even if their net result was equal that of technological applications, because they are always bestowed on a specific individual, who is in immediate need of care, whereas the benefits of technological application are more widely spread among a larger group of anonomous individuals, whose needs are seen as less pressing.

Fourthly, aside from this strong appreciation of the benefits of the medical practice, the burdens of technology appear to be much more directly visible. Medicine is often confined to the boundaries of a given hospital and sometimes

[3] This may be different for people who are ill for a long time, and who are not too debilitated. These however are the rarer cases and the main disputes will not take place at moments of Informed Consent.

to the boundaries of a patients' home or an ambulance racing through the streets. Technology in contrast is commonly very visible in society[4], which renders the burdens of such technology much more directly visible.

Paying for your health insurance is much less threatening than having a chemical factory built near to your house. Although in both cases, the individual does not directly benefit from the burdens that are imposed on her, the burdens may be evaluated quite differently as they have quite different characters. The first is a financial burden that is generally easier to carry than a (possibly) life-threatening risk, such as the second. [5]

Put differently, there will generally be less agreement on the necessity for a given technological development than there is for the necessity of a medical development of treatment, as the benefits are easily discernible for medical practice and always pressing, whereas for technological practice, the burdens are more easily discernible.

Fifthly, most healthcare practices and medical researches are usually associated with hospitals and governments, and not with companies, with the exception of pharmaceutical companies. Several people stated in relation to biobanks that they would be less willing to contribute if they were asked by a company for a donation of their DNA material (Busby, 2004: 50). The absence of commercial interests generally contributes to the trust people put in expert health systems. To perceive the interests of the other party as compatible with your own increases the trust one places in the other party (Baier, 1984). This is easier when there is

[4] Not all specific kinds technologies are always visible. Nanotechnology and biotechnology for instance are not easily perceptible for the layperson. However, the point is that people may be better able to witness the negative effects of technology *in general* because they experience technology daily than they are able to judge the negative effects of medicine *in general* as they usually encounter this practice only in very specific instances. Circumstances, moreover, in which a direct need for medicine is felt.

[5] Additionally it can be stated that the health insurance burden is at least shared throughout society, whereas the burden of the chemical installation is directed at one specific geographical area. It is much more difficult to accept this burden, when the benefits are not directly visible, than it is with the burdens of medical practice. The general observation is that the benefits of medical practice are usually aimed at specific individuals while the burdens are evenly distributed in any society. In contrast, in technological practice, the benefits are often accessible to society at large, whereas the burdens are imposed on a limited group of people.

lack of commercial interest. The development of technological artifacts often involves commercial interests.

In conclusion it can be stated that medical risks are usually thought to be more acceptable since they are typically considered to be legitimated by the aim of medical practice for the various reasons mentioned above.[6] The IC-procedure in the medical context therefore serves mainly to protect the patient from deception and coercion (O'Neill, 2002: 97) and does not require discussing the aim of the proposed treatment or experiment.

People will in general be more concerned about the choices that predate the development of technological developments. The fact that such choices are more often of importance to them, justifies their inclusion in the procedure used in the field of technology to gain informed consent. To exclude such issues from the procedure of informed consent will undermine their autonomy, as individuals will be denied the opportunity to make and enact choices according to their own moral framework. If it can be expected that such choices will elicit little discussion and little concern, the conclusion can be drawn that the choices as made by the experts alone, will overall coincide with the choices laypeople would deem most desirable. As it is however, laypeople appear to have strong concerns about the (alleged) necessity of technological development.

This is far less problematic, though not completely unproblematic, in the case of medical developments as laypeople have fewer reasons to question necessity in this area since the aim of medical practice seems to justify for most people most of the risks associated with this practice. However, even if the aim of a technological development was defined straightforwardly and widely embraced, a discussion about the acceptability of the risks involved is still more likely to occur for the same situation in the medical practice.

2. Uncertainty

[6] However, it would be false to state that medicine has not experienced some of the distrust towards its institutions that has characterized the scientific and technological practice. The aim of medicine (cure) does not always legitimize its means or its methods to everyone, as is shown by the growing number of people who turn to alternative health practitioners. Such debates are however usually not conducted in the process of informed consent, though possibly they should be.

Deciding on the acceptability of a certain risk involves two different fundamental issues. The first is A) how a risk is identified and estimated. The second is: B) how a risk is evaluated (Shrader-Frechette, 1991). For the technological practice, both issues have characteristics that have led to the increasing inclusion of lay perspectives in the risk decisions process. For medical practice, only the latter issue is considered in the demand for input from the layperson or patient (Faden & Beauchamp, 1986). Not only is her input required, she is considered to be the sole authority on this matter.

With regard to B, evaluation of a risk, this is basically a *moral* issue. When scientifically trained experts or dedicated policymakers or physicians are given the sole authority to decide on such questions, their specific moral frameworks alone should determine the answer to such questions. Such a decision structure excludes other moral considerations, such as those that laypeople may hold, thereby undermining their autonomy. In matters of purely technical or scientific character, experts or dedicated policymakers may legitimately provide the relevant answers without undermining the autonomy of laypeople, as these questions typically have only one, or a limited number of adequate answers, which the experts will most likely be able to find. This is in contrast with the issue of evaluating the risk: judging whether it is worth taking that risk, here the layperson offers valuable expertise as this is not a technical but a moral issue.

This brings us to issue A: many decisions about risk suffer from lack of certainty or incomplete information. Scientific knowledge often fails to provide conclusive evidence to establish the nature of a given risk. Risk-assessors therefore necessarily rely on assumptions of a non-epistemic, moral, social, economic, kind to determine what constitutes a risk (Shrader-Frechette 1990, Fischoff 1981, Wynne, 1980). Such assumptions are primarily based on a specific worldview which is not scientifically falsifiable. The presence of such assumptions in risk-assessment is inevitable. They should not be regarded as problematic for the field of risk-assessment as knowledge production isn't hindered but they do cause substantial uncertainty. Variance in such assumptions leads to variance in the outcomes of the estimation of a risk.

These assumptions can not be eliminated or reduced. There is reason to suppose however, that they cause less uncertainty about risks in medical practice than in technological practice.

There are two main reasons to suppose this is the case: one, in medical practice new products are extensively tested in controlled environments and two, and related, the application of a new product is very narrowly defined. Qualified professionals may only apply some products; others, for example, can only be taken by people who have obtained prescriptions, based on need, from qualified professionals.

In contrast, the release of most technological products in society is not characterized by the qualities of medical research and application: there are no controlled circumstances. Of course guidelines exist to guarantee safety and products will be tested before they are released onto the market which offers some means of control over the effects the technology will have on society. However, as Van Gorp (2005) describes, for new, radical designs especially such regulatory frameworks are often inadequate.

The main instruments of control for technological products are actual risk-assessments, which suffer from uncertainties. Many of the uncertainties in technological risk assessment arise out of differences in assumptions present in the models applied. These assumptions may involve the way a technological artifact is used, under what circumstances, what kind of events might cause it to malfunction, how it will affect its environment. Such assumptions are very likely to diverge considerably among risk-assessors, since they cover a whole range of environmental, human and technological qualities and reactions that are hard to predict, either because of lack of knowledge or due to sheer complexity.

In contrast, the medical context appears to be much more predictable. This is not to say that in the medical context, no surprises ever occur or that controversies never arise. The likelihood is just much smaller for two reasons. Firstly, knowledge of risks has mainly remained within the technical-medical discourse, confined to medical laboratories and institutions whereas with technology and its attached risks are much more out in the open. The assumptions that underlie the descriptions of risks vary in medicine to a much lesser extent than the risk assumptions made in the technological practice. Second, the context of medical practice is much easier to control in general than the wide-ranging (indefinite) context of technological practice; this widens the variation in assumptions.

This is not to say that medical practice is a necessarily a lot safer than technological practice. The kind of risks in medical practice however, can be said to be easier to describe. This implies that when a patient or a research subject

decides on the acceptability of a risk attached to a certain treatment or experiment, the knowledge of the risks involved has been presented in a more homogenous manner as is the case for technological risks. This is true for treatment as much as it is for experiments.

The point is about the nature of our knowledge of risk. The social institutions and relations that underlie each of the practices are fundamental to understanding the generation of knowledge of risk. The social practice of medicine is much more narrowly defined than that of technological practice. This aspect does not necessarily relate to what the risks amount to precisely, it concerns primarily the way the risks are interpreted and described.

Therefore, the patient or the research subject evaluates a specific risk and its estimation will not give much room for multiple interpretations. The possible description of risk is a lot narrower and therefore less debatable in the medical practice than in the technological practice for the reasons mentioned above.

Presumably then, decisions made in medical practice are understood as relating solely to the last stage of risk management: evaluating the risks. The issue of establishing the risk is not so much an issue, therefore the focus is on evaluating the risk. The autonomy of the individual is deemed to be a legitimate concern in this stage of evaluating the acceptability of a certain treatment in medical practice, but not in any other stage (estimation or identification of a risk) as this is a stage that is accessible to experts only.

This gives us reasonable assurance that the judgment of the layperson will be aimed primarily at the *moral* issue of evaluating the risk. In this area, the layperson is usually considered the ultimate authority as her health is at stake and she is the one who knows best what risks she is willing to take to consolidate her health.

In contrast, in technological practice, the realization that the establishment of a risk should, to some extent, be opened up for the input of laypeople, has arrived at the forefront of the consciousness of experts and policymakers. This has led to the inclusion of laypeople in this specific stage of risk-assessment. In many European countries, laypeople are being increasingly invited to participate in decisions regarding the acceptability of technology, to take part in Participatory Technology Assessments (PTA). These assessments resemble the procedure of gaining informed consent in medical practice in that the participants are first

informed about the technological development at stake and its accompanying risks, and then get a change to form an opinion about this technology (Europta, 2000, Asselt, v. et al., 2001).

However, even if the fallibility of the expert is recognized, a scientifically trained person might still do a lot better at estimating a risk than a layperson. So even though the input of laypeople is valued very strongly, their perspective on matters is not binding, it is taken as a valuable addition and nothing more. Their input primarily helps experts to overcome the confines of their own limit visions. That this input is solely of an advisory character is a salient difference with the status of the input of laypeople in medical practice, where it is binding.

As the evaluation and estimation of a risk are intertwined more strongly in technological practice than in medical practice where the knowledge of risk is more diffuse, it is more accepted that the layperson has a binding say in the matter of evaluation of the risk in the medical practice. This stage is severed from the other stage of estimating the risk in the medical risk, so the layperson can be considered a true and sole authority; this is not the case for the technological practice.

3. Exclusiveness

Another important aspect when comparing medical and technological practice on their respective suitedness to accommodate informed consent is the moment in development when laypeople can voice their concern. A salient aspect of medical practice in relation to informed consent is that once people are asked to give their consent, they have already crossed a certain threshold. They have already accepted the premises on which medicine is founded. Otherwise they wouldn't go to a particular physician; otherwise they would not participate in a particular research project. Informed consent in medical practice is mainly a safeguard against abuse; it does not offer a forum to discuss more fundamental issues such as the appropriateness of the method used or deployment of resources. This stage is passed over at the moment Informed Consent is given in the medical practice.

Additionally, a strong boundary exists between what are considered to be legitimate means and practices and what are not. Alternative medicine is a clearly distinguishable medical system. Patients who turn to these practitioners can do this at their own risks and they may be considered less rational for taking such a course.

Medicine is a closed system to a larger degree than technology: the conventional medical institutions are very recognizable and one is either an insider or an outsider. This becomes clear for instance in the fact that not everyone can take part in the medical activities whereas technological development can be undertaken by anyone who is willing to get involved. Medicine is a profession with an internal judicial system, which implies that doctors can be expelled from their professional group if they are convicted of misconduct. In the United States, such a system also exists for engineers but only for engineers not working in industry. The European Union does not have such a system. Engineers do not require a special license in the EU to demonstrate their trustworthiness to third parties.

The closedness of the medical system is further strengthened by the professional loyalty that exists among physicians. Loyalty to one's colleagues and teachers also forms the first part of the Hippocratic Oath. This loyalty makes public discussions of controversies and the reporting of poor practice less likely than in the technological practice, where such loyalties may exist, but only implicitly.

In technological practice the different means used to achieve similar goals cannot so easily be judged solely by the identity of the institutions that propagate them. A wide variety of actors produces technological artifacts, for example companies, universities, inventors and research institutes. There is no formal system to distinguish between the actors if they are not universities. There is however a similar effort as that found in the medical practice to distinguish reliable and unreliable *knowledge* using the distinctive qualities of institutions that assess and publish such knowledge. However, the boundaries between conventional, scientifically sound knowledge and practices are less clear-cut in technological practice. The opponents of UMTS technology for instance, put forward numerous scientific publications, which indicate electromagnetic radiation emanating from UMT Antennas harm human health. Public advisory bodies state however that such evidence is flawed and unreliable. This might be the case, although for the outsider both publications that do not find any negative effects on health and those that do, seem very similar. [7]

[7] This may also be the case for vaccines, where laypeople mobilize medical knowledge to show that vaccines might be harmful to children. Vaccines are not a typical medical case, since the people who are vaccinated are not ill. Thus the benefits of the treatment are less clearly perceptible. This might explain why this is a medical area where fierce discussions arise.

The above described difference can be (partly) explained by the points raised in the section about aims. Medical professionals exercise and define the aim of their practice: namely promoting human health. They do not need to rely on external sources of knowledge. This is different for technological practice, where engineers have to rely on external sources to explain the exact nature of a very broad, almost non-exclusionary aim: to promote human welfare. The 'self-sufficiency' of medical practice explains why it is more of a closed social system of knowledge production than technological practice.

Inclusion in medical institutions requires some concurrence with the basic premises these institutions are founded on. This is true for professionals as for patients. The practice of informed consent in medical practice will therefore never be directed at the basic assumptions underlying this specific practice, as these are taken to be commonly shared by everyone entering into this practice. However, in technological practice this will not be the case as the foundations of this practice are much less exclusively defined. On the contrary, the foundations are necessarily vaguely defined, and may be constantly open to revision. There is little legitimate basis to claim that the definition of technological foundations is limited to professionals alone.

4. Conclusion

Three main conclusions can be derived from the above. One, the concerns of individuals does not require the same elaborate attention in medical practice as in technological practice. This is basically because the aim of medical practice is less multifarious and less open to interpretation than that of technological practice.

Two, descriptions of the risks in medical practice are more narrowly described and understood in specific (medical) jargon. Moreover, they arise in a more controlled setting where the risks are easier to foresee. This assures that the stage of risk-estimation and risk-evaluation are separated which legitimizes the position of the layperson as sole authority for risk assessment in medical practice.

Lastly, the social institute of medical practice maintains a strong external-internal division. Inclusion in medical institutions requires corroboration with the basic premises such institutions are founded on, this is true both for professionals and for patients. This is another feature of medical practice that makes disputes less

likely and less frequent than in technological practice. The introduction of informed consent procedures in technological practice requires a different set-up and should have a different scope than in medical practice, this is necessary to accommodate the differences discussed above.

There is a need for more extensive debate and opportunities to discuss fundamental issues in technological practice than there is in medical practice. This is to ensure that disputes about the proposed aim of technological developments and any divergent perceptions of risks are acknowledged and articulated. This is a first step in respecting the autonomy of the individuals involved.

It is less problematic to let the judgment of the individual be binding in medical practice. This is because medical practice does not allow much room for divergence in interpretations of risk. The issue at stake is therefore solely the moral evaluation of the individual, not a perception of the risks at stake. It is clear that the individual is a legitimate authority on the first issue, but with regard to the last issue, this is more problematic. In technological practice, where both stages are less easily to separated, the input of laypeople is welcomed, but not considered to be decisive.

This conclusion was reached mainly by taking the characteristics of both practices as given and constitutive for the needs and autonomy of individuals immersed in medical and technological practices. It may alternatively be suggested that the characteristics of these practices need to change if the autonomy of individuals is to be truly respected, but that suggestion, however interesting, is outside the scope of this paper.

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