



# Risk Medicine and Transhumanism

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## Abstract

New developments in bioinformatics, artificial intelligence, and nano-biotechnologies will radically change the practice of medicine to be exhibited in the coming years. One approach that has the potential to carry this changing medical practice into a superhuman age and that has been dominating medical literature in recent years is the risk approach. This article aims to address the issue beyond the dichotomy of good or evil without wrapping the practice of medicine exhibited throughout the human body and history in the sacrament of holiness and falling into the traps of bioconservatism and solutionism.

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## INTRODUCTION

The new medical approach expressed itself in the persona of a—most likely fictional—physician named “Hippocrates” in the 400s BC, taking the concept of disease from the purview of the gods residing on Mount Olympus and bringing it down to earth. While Prometheus stole fire from the gods, Hippocratic medicine placed health care at the disposal of man as a mortal human being and was shaped on 2 often opposing principles, such as “first, do no harm” and “be useful.” The first principle considered the healing effect of nature and advised physicians not to touch or act, while the second positioned itself alongside human action, praxis, and culture and said that in order “to be useful,” one needed to take action and not leave the healing to nature.

As we have all witnessed, life evolved mainly in favor of the second principle, with etiology and pathophysiology coming into being as the basic concepts of this action. However, for a long time—even today—patients with diseases were more interested in what the disease meant to them and the roles played by the disease in this context rather than the cause of the disease and the relationship between the factor defined as the cause and the organism. As a result, unlike the majority of physicians, they preferred to think with concepts that would create abstract mental designs of the disease in accordance with their socioeconomic levels rather than technical knowledge of the disease. They demanded information from the physicians in this vein, more often than not a futile request. This structural difference between physicians and patients also formed the basis for centuries of physician-patient miscommunication.

Furthermore, if we consider that the medical knowledge of the time in Boston in 1811 attributed people’s deaths to “drinking cold water” or “teething,”<sup>1</sup> then taking an ever-skeptical look at the etiologies explained by medicine may well provide us all with the chance and a way to overcome this miscommunication. We do know that the medical institution and the medical profession, which heftily creates the culture of that institution, are almost always confident, often to the point of arrogance. In fact, the institution was so sure of itself that it was able to claim in 1912 that all preventable diseases would be eradicated from the world by 1993 and—with a positive beautification—eugenics would finally replace evolution!<sup>1</sup>

## HYGIENE AND VACCINATION

No doubt, there are concrete reasons for the medical institution to be sure of itself. Hygiene and vaccination are just 2 of these reasons. Indeed, hygiene and vaccination correspond to 2 important leaps in medicine’s long steeplechase throughout history. The importance of hygiene was known long before Christ—in ancient Greek mythology, *Hygieia* (*Salus* in Roman mythology) was described as the daughter of the god of medicine, Asclepius. We can, however, put a date on when people understood that waste-water disposal in the context of infrastructure was more beneficial to human health than the drugs of medical science. That date is 1878 when construction began on the Paris sewers and water distribution network. For vaccination, we must accept the period 1721-1798 for smallpox vaccinations.

And when it comes to sewers and water distribution, we have to mention Edwin Chadwick. He is known as a lawyer and journalist. As such, he proves a valuable example in terms of showing that non-medical professionals can also make vital contributions to the field of health. Chadwick played a vital role in shaping the “Poor Law” and the “Factory Act” amid the negative effects on people and towns of capitalist modernization, known as the “industrial revolution,” in the late 18th century.<sup>2</sup> Following these initiatives, he established a causal relationship between “dirt and disease” in his report on urban

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health in 1840 and developed recommendations for sanitation conditions, waste-water drainage for houses and streets, and water supply. He believed it was possible to prevent diseases and deaths by providing adequate hygiene through sewers and preventing air pollution with good ventilation. Similarly, he underscored in his report that the lack of water resources stops people from developing cleaning habits and stated that the quality of both drinking water and utility water needed to be raised.<sup>2</sup> He also determined that building sewage and sewer systems in compatible with geological areas is imperative for health, particularly the health of the working class. Out of his adherence to the theory of miasma, he suggested that houses, streets, and rivers be purified from bad odors through drainage. Chadwick's perspective and efforts led to the promulgation of the Public Health Act in England in 1848. This is the first law that states that the government is responsible for the health of the people.<sup>2</sup>

These 2 leaps in the history of medicine in the form of hygiene and vaccinations are quite different from one another, qualitatively speaking. This is because, with vaccination, the institution of medicine succeeded in changing the protection that exists in humans *naturally* through *artificial*, man-made means. Undoubtedly, the significance of this success in terms of health was that it prevented the deaths of millions. But this achievement was also the first realization that the culture created by human civilization could change the given nature of man. To put it another way, the medical institution had been balancing nature and culture with 2 opposite principles since the 400s BC, but it was now upsetting that balance in favor of culture for the first time with vaccinations and announcing to mankind that culture could overcome nature and change its original structure. There is no doubt that this awareness and defiance of nature by the medical establishment would also give rise to the idea of creating the future in a completely different form, which could mean the road to hell is paved with good intentions.

Regardless, the competence that the medical institution gained over time led to a change in the strategies for combating diseases. For instance, plague patients were able to live in society provided that they obeyed some rules due to changing medical practices, unlike patients with leprosy, who were informed of their rights and exiled from society. In other words, as a result of the medical institution, society responded to leprosy patients with the verb "do not do" and to plague patients with the verb "do." As a result of the smallpox [and now coronavirus disease 2019 (COVID-19)] vaccinations, disease is now a problem that can be terminated (managed for COVID-19) in the community. Looking at these processes from Michel Foucault's point of view, we can identify their main themes as "sovereignty" in leprosy, "disciplinary authority" in the plague, and "governmentality" in COVID-19 and smallpox.<sup>3</sup> However, it would be a mistake to think that governmentality is reflected in life through vaccination alone. Far from it, the concept of risk, which is widely used in the medical literature, is also a part of this process.

## RISK

Describing any deviation of the human body from its "normal" functioning as "sickness," the medical institution has

throughout history aimed to repair the body's deviant function and restore it to its original state. But is it still pursuing this goal?

It would be appropriate to consider the patenting of Viagra® in 1996 as a guiding example here. Up until that date, treatment was limited to restoring existing or accepted dysfunctions to normal functioning. But sildenafil changed the nature of the phallic manifestation of masculine power on the basis of "much more" than normal and "many more times" than normal. With Viagra®, it was now possible to go beyond the old "normal" functioning, go beyond the previously defined normal limit, and "upgrade" the function to the next level.<sup>4</sup>

Indeed, sildenafil has taken the concept of "maximization," denoted by the "more" of capitalism, directly into the field of medicine. Viagra® has proven that the performance of the creature known as a human being does not have to be confined to existing norms but can be "enhanced."<sup>4</sup> A similar masculine process had already taken place in the field of plastic and reconstructive surgery. Body parts such as the nose, breast, forehead, hips, and abdomen, which had long been accepted as "ugly" and "unacceptable" in accordance with the patriarchal beauty norms of the day, were cut and pruned to conform to the valid norms, and the bodily form was recreated, so to speak, made acceptable, and "upgraded." What is more, the fact that this "upgrade" procedure was almost always performed on women's bodies as a result of the patriarchal world showed that the reason for this aesthetic madness was the result of internalized necessities rather than personal "free choices."

Undoubtedly, this level of skill achieved by the medical institution has made it possible to beat many diseases. As such, we must consider the subject beyond the absolute concepts of "good" or "bad." Risk medicine not only eliminates disease but also upgrades the human body by eliminating the risks it carries that lead to disease and promises mankind a life where cheating old age and death is an achievable goal. Under this approach, nano- and biotechnologies that will minimize or even eliminate risks, in particular *Big Data* and artificial intelligence, are included in the medical field as elements that can maximize human performance with the objective of "human enhancement."

## GENOMICS

When we consider the history of medicine, we can see that almost every new development and innovative step is based on a very legitimate and indisputable justification valid at that moment, but the step taken afterward is quickly expanded and stretched. One does not need a crystal ball to predict that we will see the same thing happen in the field of risk medicine. To illustrate, the CCR5 gene can be considered a current example in the prevention of AIDS, one of the leading health problems of our age.

The presence of the CCR5 gene in a mutant state in some people can prevent that person from getting AIDS by not allowing HIV to enter the cell. In which case, should we artificially mutate the CCR5 gene, a risk factor for AIDS, from its natural state and tamper with the human genome in this context or not?

**Box: Genome Editing and CRISPR-Cas9 Technology**

Genome editing is the technology that allows an organism to alter its DNA. There are multiple such technologies. The one that delivers faster, cheaper, and more accurate results than other methods is the recently developed CRISPR-Cas9 system. In this method, “Guide RNA” is created to be attached to a specifically targeted part of the DNA. The resulting RNA binds to the Cas9 enzyme, and the enzyme cuts the DNA from the desired location. It is then tampered with by adding, deleting, or replacing the cut piece.

The story of the babies named Lulu and Nana, who were brought into the world by Dr. He Jiankui using Clustered Regularly Interspaced Short Palindromic Repeats/Cas9 (CRISPR-Cas9) technology to justify HIV, effectively answered this question. However, Jiankui’s research and the fate of the babies he used as subjects have not been published in any academic scientific journals to date, and Jiankui has been imprisoned and fined for his unethical experiment on humans. But this should not prevent us from discussing how the CRISPR-Cas9 technique, which regulates base pairs and DNA fragments in cells and living organisms, shows its potential within the scope of risk medicine—indeed, it has not prevented this.

Dizzying developments are taking place in genomics today. To begin with, medicine and science have gained a lot of momentum in this field. For example, a complete sequence of the human genome can now be obtained in 24 hours.<sup>5</sup> In addition, CRISPR technology has made it possible in the last decade to form gene knockouts, create knockout mice and animals, and perform genetic screening and multiplex editing. The applications of this technology in medicine and agriculture will shape our future. Achieving an FDA-approved drug for the treatment of sickle cell anemia, producing CRISPR-based treatment options, administering CRISPR cell therapies, and changing the nature of food and animals will be commonplace developments over the next decade.<sup>5</sup>

Furthermore, CRISPR technology will also give us the means to eliminate the genetic risk factors behind many diseases, particularly cardiovascular diseases, the leading cause of death. But at the same time, when this technology meets Viagra®’s idea of not being confined to bodily limits but enhanced and upgraded on the basis of “more,” it promises/will promise mankind a superhuman age. But we have to foresee that this superhuman age will also be an age of “positive” eugenics based on personal choice in line with the “from chance to choice” approach, and that aims to enhance rather than weed out.<sup>4</sup> In other words, the change in the field of medicine means neglecting and ignoring the principle of “first, do no harm,” which meant letting nature take its course in 400 BC and transitioning to a process in which man completely dominates evolution and fully creates man just as the transhumanist movement intends, instead of chance-based selection.

**Box: Transhumanism**

It is a cultural movement that aims to leverage technology and science to increase human physical and cognitive abilities, eliminate undesirable conditions such as old age, disease, and death, and improve on the basic characteristics of human beings. This movement advocates and supports the use of advanced technologies such as nanotechnology, gene cloning,

and artificial intelligence on humans to achieve its goals. One situation desired in transhumanism is to encode the human body and mind and replace them when necessary with new/artificial organs prepared using advanced technology. This is because transhumanists think that in the wake of such interventions, humanity will emerge from childhood and enter the posthuman age.

**Specialized Risks**

The concept of risk will play a key role in shaping a transhuman world that aims to perfect human beings in the coming decades because the use of the concept of risk, which originates from the French word *risque*, meaning “damage insured in maritime trade,”<sup>6</sup> has a quite different meaning in medicine from its original use.

In medicine, the concept of risk almost always corresponds to a quantitative acceptance that can be reduced or changed by a number of individual measures. In the words of François Ewald, “Nothing is a risk in itself, there is no risk in reality. But on the other hand, everything can be a risk; it all depends on how someone analyzes the danger, considers the event.”<sup>7</sup> Yet, despite this reality, almost everything in the medical literature is placed spontaneously into the “risk concept” basket. For example, smoking, physical inactivity, poor diet, and air pollution will trigger inflammation and aging; this triggering will lead to cardiovascular diseases with chronic obstructive pulmonary disease (COPD) in various pathophysiological ways; COPD, heart failure, atrial fibrillation, diabetes, pulmonary hypertension, and ischemic heart disease will each turn into a risk factor for the other, and all these risks can be reduced with “triple (inhaler) treatment...”<sup>8</sup>

One of the key problems with the risk concept approach is that it increases dependence on specialties and experts. There is no need to be an expert on the health-disrupting effects of risks such as war-conflict, unemployment, poverty, and poor housing conditions. These risks are the knowledge that common sense imparts to everyone. However, common sense falls short when it comes to assessing the malignancy risk of a nodule detected in the lung. These risks require the personal opinions that only experts can provide and the percentage probability results calculated by the smart application programs developed in recent years. However, it is interesting that, contrary to the socially accepted risks that common sense shows to almost everyone, the risks requiring expertise are prioritized more in health, and health services are given depth by taking these “specialized risks” into account. Undoubtedly, the main factor underlying this strange paradox is the marketization of health services and the fact that risks exceeding common sense have created a field of commercial gain as a result of physician visits and the use of advanced technology. Clearly, the higher the risk in the shaped health market, the higher the commercial return.

**Smoking and New Risks**

The Framingham Heart Study began in 1948 and became a milestone in the history of medicine by proving the existence of a relationship between smoking and coronary heart disease in 1959. However, this research has been criticized in recent years in terms of the risks it predicts. The most important criticism in this context is that “smoking” is investigated as

a risk in this research, but cigarette advertisements and taxes were not investigated as a possible risk factor. Considering that advertising and taxes have a significant effect on tobacco product use, this criticism is not without reason.

However, the Framingham Heart Study addressed risks on a personal level as opposed to a societal and structural basis, such as advertising and taxation. At the time of the study, physicians were mostly working in consulting rooms, and the researchers wanted to monitor the factors that could be applied in the consulting room, were directed at the individual, and were quantitative, were easily measured, and were clinically observed to ensure the physicians did not object to the study but were involved in it.<sup>9</sup> Besides, the main goal of the team conducting the research was to help propagate the doctrine of “preventive medicine” applied in the consulting rooms as opposed to infrastructure improvements or free treatment for tuberculosis.<sup>9</sup> When the basis, structure, and ideology are all couched within this framework, it is not surprising that the research targeted individuals smoking and not advertisements or taxes. In fact, this approach not only shows that the medical institution deals with health and disease on a personal basis, but it also validates the finding that risk is shaped by how the danger is analyzed, as Ewald said.

It should be emphasized that the Framingham study has been trying to determine the genome sequence of the participants since 2017 and identify very likely new risks based on these sequences. Ulrich Beck defined the concept of “risk society.” His emphasis saying “... power problem is actually a problem of definition. It is the question of who, with what legal and intellectual resources, gets to decide what counts as a ‘risk,’ what counts as a ‘cause,’ and what counts as a ‘price’”<sup>10</sup> stands out in terms of identified risks and perceptions of medicine, shaped according to these risks.

### Predictive, Preventive, Personalized, and Participatory Medicine

The medical institution today collects data from the respiratory, nasal, and systemic (blood, urine, and skin) areas using sputum, imagery, and bronchoscopy to reveal the risks of the diseases it chooses as the subject of research on the respiratory system. It attempts to describe the markers and omic deviations that predetermine the development of diseases from these data and tries to form “treatable targets” for these risk areas it detects.

In other words, the medical institution aims to identify not the disease but the risks that lead to the disease and to treat these risks on a personal basis before the disease develops, using the predictive, preventive, personalized, and participatory (P4) medical approach and by including machine learning in the process today. This is because the P4 approach mainly takes risks on an individual basis and proposes a personal treatment policy to counter the risks it detects.<sup>11</sup>

#### Box: P4 Medicine

It is a medical approach that aims to develop appropriate approaches and treatments for each person’s biological, cellular, and physiological makeup. It aims to predict the disease or change by analyzing very different data with its “predictive”

feature; to prevent the pre-disease period or change with the “preventive” aspect; to provide personalized health services specific to each individual with its “personalized” approach; and to take responsibility and make decisions about the individual’s/patient’s own health/disease with its “participatory” philosophy.

P4 medicine rightly criticizes today’s medical approach as a reactive, organ-disease-centered, and symptom-oriented treatment approach and proposes a new medical practice that pays attention to the pre-disease period when symptoms have not developed by leveraging the means offered by *Big Data* and omic technologies instead, that pays attention to the pre-disease period when the symptoms have not manifested, that aims to apply proactive and preventive “treatment/upgrades” to counter the individual risks detected at this time, and that advocates a person-centered, needs-oriented, and biologically variable life-long personal health regime.<sup>12</sup>

#### Box: Big Data

It is the name given to the meaningful and processable form of data obtained from observation, research, search engines, blogs, forums, social media, network logs, photos, videos, log files, bank accounts, sensors, devices, and other sources. It is distinctive in that it contains much more volume compared to previous data, acquires these data much faster, and includes very broad diversity. This informatics field enables the systematic extraction of information by analyzing the collected data.

#### Box: Omic

Using different technologies, it aims to investigate molecules, the relationships between different molecules, and the effects of the cell to comprehensively analyze biological systems. If these studies examine genomes, they are called genomics; if they examine protein sequences, they are called proteomics; if they examine small metabolic molecules, they are called metabolomics; and if they examine mRNA transcripts, they are called transcriptomics. The study of cells, tissues, or organisms through omic technology creates system biology.

Clearly, this new medical approach, which prioritizes risk and aims to treat the detected risks before the disease develops, will deepen and diversify the health market in the context of “preventive medicine.” Although the level of evidence is still very low, we can include laboratory-based tests that are rapidly entering the market, advanced technological imaging applied during screening, and some interferon examinations described as risk factors for COVID-19 in the recent epidemic, as well as glutathione or ozone-like treatments that are claimed to reduce possible risks.

Another important problem with the risk medicine approach is that it regards exposure to tobacco smoke, air pollution, etc. as the inevitable result of the human civilization we live in and does not question their existence. Risk medicine deals with the pathophysiology caused by an individual’s exposure to tobacco smoke or particulate matter and the risk targets that will change the possible outcome in these pathophysiological pathways. Its radar of investigation and interest does not cover government incentives for the tobacco industry or the air pollution caused by incentivized industrialization,

unless they lead to individual consequences. Risk medicine deals with how people can protect and treat themselves physically on the individual plane and *upgrade* themselves against such “inevitable” risks of modernity. In this context, Ulrich Beck’s concept of “being poisoned to the extent tolerated” adequately describes this approach by risk medicine, which ignores the social and systemic reasons behind risk.

A key problem that risk medicine has in terms of the future is the policies it proposes and will propose to control the problems it defines as risks. Undoubtedly, these individual treatments/upgrades it will recommend will primarily apply to the socioeconomically advantaged segments of society, wage-wise. Yet, the segments that neoliberalism has left unprotected are predominantly the socioeconomically disadvantaged groups that are trying to survive with real risks. Furthermore, these treatment/upgrade approaches, intended to reduce personal risks, will (or have already) easily meet up with the idea of Lula and Nana’s genetically modified babies based on the performance-enhancing doctrine of Viagra® treatment soon (or covertly today). However, the intention of such a meeting this time will not be to create a protective shield against HIV; on the contrary, the meeting will take the shape of designing a perfect superhuman body to increase the performance of the yet unborn child, make it more intelligent, give it perfect vision, or reduce the risks of chronic disease and prevent omic deviations in the context of risk mitigation. Undoubtedly, such an “upgrade” intervention means that human society, which still has a socioeconomic hierarchy and is classified as sociocultural, will evolve into a hierarchical class structure and stratification based on biology with the creation of the superhuman body in the coming decades.

### End of the Word

To be frank, neither a human’s given body nor the practice of medicine itself is sacred. Moreover, regardless of whether this is expressed openly or secretly, the practice of medicine has been developed from the very beginning to correct and repair the body made by nature and the flaws it creates, making it an inherent act of human praxis and culture. It is a reasonable, expected, and even desired goal for this act to change in line with the knowledge, experience, and skills of the time. This is why one must not oppose omic technology, *Big Data*, and nano/biotechnology by falling into the trap of bioconservatism. Furthermore, just as in every period of history, medical practice is not free of micro- and macro-power structures. Therefore, the notion that the technology developed by being caught in the trap of solutionism will automatically bring about solutions to health problems or that it will create a better world for everyone is incorrect. On the contrary, a risk medicine approach developed on the basis of a neoliberal ideology that sacrifices everything and every value on the altar of price, success, winning, surviving, not falling, and maximizing profit–benefit and that ignores the social determinants of health could ultimately create hell regardless of its intentions.

Given this point of view, the aim of this article is not to argue that omic technology, risk reduction, and genetic interventions are wrong and that they should be abandoned. On the contrary, this article argues that these developments in the field of medicine and science should not be considered as being free

from the patriarchal capitalist system and the power relations of the medical institution, including medicine, as in the dominant medical literature, and that we must describe the necessary control mechanisms on both the personal and social planes without becoming infatuated with technology and progress in a world rushing headlong into a superhuman society.

Finally, as the author of this article has tried to do, although pondering and questioning one’s own praxis in the practice of medicine is valuable, it is not enough. On the contrary, knowing that the concepts of health and disease are constructs directly related to social and societal processes, we must socialize the issue and include all segments of society in common thinking and decision-making mechanisms, ultimately ensuring that future medical doctrine is grounded in a world of ethics, rules, and laws that will not be trapped within the borders of the nation-state.

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### REFERENCES

1. Jones DS, Podolsky SH, Greene JA. The burden of disease and the changing task of medicine. *N Engl J Med*. 2012;366(25):2333-2338. [CrossRef]
2. Gürsoy Taner Ş. Edwin Chadwick. *Toplum Hekim*. 2006;21(4):262-270.
3. Keskin F. Salgın hastalık ve iktidar. Türk Tabipleri Birliği COVID-19 Pandemisi 6. Ay Değerlendirme Raporu [Accessed: 04.04.2023]. *Türk Tabipleri Birliği*. Available at: [https://www.ttb.org.tr/kutuphane/covid19-rapor\\_6/covid19-rapor\\_6\\_Part75.pdf](https://www.ttb.org.tr/kutuphane/covid19-rapor_6/covid19-rapor_6_Part75.pdf); September 17, 2020.
4. Ferry L. Transhümanist Devrim. Türkiye İş Bankası Kültür Yayınları; 1st edition, January 2023, İstanbul.
5. Wang JY, Doudna JA. CRISPR technology: a decade of genome editing is only the beginning. *Science*. 2023;379(6629):eadd8643. [CrossRef]
6. Available at: <https://www.nisanyansozluk.com/kelime/risk> (Accessed: 04.04.2023)
7. Ewald F. Insurance and risk. Available at: [https://lhc.ucsd.edu/cogn\\_150/Readings/ewald/ewald.pdf](https://lhc.ucsd.edu/cogn_150/Readings/ewald/ewald.pdf). *The Foucault Effect: Studies in Governmentality*. The University of Chicago Press; 1991 (Accessed: 04.04.2023)
8. Solidoro P, Albera C, Ribolla F, Bellocchia M, Brussino L, Patrucco F. Triple therapy in COPD: can we welcome the reduction in cardiovascular risk and mortality? *Front Med (Lausanne)*. 2022;9:816843. [CrossRef]
9. Aronowitz R. Risk Tıbbi. *Koç Üniversitesi Yayınları*, September 2019. İstanbul.
10. Beck U. Sağa Karşı: Hayek ve Liverter Kelime Dağarcığı. *Sosyal Bilimler*. Available at: <https://www.sosyalbilimler.org/wp-content/uploads/2021/10/Ulrich-Beck-Korku-ve-Risk-Toplumu.pdf> (Accessed: 04.04.2023)
11. Wouters EFM, Wouters BBREF, Augustin IML, Houben-Wilke S, Vanfleteren LEGW, Franssen FME. Personalised pulmonary rehabilitation in COPD. *Eur Respir Rev*. 2018;27(147):170125. [CrossRef]
12. Sagner M, McNeil A, Puska P, et al. The P4 health specturum – a predictive, preventive, personalized and participatory continuum for promoting healthspan. *Prog Cardiovasc Dis*. 2017;59(5):506-521. [CrossRef]