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Ethics and factors of humanization of modern neurosurgery

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Abstract. This study presents a brief excursion into the history of the question of ethics and morality in neurosurgery. The current contradictory situation is analyzed: a technological "explosion" in relation to methods of diagnosis and treatment of diseases of the nervous system and a crisis of medical ethics. The most important factors in the humanization of neurosurgery are highlighted: the approach to the criteria for an ideal method of diagnosis, treatment of previously surgically inaccessible lesions, the carrying out of minimally invasive procedures, the transition from neurodestruction to neurostimulation and neuromodulation, the development of reconstructive operations, adequate anesthesia, intraoperative neuromonitoring and the possibility of prolonged monitoring of vital functions.

The main problems of dehumanization of neurosurgery are emphasized: estrangement (distancing) of the doctor from the patient, the possibility of adverse changes in the psyche as a result of neurosurgical intervention, increasing iatrogenic neurosurgical pathology, the high and growing cost of neurosurgical evaluation and treatment, and other problems. Contradictions in modern neurosurgery are noted. Particular attention is given to conflict of interest and conflict of obligations related to the commercialization of modern neurosurgery and their possible solutions, as well as mistakes caused by unwarranted surgery. The authors believe that the prioritizing of human values in all stages of neurosurgical education, training and work can prevent the dehumanization of neurosurgery in the era of high technology. The main condition for the humanization of neurosurgery is formulated: neurosurgeons must not only be *homo sapiens*, but also *homo moralis*.

Keywords: Medical ethics, deontology, neurosurgery, humanism, a conflict of interest

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From Deontology to Bioethics

Ethics is the field of philosophy, which studies morality, one of the most important elements of human existence [1]. Since the term "ethics" ideologized in the Soviet period, the famous surgeon and oncologist Nikolai Petrov introduced the concept of "surgical deontology" in 1938, which included the "rational allocation of rights and responsibilities to surgical workers", the safety of patients' psyche, individualized diagnosis, the recognition and discussion of errors, and the presence of work experience relevant to training a surgeon [2, p. 6]. "Medical deontology" was called "the study of principals of behavior for medical staff... for maximal social benefit and maximal elimination of harmful consequences of inferior medical work" [2, p. 7]. In the late Soviet period the concept of medical deontology was popularized in the hope that the relatively low rate of pay for medical workers would be compensated by development of high moral qualities. By a resolution of the Presidium of the High Legislative Chamber of the USSR, the text "Oaths of a Soviet Doctor" [3,4] was adopted. In the same period, as "a part of the discussion", the article "Problems of Medical Ethics and Deontology in Neurosurgery" [5] by the famous neurosurgeon Isaak Babchin appeared in the journal "Questions of Neurosurgery". Unfortunately, no further discussion of the issue followed the article's publication[1]. More than

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[1] This article does not use any clinical examples, and seems to be simply an assortment of broad statements and ideological clichés (for example, "Engendering in Soviet neurosurgeons authentic medical ethics and deontology should begin with communist teachings medical universities, especially during introductory neurosurgery courses" [5, p. 5].

thirty years went by before another article about general questions of neurosurgical ethics appeared in that journal [6]. And once again, the reader was faced with an assortment of clichés. The only significant difference between the two articles is that the term "communist morality" was replaced by the term "universal human morality". The author notes that, "the suggested positions on ethical norms guiding professional behavior are relevant to all medical workers, but particularly to neurosurgeons" [6, p. 40][2]. There is a very curious section called "Patient Gratitude" which says, "The moral law that dictates repayment of kindness with kindness is one of the principles of fairness that governs human relationships, and this motivates the gratitude of a patient, who has received a doctor's help. Neurosurgeons and other medical workers have a right to a patient's gratitude, if it is expressed in a civilized manner and if it does not interfere with any higher principles (humanism, honesty) or laws" [6, p. 42]. Then, according to the claims of the author of the article, wouldn't the doctor have a moral right to interact with the sick or their relatives like they were material goods, to receive an inheritance from them, to create a trust fund? And what does this all have to do with neurosurgery? This excerpt is essentially taken word-for-word (unfortunately, without any citation indicating the original source) from the previously published work of one of the co-authors [7]. The only difference in this quote is that the word "neurologist" is used instead of the word "neurosurgeon".

The term "neuroethics" has appeared in the past ten years. The goal of neuroethics is the development and practice of ethical standards in neurology, neurosurgery, and psychiatry. Thus, the World Federation of Neurology (WFN) created a committee on neuroethics, and the World Federation of Neurological Surgeons (WFNS) published "Statement of Ethics in Neurosurgery" [8][3].

It is to be expected that the work of a modern surgeon should be founded on three main principles: humanism, clinicalism, and technicism, which are very much interrelated [9]. This demands a high level of professionalism from specialists. However, these days, during a neurosurgeon's training, as a rule, the clinical and technical aspects dominate, and humanistic principals are given little attention.

Those in the field of neurosurgery focus their attention on the technological explosion of methods of diagnosis and treatment of a dysfunctional nervous system, but, on the other hand, the ethical component of doctoring is in a grave crisis. It is really ethics that give a "human face" to neurosurgery in general and to each neurosurgeon individually.

The term "ethics" is very commonly used now, however this is dangerous because it is often used without any effort to grasp what it actually means. To many people, especially those in the field of surgery, ethics may seem unnecessary. On the other hand, since Hippocrates's time, medical ethics have encompassed the humanity, duty, and love for one's profession, without which true medical treatment would be impossible.

Ethics in neurosurgery, as in any medical discipline, have existed from the very beginning. However, for a long time ethical principles have not been regulated. They have been shaped by religious and societal morals, and by the evolution of medicine. The evolution of civilization, the implementation of advanced technologies in neurosurgery and, as a result, new diagnostic, medicinal, and therapeutic possibilities demand the regulation of the ethical components of medicine.

In the last decade, ethics has undergone substantial change, above all due to the heightened observation of human rights and the increase of medical situations, in which moral factors play a significant role.

The generally accepted approach to the analysis of ethical problems in medicine has become the unification of four principles (the "Georgetown Mantra"): autonomy of the patient, beneficence, nonmaleficence, and justice.

Autonomy of the patient includes their right to make choices and decisions, and to be responsible for their conduct in relation to their own health. A doctor must respect the patient's

[2] Especially, it is claimed that "during their treatment, giving any patient privileges, which are not related to their treatment is non-permissible and amoral" [6, p. 41]. But then, how would private clinics or wards of a higher quality be allowed within the confines of this rule?

[3] A detailed analysis of "Statement of Ethics in Neurosurgery" is not relevant to the discussion in this article, which is the analysis of factors of humanization and dehumanization in neurosurgery.

right to any consideration or action connected to the disease and must present them with honest information about the disease. This is the so-called informational agreement. Those patients mentally capable of making their own decisions can agree to or decline from a treatment or operation, independent of the consequences of this decision.

If a patient is mentally capable, then they themselves should gauge the benefit or harm of a treatment. In neurosurgery, the help of a doctor ("benificience") always has the possibility to cause harm, as the intrusion into a brain not only risks causing an additional neurological deficit, but can also the change the individual's personality.

Patients have a right to fair treatment. There should be absolutely no discrimination, regardless of any difference in social or economic rank between the doctor and the patient. Nevertheless, this stipulation is often not recognized. A clinical attitude to patients as a suffering individual should counter the technological considerations, which do not focus on the individuality of the carrier of the malady.

Along with the ever-present ethical questions in modern neurosurgery, there have emerged newer ones, like the diagnosis of brain death and transplantation of organs and tissue, a persistent vegetative state, active and passive euthanasia, neurotransplantation, clinical trials for new products and methods of diagnosis and treatment, and cloning [12].

Factors of Humanization in Neurosurgery

Modern neurosurgery has been enriched by its humanizing factors, which include:

1) a diagnosis that fulfills, as closely as possible, the criteria of an ideal method: ridding of the disease, no blood, safety, and the prompt imaging of the brain and spinal cord (a diagnosis that requires the suffering of the patient is almost never done in modern times);

2) successful surgery on previously inaccessible regions of the brain (tumors, aneurisms, hematomas, the brain stem, the third ventricle, the epiphysis, the thalamus, etc.);

3) the substitution of palliative operations with radical ones (involving tumors at the base of the skull, the cranial orbit, the cerebrospinal axis, deep arteriovenous malformation, large aneurisms, etc.);

4) the popularization of conservative operations (instead of traumatic trephination of the skull, the use of minimally invasive, endoscopic, endovascular, stereotactic intervention, etc.);

5) the targeting and reduction of the impact on the tissue and vessels of the brain (with the help of operational microscopes and microsurgical technology, guiding systems, intraoperative monitoring, fluorescence, lasers, ultrasonic suction, "implantation of electrodes", etc.);

6) the switch from destructive impact to stimulating and modulating effects;

7) the broadening of possibilities for non-surgical treatment of discrete lesions of the central nervous system (gamma knives and cyber knives for primary and metastatic tumors, arteriovenous malformations, radiation treatment (for germinomas of the pineal gland), targeted chemotherapy (for lymphomas), parlodel (for prolactinomas of the pituitary gland), monoclonal immunotherapy (for metastasis of melanomas), and conservative treatments (for discrete crush injuries and intracerebral hematomas), etc.);

8) the development of reconstructive and cosmetic neurosurgery (for congenital anomalies of the skull and vertebra, the brain and spinal chord, and acquired defects of the bones of the skull and vertebra, etc.);

9) adequate anesthesia and the capability for effective control of functions necessary for life;

10) new knowledge about the structure and function of the nervous system, the pathogenesis and sanogenesis of diseases of the nervous system, the discovery of new ways to prevent and treat of various ailments and traumas of the CNS;

11) new technological apparatuses and worthy social conditions so that the patient can live a full life within their family and society which widen the concept of "quality of life" from survivability to survivability without disability;

12) the opening of rehabilitative centers and hospices.

Factors of Dehumanization in Neurosurgery

Problems of dehumanization in neurosurgery surface along with the above factors, but in some ways, ironically, humanize neurosurgery:

1) the distancing of the doctor from the patient[4];

2) the possibility of unwanted changes in the mind of the individual patient as a result of neurosurgical interference and related unpredictable consequences;

3) possible contribution to a genetic catastrophe[5];

4) the increase in neurological pathologies[6];

5) the high and ever increasing cost of neurosurgical examination and treatment. Economic factors prevent universal humanization of neurosurgery;

6) breaching of the doctor's ethical code.

Neurosurgery has become so advanced that the discussion of the problem of humanization with a consideration for neurosurgery-specific issues has become especially important. Neurosurgery, as opposed to other medical fields, involves immediate contact with the physical material that makes up an individual, the brain, and penetration into the brain requires well-intentioned actions with beneficial aims. However, while this penetration involves the possibility of a cure, there is also the possibility of changing the personal characteristics of an individual. Therefore, when is surgery permissible and when is it not from the position of humanization?

A patient's identity is not reduced to their sickness. Human psychology suggests that every person is unique in their life goals and thoughts. In every person there are not only biological elements, but mental and spiritual ones as well. A person is at any one time the person they are in the present moment, as well as who they strive to be. A person is an active, creative being, who is free to react to exterior situations however they choose. A rational person is responsible for his or her own life and for the decisions made.

For decades, medical science has mainly focused on the study of objectivizing symptoms and characteristics of diseases. There have been great strides forward in this area of study, including the ability to map the pathology of a living patient through noninvasive procedures. However, the study of the human psyche has been put to the side. Thus, the patient has been divided into two parts: the carrier of a disease, which is given more attention, and the individual, which is of little interest to science. From this perspective, the perception of a patient as an individual is no longer dominant. Thus, for example, a neurosurgeon would see a brain tumor, and it would be clear to them that it would need to be removed, but the doctor does not necessarily think about the actual person who is the carrier of the tumor, his or her perceptions of the disease, goals, purpose in life, etc. Success with modern science and technology influences not only the individual patient, but also the individual doctor. It is especially tragic that given the increase of neurosurgical possibilities, and in medicine in general, there is also a devaluation of the life of the individual. This attitude is able to engender despair and lead to a crisis for the patient. This presents a problem that needs deep restructuring, where both a change in ethical values and an establishment of new connections between humanism and morality need to be made. The graveness of the situation is heightened by the worldwide development of transplantology and the opportunity of receiving various organs from mainly neurological patients.

Contradictions in Modern Neurosurgery

We have highlighted a series of contradictions in modern neurosurgery: clinical, technological, ethical, legal, and economical. Among these is a redundancy of information, essentially a chaotic mess of facts, and superficial clinical ways of thought that have led to doctors' incompetence.

[4] The almost unlimited technological possibilities in neurosurgery may eclipse a more rational and humane solution for some particular patients. The patient loses so much necessary human contact with the doctor, and they will, naturally trust a human doctor more than a soulless machine. The syndrome of separation of the doctor from the patient causes their relationship of reciprocity to cease. Often in this situation the knowledgeable and understanding doctor is replaced by a nurse, a caretaker, a roommate in the hospital, acquaintances, etc., or the patient will begin to blindly believe only what the instruments tell him, attempting to understand something that is not entirely easy to comprehend for them.

[5] Saving the life of a neurological patient with any genetic pathology who is a child or of the age when able to reproduce can be fraught with the danger of obstruction of the genetic pool, but a genetic catastrophe is even harder to reverse, than an ecological (antiaristogenics).

[6] For example, defects in the skull, deterministic by wrongful widely used resection trephination instead of osteoplastic.

The results of this are hypoxilia (the lack of clinical experience), an almost fetishization of "graphs" and "figures", and the ignoring of medical history and clinical data. Given the abundance of refined methods and technology in the field, there is still a lack of generalizing theories and concepts. Iatrogenic pathologies are increasing with the use of uncontrolled radical operations. The blind following of the recommendations of "trusted" doctors is often not the optimal treatment for an individual patient. Also, commercial interests often inappropriately influence the duties of a doctor.

The hope of saving a neurological patient at times comes into conflict with the necessity transplanting organs for other patients. We often notice that the vast amount of technological possibilities in modern medicine clashes with limited financial resources. This is even more discouraging when one realizes that many life-saving neurosurgical procedures seem pointless given the devaluation of human life as a result of wars, terrorist attacks, and epidemics.

Conflicts of Interest in the Practice of Medicine

Ethics and law differ, however they are closely related fields. The paternal attitude to a patient has gradually given way to a partner-like relationship. This democratization of the relationship between the doctor and patient came with an expense, namely that the patient is not always able to accept the "entire truth" of a situation due to their mental condition. Currently, everything appears to be more distinct, with the switch from a partner-like relationship to that of a client. Essentially, "the doctor sells a medical service and the patient buys it", and thus the field is fraught with court cases (perhaps for this reason the United States has a larger quantity of medical lawyers than doctors). Ethics should be at the foundation of every neurosurgeon's work, but we live in an unfair world, where society's morals are misguided by corruption and social discrimination. Because of this, almost all of the responsibility to follow an ethical code lies on the shoulders of the individual doctor. Is the individual able to resist the temptation of money? This question has been asked since the time of Hippocrates, who, according to Galen, refused the money that the Persian King Artaxerxes offered him so that the King could become a doctor [13].

The fact that doctors receive money from patients for consultations or operations is allowed given the modern ethics of the relationship between a doctor and patient, and does not violate moral norms. The ethical codex of Russian doctors also permits this saying, "A doctor is in the right to accept gratitude from a patient or the people close to them" (Article 4) [14][7]. However, it is one thing when a patient wishes to express gratitude to the doctor, but it is another when a doctor in a state hospital names their own price for consultations and operations (in other words, extorts). It is amoral when supposedly free medical care is a mask for extortion.

We need to develop a system that does not require a financial relationship between the doctor and the patient (where the payment for a specialist's service is facilitated by the government or by private insurance).

Essentially, ethics should not depend on economic factors, but in our society the inferiority of the economic system creates inferior ethical behavior.

Commercial temptations originate from firms, which manufacture and disperse medicine and medical equipment, which seek to maximize their sales in the Russian market. Advertisements in medical journals and newspapers, on the radio and on the television are not enough to accomplish this. The most effective tool are "agents of influence", or scholars and practicing physicians. The main way to attract them is through material offers. The firm asks a prominent specialist to lecture about the advantages of the company's drugs, instruments, or apparatuses in front of an audience of doctors at a seminar or symposium organized by the company. For this, the company gives ample compensation, finances trips abroad, sponsors publication of monographs, etc. In this manner companies "buy" the services of professionals.

All firms want doctors to recommend their product from a large list of medications that do

[7] The previously mentioned article is absent from "The Codex of Professional Ethics for Doctors of the Russian Federation", passed by the First National Congress of Doctors of the Russian Federation (Moscow, October, 5, 2012) [15].

the same things. The following is an example of how this is usually achieved. Many medications are effective in the treatment of epilepsy, however each one has its own unique qualities in clinical application, individual patient tolerance, price, etc. Treatment of epilepsy usually continues for many years, and it is difficult to switch medications during that process. Various pharmaceutical companies that sell antiepileptic drugs approach doctors to persuade them to prescribe their drug. The doctor then receives a percentage of the proceeds for every prescription they give out. The company's representatives provide a list of pharmacies, where the medicine is carried, part of a fine-tuned system is to determine who wrote the prescription. Companies that sell orthopedic products, medical polymers, adhesive compositions, instruments, etc., use the exact same method.

A doctor must act independently; he or she is required to take into account all circumstances when making a decision. These factors include not only the specifics of the disease, but also the social status of a patient. Collaboration with a company means that the doctor is materially motivated, and it forces them to neglect to care properly for the patient. The doctor's decision-making process is changed when they understand that they can prescribe a helpful prescription and earn extra money at the same time, and they will no longer consider whether a patient is able to pay for this treatment. In other words, commercial temptations begin to interfere with a doctor's ability to fulfill their duty, in which lies a conflict of interest. This is not only immoral, but also unlawful[8]. At present, there are many similar temptations, however the professional duty of a doctor is still the same: the honest, altruistic service to the patient. Only a doctor's conscience and principles may withstand the influence of money.

Desperation and Therapy

A person driven to desperation will agree to anything when it comes to saving a dear one. The ability to critically think and adequately evaluate a situation drops sharply in these circumstances. The duty of a doctor is to understand the emotional state of the patient's relatives and to try to help, using every tool available in modern medicine, not to capitalize on other's misfortune, and not to extort these people.

These days, a significant amount of expensive services of doubtful authenticity are offered, and not by mages or sorcerers. Doctors will promise anything (to make the paralyzed walk, to make the blind see, etc.) in return for generous compensation. Each doctor has their own method, each mysterious yet scientific-sounding.

In the last few years, stem cells have become the most common, fashionable, and expensive method of accumulating extra fees. The possibilities associated with stem cells are promising, but stem cell use is only starting to emerge from the research stage. However, in Russia, stem cells have long been used for curative purposes for any serious disease or trauma on a dangerously large scale. They are injected into the brain, the spinal chord, spinal fluid, blood, muscles, the abdominal cavity, under the skin, etc.[9]

Unfortunately, the commercialization of medicine has become a powerful motivation for various types of profiteering, and there is no one, universal solution for it. However, it is necessary to remember that the catamnesis and the objective discovery of any consequences of an action or a doctor or a drug is the authentic criterion of the effectiveness of a drug. The principle "Move forward, and figure the rest out later" is an invariable part of medicine.

[8] For example, knowing that there is a significant reward for this behavior, a doctor caring for a dying patient may seek to prematurely induce brain death, in order to have the opportunity to collect organs and tissues for transplantation.

[9] Sometimes a patient goes into a chronic vegetative state following traumatic brain injuries. Internal organs and the brain stem are still functional, but the cerebral cortex is inactive and consciousness is lost. Seeing the futility of neurological rehabilitator's efforts, those close to the patient begin to despair. The doctor then suggests that they can return the patient to consciousness using stem cells, but for a large sum of money. This method easily comforts those close to the patient, but as of yet, no one has observed any positive results. It heightens the reputation of the person who profits from the use of this treatment. When there is no change in the patient's condition, doctors "persuasively" explain that they acted too late to cure the patient. They do not return the money. This type of fraud is usually well protected by the law.

Misconceptions and Errors in Neurosurgery

Medical errors occur often. Because of them, it is believed that 440 thousand people die every year in the United States. Research has shown that neurological patients are informed of these mistakes 25-85% of the time [15][10]. We are used to analyzing, discussing, and classifying doctor's mistakes, and assigning punishment for them. However, a massive quantity of errors fostered by misconceptions from the field of medicine itself remains outside the purview of doctors. Doctors make these mistakes indifferently, and their culpability in the matter is small. It follows to at least investigate the established system of treatment of patients.

It is necessary to differentiate between misconception, determined by the level of a person's knowledge, and an error, connected to a widely held perception, or to general subjective opinions. The following are some concrete examples. Radical removal of chronic subdural hematomas before the existence of knowledge about their pathogenesis and sanogenesis was not a surgical error, however lamentable the results were. Today, the belief in old-fashioned stereotypes is considered a medical error. Another example, after the famously misfortunate session of two academies in 1950, Russian medicine was imperatively (and without any associated evidence!) under the control of the teachings of Ivan Pavlov, and significantly corrupted. Based on the idea of the therapeutic role of "saving by slowing down", some "scientists" decided to treat traumatic brain injury patients by putting them to sleep. Not to mention the intoxication of sedative substances, immersion into artificial sleep lead to intracranial hematomas increasing pressure on the brain. The doctor would thus relinquish the only time, in that period, when they could discover the life-threatening compression of the brain through the dynamic examination of cerebral, focal, and brain stem symptoms. As a result, sleep therapy resulted in the patient entering a comatose state and with hematomas on the brain. "Sleep therapy" for traumatic brain injury was used for years. There were dissertations defended, supporting its "effectiveness", and its opponents were driven out of the field. Can we blame a doctor for accepting "sleep therapy" back then? Of course we cannot. It was a systematic error in the field of medicine, which permeated the field of neurotraumatology.

In the 1960s and 70s, two key players in the field of neurotraumatology, one in Leningrad and one in Moscow, put into practice experimental data from foreign research on the effectiveness of removal of damaged sites of the brain [17–18] and started to recommend local operations on damaged cerebral areas. Simultaneously, another perspective on the issue was brought to light, which was the suggestion of removal of traumatized tissue in order to leave the healthy brain tissue to repair itself (in other words, the authors physically removed non-critical matter, as done in surgery of muscles, bones, and internal organs). At this time, methods of non-invasive neuroimaging did not exist, therefore any seriously ill patient with a traumatic brain injury was viewed as appropriate for skull therapy (with the recommendation of resectioning). Many suffered from this intervention, especially in the frontal cortex. Their quality of life in the future was looked on with regret by the family and psychiatrists.

Can we accuse a neurosurgeon of wrong-doing if they operated on damaged areas of the brain in this period, not knowing their exact place, size, or structure? Of course we cannot because they were simply following the recommendations of the "maestros" of surgery. This tragic error in neurotraumatology is a massive one, and was corrected thanks to the consideration of numerous facts and new neuroimaging methods, which brought clarity into the understanding of damaged sites of the brain and their dynamics. It turns out, that sanogenesis heals the majority of damage to the brain, even that of a serious nature, better than aggressive surgery. It is notable that in the pragmatic West, doctors had long rejected the use of operative intrusion in cases of brain damage.

Today, "stem cell therapy" sounds as promising as "antibiotic treatments" sounded in the 1940s, when it was entirely justifiable to believe in its positive effects, but now we see the

[10] A doctor's mistake, defined by American authors, is any error or action that causes the divergence from the optimal course of treatment. This can range from the slightest error (for example, dropping a sponge during an operation) to a grave mistake (for example, treating the wrong side of the brain). An optimal course of treatment is one where everything happens as planned.

problems it has created. What exactly stem cells could complicate is difficult to predict, and serious research and caution is necessary. However, in the meantime, especially in Russia, groundless speculation prevails on the subject (for example, there is a belief that regeneration of a dysfunctional spinal cord is possible) [19]. Without any scientific proof doctors are suggesting diffusing blood from the umbilical cord as a source for mesenchymal stem cells.

Towards the end of the twentieth century "evidence-based medicine" appeared, standing against subjective methods and supporting useful and objective methods for diagnosis and treatment. However, with it also comes the possibility for recommendations for treatment, which may be disproved in the future. One more consideration is that evidence-based medicine does not take into account individual factors for each patient. Only the doctor endowed with clinical reasoning can allow the use of medical standards and make individual recommendations for each patient.

Conclusion

There are a series of measures, in the author's opinion, which should be put in place to encourage the humanization in neurosurgery and to prevent dehumanization. The most important among these is the importance of prioritizing humanistic goals and a compassionate foundation in every stage of the education of a neurosurgeon.

It is also necessary to heighten the level of professionalism in neurosurgery. The higher the professionalism is, the more effectual the humanism will be. We must also not forget that art and literature are sources for humanization of individuals and inspire a sense of wonder and fairness in a doctor. The architecture and design of medical facilities, clothing of the staff, the design of apparatuses and tools for treatment and care for the patient, etc. play a substantial role in this. It is necessary to provide support to the patient (compensating for the expenses of treatment and rehabilitation, giving them the right to chose a doctor, etc.) and also to the neurosurgeon (giving moral and material incentives, earned for an outstanding life and work, etc.). It follows to provide an adequate model about how all players, the doctor, the patient, society, the family, should act. Additionally, it is obligatory for a neurosurgeon to think about their contribution to society (to help each patient as well as they can and to protect the patient's family and society in general). It is necessary to develop the fundamental study of neurosurgical pathologies and to encourage humanization alongside diagnosis and treatment. Finally, any advancement in neurosurgery should be viewed from the perspective of humanization (only those technologies, which help patients should be used). The possession of advanced technology and clinical ways of thinking is, undeniably, necessary for the humanization of neurosurgery, and a neurosurgeon's consciousness plays a key role in this development. This is why neurosurgeons should be not only *homo sapiens*, but *homo moralis*.

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