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TRANSHUMANISM (H+) IN ONCOLOGY, BETWEEN BENEFIT AND RISK

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Abstract

Transhumanism, as a philosophical movement with ancient origins in the Renaissance period, promotes respect for reason and science and the application of scientific and technical conquests for the benefit of man, principles which are not fundamentally different from those of humanism.

Like it or not, many of us will live to see their practical application: communication, computer science, robotics, AI (artificial intelligence), with multidisciplinary involvement.

We looked at what the current practical applications are in an oncology service and where we foresee transhumanism (H+) fitting in the future. Today, access to medical information, epidemiological data, health policy, computerised treatment prescription, robotic surgery, unprecedented development of imaging techniques are concrete evidence of practical applications in oncology.

The volume of information and the varied conditions of its application, with its specific details, the need for personalisation of treatment, the speed of technology's development and artificial intelligence is beginning to outstrip the possibility of assimilation, even for physicians with a high IQ, with an adequate memory, bent on study, so that oncology will probably be one of the fields that will benefit from the introduction of AI.

The conclusions are pro-progress, but also fatalistic. The usefulness and applicability of the new breakthroughs are useful: what doctor wouldn't want his patients to be cured? It's just that each of us is unique, or this divine uniqueness cannot be taught, especially when it comes to the empathy that the doctor displays towards the patients.

Keywords: oncology, transhumanism, robotics, technology

Transhumanism - definition, concept

Transhumanism is a school of thought based on the belief that the human species should evolve using all possible technological means, both those currently within our reach and others yet to be developed (Baldwin, 2021). Transhumanist philosophers place the lode of their thinking in antiquity, often confusing it with progress. For example, René Descartes considered human improvement one of the fruits of his scientific approach, and the Marquis de Condorcet speculated on the use of medical science to extend human lifespan.

In reality, the human species has progressed and adapted in relation to its own discoveries since the discovery of fire. The term "transhumanism" (Cordeiro, 2019) was first used by biologist Julian Huxley (brother of author Aldous Huxley) and defined transhumanism as "man remaining man, but surpassing himself by realising the new possibilities of his human nature"(Iordache, 2009). This definition differs substantially from that in common use since the 1980s.

Analysing the "Transhumanist Declaration" adopted by the WTA in 1999, we notice that it includes two formal directions of orientation. The first is related to the improvement of the human condition through applied rationale, through the development and widespread availability of technologies that will eliminate aging and greatly enhance human intellectual, physical, and psychological capabilities (Bostrom, 2005).

The second direction focuses on the study of the consequences, the potential dangers of technologies that allow us to overcome the fundamental human limitations. It also includes the study of ethical issues involved in the development and use of such technologies.

The issues are pressing as a result of the development of AI and robotization. We are facing a radicalization of transhumanism and an exponential speed of technological development. In contrast, the development of analyzes of the consequences and risks for the human species as a whole that this technology entails, has a development trend with a smoother slope. In other words, their development speed is much lower than the development of information technology. The risk of believing God could have consequences that are difficult to anticipate, such as "reprogramming" the human race, using it for military purposes, etc. Any technological advancement has been manipulated and used for destructive purposes as well! At this level of technological development, however, the risks could be disastrous for the human species, for life on earth, and even for the planet. The transhumanist movement has created controversy over the years because it has notable ethical implications. One wonders what the limit of metamorphosis is, whether this technologically mediated evolution will be accessed based on our economic capacity, or whether these improvements will foster a new social stratification, with the creation of new lower and upper classes based on a flawless genetic code?

The means to achieve transhumanist goals, such as GRIN technologies - genetic, robotic, info and nano, will eventually artificially accelerate natural evolutionary progress, taking the human body beyond its typical species structure, function, and abilities (Mirkes, 2019).

Transhumanism - impact in medicine

Transhumanism is multidisciplinary, and its basis is genetic engineering, more precisely, the polishing of the human genome, with the declared aim of giving humans (?!) a better life, a better society (without actually explaining to humanity what this means!), longevity. Genomic decryption and gene manipulation are the basis of the previous development of modern oncology. The new medicine could thus offer us the possibility of prolonging and improving the quality of life and curing a much greater number of diseases currently considered fatal. Can we imagine a world without disease or cancer?

In order to highlight the impact of the transhumanist movement in medicine, especially in oncology, we will present some epidemiological data related to this entity called cancer.

According to the Global Cancer Observatory, in 2020 statistics show an estimated 19.3 million active cases globally, of which 22.8% are in Europe. It is also estimated that by 2040 the number of active cases will increase by 10 million worldwide, 50% more than today (GLOBOCAN , 2020).

Genomics has enabled therapeutic progress in oncology, with undeniable benefit in SV (prolonged survival). Immunotherapy is a standard today in most cancers. Much of the research to date focuses on immunotherapy, which uses the body's immune system to fight cancer. We have molecular treatments targeted to the genetic defect: EGFR, HER-2, ALK, Ros-1, cMET, ras, NTRK, RET, microsatellite instability, TBM, etc. Recognition and repair of inherited genetic defects by manipulating BRCA1 and BRCA 2 and other genes involved in carcinogenesis, cancer development or those responsible for anti-tumour defence may become possible. Oncologists have welcomed scientific progress translated into increased overall survival (OS), quality of live (QoL) of their patients.

If epidemiological statistics make us somewhat worried and uncomfortable, the current development of oncology and the obtained results with the use of targeted molecular treatment and immunotherapy, the scientific advances in the field of genomics and epigenomics, prompts us to hope, to be more optimistic.

1. New technologies in oncology

There are currently ongoing clinical trials involving genome editing using CRISPR-Cas9 technology, a method that can edit virtually any DNA segment of the 3 billion letters of the human genome and is more accurate than other DNA editing tools. How could this system help in the fight against cancer? (Moore, 2022)

There are different ways to do this, such as:

- Attacking disease - some scientists have used CRISPR to supercharge the immune system's T cells. In lab tests, CRISPR researchers have edited T cells so that they recognise cancer. The edited T cells then killed the malignant cells.
- Suppression of cancer defence mechanisms. T cells should not attack normal cells. Healthy cells use certain proteins, including one called PD-1, as a signal to avoid T cells. It's like saying, "Everything is fine here. No T cells are needed." But some cancer cells have PD-1, even if they're not healthy. It's like having a fake ID that keeps T-cells at bay and lets cancer grow. In one experiment, scientists used CRISPR to turn off the gene that makes PD-1. And just like that, the T cells attacked the cancer cells.
- Slowing malignant progression. Another lab used CRISPR to change genes in cancer cells. By doing so, they slowed the rate of cancer spread. (Moore, 2022)

There are lots of different types of cancer and they are all linked to problems with the genes. So CRISPR promise, although there are no treatments or cures yet.

As gene editing becomes a more precise science, thanks to new techniques such as CRISPR-Cas9, it won't be long before they are widely used to prevent most inherited diseases.

Would people be able to actively intervene to ensure they have healthy offspring? Especially if they had the sequenced genome and knew they carried harmful genes, such as BRCA1 and BRCA2 mutations, which strongly predispose those with mutations to breast and ovarian cancer (National Cancer Institute, 2020).

2.Clinical trials

There are currently over 30,000 active oncology trials worldwide, out of a total of 93518 (ClinicalTrials.gov). Oncology trials reached historically high levels in 2021, up 56% from 2016. A record of 30 new active substances (NAS) were initially launched globally in 2021 in oncology, and a total of 159 have been launched in the last 10 years (Global Oncology Trends , 2022). Diversification of treatments, indications, side effects and the need for personalised treatment, which is increasing steeply, will create difficulties in therapeutic decision-making. We can imagine the role that AI would play in therapeutic decision, but we cannot ask ourselves how correct will be the decisions based on this software (AI)? Even if it is estimated that the "robot" error would be smaller than the human error, this software is not infallible either. This raises another question: what will be the responsibility of the one who will apply the treatment from a legal and ethical point of view?

The overall number of patients treated has increased by an average of 4% over the last five years.

AI could also be useful in sophisticated cost-effectiveness and cost-benefit analyzes of new therapeutic molecules (Global Oncology Trends, 2022).

We can therefore say that oncology is among the main areas benefiting from innovation - in terms of the level of clinical trial activity, the number of companies investing in therapies, the size of the pipeline of therapies in clinical development, new active substances being launched and the level of spending on these drugs. In 2021, during a global pandemic, cancer care continued to be delivered, although delays in treatment delivery and screening implementation raised worrying questions.

In 2021, more new cancer drugs became available for the first time than in any year in history, and many of them use immunology or precision biomarkers to transform the way patients are treated. The adoption of innovative medicines and new diagnostic techniques is improving outcomes for millions of people around the world, although broad and equitable access remains a significant challenge for healthcare stakeholders, including patients (Global Oncology Trends 2022, 2022)

3. Impact of technological development in the administration of chemotherapy

Chemotherapy is also subject to progress, from the current computerised prescription to robotic dissolution of cytostatics, to delivery and micro-robotic administration directly into the cancer cell, avoiding side effects on healthy cells.

In the field of oncology there are robotic cytostatic dilution systems, a technological concept that has been in existence worldwide for 10 years and whose notoriety has been on an upward trend over the last 5 years. Intravenous (IV) combination robots mix drugs in a self-contained system to protect staff from potential exposure to certain harmful effects of cytostatics and to improve the accuracy and efficiency of chemotherapy combination.

Robots are programmed with a drug library that includes information on how to combine common chemotherapies (Wild, 2019). They also contain highly accurate scales that weigh ingredients and automatically reject any end products that do not fall within the correct weight range. (Leventhal, 2016). Pharmacy staff must prime the system with clinical information, such as the number of doses needed and the patient's height and weight. **Error! Reference source not found.** (Yaniv & Knoer, 2013) They also need to load the system with infusion bags, syringes, and medications needed to produce chemotherapy. The robot then prepares individualized doses, in a completely sterile and closed environment, that are ready to administer.

Combination IV robots can keep an electronic record of all chemotherapies that have been prepared (Buckley, 2021). Implementation of these automated systems in oncology clinical pharmacies, requires considerable planning and trained pharmacy staff to calibrate the robots. Some pharmacies have hired automation specialists to ease the transition to automated processes.

While the technicians were also incredibly accurate, the robot consistently has a margin of error of less than 1%, taking accuracy in combining to a whole new level. (Wild, 2019). This assures patients that the therapy administered is accurate and appropriate for their indications, without error.

Chemotherapy successfully treats many forms of cancer, but they have important side effects by also acting on healthy cells. Delivering drugs directly to cancer cells could help reduce these unpleasant symptoms. Now, in a proof-of-concept study, researchers at the American Chemical Society have made fish-shaped microrobots that are guided with magnets to cancer cells, where a change in pH causes them to open their mouths and deliver their dose of chemotherapy (Chen Xin et al., 2021).

Scientists have previously created small-scale robots (smaller than 100 µm) that can manipulate tiny objects, but most cannot change shape to perform complex tasks such as delivering drugs. Some groups have made 4D-printed objects (3D-printed devices that change shape in response to certain stimuli), but they usually only perform simple actions, and their movement cannot be controlled remotely. In a step towards biomedical applications for these devices, the researchers wanted to develop shape-shifting microrobots that could be guided by magnets to specific locations to provide treatments. Because tumours exist in acidic microbes, the team decided to make the microrobots change shape in response to low pH.

So, they printed 4D microrobots in the shape of a crab, butterfly or fish using a pH-responsive hydrogel. By adjusting the print density in certain areas of the shape, such as the edges of the crab's claws or the butterfly's wings, the team encoded the pH-responsive shape transformation. Then, they made the magnetic microrobots by placing it in a suspension of iron oxide nanoparticles.

Researchers have demonstrated different capabilities of the microrobots in several tests. For example, a fish-shaped microrobot had an adjustable "mouth" that opened and closed. The team showed that it could drive the fish through simulated blood vessels to reach cancer cells in a particular region of a Petri dish. When they lowered the pH of the surrounding solution, the fish opened its mouth to release a chemotherapy drug, which killed nearby cells. While this study is a promising proof of concept, the microrobots need to be even smaller to navigate real blood vessels and a suitable imaging method must be identified to track their movements in the body, say the researchers (ACS, 2021).

4. Robotic surgery

Nowadays, robotic surgery is also increasingly being applied to locoregional cancer treatment. In the last decade robot-assisted surgical techniques, especially for solid tumours located in visceral cavities, have been developed, evaluated, approved and entered medical practice. Today, robotic-assisted surgery is performed on tumours of the lungs, prostate, oesophagus, pancreas, kidneys, intestine, cervix and other organs. The feasibility and safety of applying surgical robots have been largely proven.

When it comes to cancer treatment, robotic surgery is the ideal solution for removing hard-to-reach tumours. The da Vinci robot is considered the cutting edge of surgical technology. It gives doctors the ability to perform minimally invasive surgery with an accuracy that can't be matched by any method known to date.

Robotic surgery also reduces the risk of postoperative complications, minimizes pain and the need for pain treatment, and helps the cancer patient recover faster after surgery (Hoeppner, 2021).

5. Impact of technological development in medical imaging

Medical imaging plays an important role in both the early detection, diagnosis and long-term surveillance of cancer conditions.

This field has progressed from classical performance imaging to functional imaging and molecular imaging. The last two decades have seen the emergence of PET/CT, PET/MRI molecular imaging, which offers an added benefit in sensitivity and specificity of investigation. The use of radiotracers targeting a specific metabolic or pathogenic pathway allows accurate visualisation of lesions and allows functional analysis. In the case of PET-CT, the substance routinely used is FDG (glucose radioactively labelled with F-18, being captured in proportion to the glucose consumption of the cell, tissue, or organ). In oncology, cells are highly glucose consuming, so will be able to be visualised using this tracer (Grigore, 2021).

Imaging is making new advances every year: new techniques or contrast agents are emerging, new radiotracers are being developed, with the sole aim of refining diagnosis and providing greater accuracy in oncological pathology. Technologies are being developed that go beyond simple diagnosis to enable treatment, thus making the transition to theragnostic. (diagnosis + therapy).

6. Impact of technological development in pathological and genetic anatomy

Regarding new technologies in the field of pathological anatomy and molecular-genetic diagnosis as a basis for the diagnosis of malignant disease, we foresee the emergence of automated image interpretation in the future. We already know that in any pathological anatomical process there are two main stages: the stage of histopathological processing of tissue and the diagnostic stage, carried out by the pathologist on the basis of slides. A prototype software, built on AI algorithms, aims to automate and digitise the histopathological component of the pathological diagnosis process, with a positive impact on the analysis time required for the traditional process, by reducing it and improving the accuracy of the results (Mihăilă, 2022).

AI - pros and cons in oncology

So, we are facing with a perpetual development of oncology, but we cannot help but wonder what the pros and cons of this technological progress are.

While robots can certainly help doctors in many ways, from operations to diagnosing illnesses, a normal person in a patient's position might not trust them. We always trust human expertise more than AI. We are human beings, with emotions and feelings, and we like to be treated as such. Even if robots are more accurate than doctors in some cases, robots will most likely not replace humans any time soon, lacking empathy, emotions, with limited capabilities in interpreting them (Hoorn & Winter, 2017).

The advantages of using robots in the medical field are, as mentioned above, the following: faster diagnostic and computational methods, accuracy, lack of overwork and stress, and perhaps one of the most important advantages is that they cannot develop and transmit diseases.

At the other end of the spectrum, AI's disadvantages include high acquisition costs, time-consuming training of medical staff to learn how to use the robots, lack of empathy for patients, and the risk of errors or malfunctions in their software, impacting diagnosis and treatment delivery. It is generally accepted that A.I. would bring superior performance to human intelligence, but no one can guarantee that a software design or maintenance error, or a technical failure, is not possible. Perhaps the human mind does not accept perfection yet and these ideas have no realistic substrate, but perhaps artificial intelligence will not be perfect either, as long as it still operates with human input.

Ethical dilemmas

Technological progress should not be confused with transhumanism, with the creation of post-human and transhuman species. Any progress must be favorable to man and the development of humanity. From an ethical point of view, any new technology, (including the development of genomics (the basis of the development of oncology) should be studied through the prism of possible repercussions and side effects on man as an individual, on the human species as a whole.

The speed of technology development is outpacing the rate of evaluation and study of side effects, especially in the long term. Long-term evaluations require time, or exactly this time seems to be lacking in relation to the exponential development of technology, including technology applicable in the oncological field.

The assumption that new technologies are more accurate than human performance is justified. An example is nowadays the use of robots in oncological surgery. No technology, however, is infallible. A software can get a virus, a robot can malfunction, AI can rely on erroneous data entered into its software. Based on the assumption that robots could fail in certain situations, whose responsibility is it: the creator or the staff/surgeon who used it?

Whose responsibility will it be then? Can we punish a robot? Can we punish AI? What will happen if AI makes decisions on its own? Will they always be good? By what system of ethical values will they be judged and by whom?

Would patients trust their lives in the "hands" of a robot? Robots can be accused of lack of empathy, lack of understanding of patients' emotions. These emotions nuance the symptoms of patients in many situations in clinical practice. From this point of view, there may be deficiencies in the interpretation of symptoms, which may represent pertinent arguments against the exclusive or predominant use of AI. The increasing use of big data and artificial intelligence techniques demands a re-examination of these principles in light of the potential issues surrounding privacy, confidentiality, data ownership, informed consent, epistemology, and inequities (Balthazar et al., 2018). The assumption that their use is made exclusively according to the created purpose can be utopian regarding the conditions in which the possibilities of defending and counteracting some unwanted situations and side effects will not be known well enough.

Patients have strong opinions about these issues. According to the definition of ethical responsibility, patients have the right to be informed of their diagnoses, health status, treatment process, therapeutic success, test results, costs, health insurance share or other medical information, and any consent should be specific per purpose, be freely given, and unambiguous. We also envision a major change in the formulation of the patient's informed consent, which in this new framework acquires other dimensions. Informed consent is a process of communication between a patient and health care provider, which includes decision capacity and competency, documenting informed consent, and ethical disclosure (Code of Medical Ethics, n.d). The Hippocratic oath articulates foundational principles for how physicians interact with patients and research subjects (Balthazar et al., 2018). Concerns about this issue also increased with the rise of AI in healthcare applications. Based on the autonomy principle:

- All individuals have the right to get information and ask questions before procedures and treatments.
- Patients should be able to be aware of the treatment process, the risks of screening and imaging, data capture anomalies, programming errors, the privacy of data and access control, safeguarding a considerable quantity of the genetic information obtained through genetic testing.
- Patients may refuse treatment that the health care provider deems appropriate.
- Patients have the right to know who should be responsible when these robotic medical devices fail or errors. The answer is essential for both patient rights and the medical labor market (Farhud & Zokaei, 2021).

Technological progress does not lead to an increase in individual performance, a fact supported by studies showing IQ declines of those born in recent decades by 10 points (Lucas, 2021). This is due to the decrease in the ability to analyze and process and the decrease in the functions of the associative regions of the brain, too. This can affect all aspects of social life and all professional categories. So, will we also have doctors with poor Intelligent Quotient (IQ)? Who guarantees that the genome cannot be manipulated so that it cannot be used against humans and the human species? The impact of AI, genomic manipulation and their side effects on humans, the species and the planet remain unknown as yet!

Conclusions

We conclude that we cannot be totally opposed to progress, but also that it would be wrong to conflate technological progress with transhumanism, with the creation of posthuman or transhuman species, and these issues should be clearly delineated. We do not want progress to become for humanity a regression, an end to the evolution of humanity. Technological progress is necessary, it is created to help man. It is wrong to confuse technological progress with transhumanism, with the creation of posthuman or transhuman species, and these aspects should be clearly delineated. We do not want progress to become a setback for humanity, an end to the evolution of humanity. Technological progress is created to help man, not to destroy him!

The usefulness and applicability of new discoveries are clear, including in the field of oncology, starting from diagnosis, personalization of treatment, effective application of treatment (medical oncology, robotic surgery), imaging in oncology, cost-effectiveness and cost-benefit analyses, with the choice of the most effective treatment for the patient.

The unprecedented development of current and future oncology is based on the study of human genomics. What doctor wouldn't want his patients to heal? This is also where the main ethical dilemma resides, however. The possibility of manipulating human genomics can also be used for other purposes - the creation of the posthuman species.

The usefulness and applicability of the new findings are clear, including in the field of oncology. What doctor wouldn't want their patients to be cured? Yet there is insufficient knowledge of the side effects of AI and genomic manipulation! Insufficient time allocated to studying the risks against the exponential development of technology and insufficient time to adapt to the individual and the human species can create catastrophic effects. Looking back, no scientific breakthrough and technological development has escaped its destructive use. Nuclear bombs are the cause of global terror, for example. Who can guarantee that AI and new technologies will not be used for purposes contrary to the reason for their creation?

In such an event, what are the means by which we can defend ourselves? How could we prevent such incidents? The application of AI does not yet benefit from an ethical framework and moral guiding criteria. As if that were not enough, we are also witnessing a global overturning of the traditional moral rules that govern society. From which coordinates will we interpret what is ethical and moral in the future?

In our journey into the future we must prepare ourselves to live intensely in the present, striving to find universal bioethics, founded on resilient pillars, to ensure that all medical practices designed to improve us will respect human dignity and our moral principles (Hrişman, 2012), but at the same time there is a need to strengthen the pillars of ethics, bioethics and societal morality.

Many questions remain unanswered...

What happens if the robot malfunctions, if the software goes viral, or if the learned "emotions" are manipulated towards the opposite of the purpose for which AI was created?

Is progress real or a regression in the species to which we belong?

Playing God, without an in-depth knowledge of the laws governing the Universe, couldn't cost us? Are we not digging the grave of the species to which we belong?

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