Impacts of technological innovations on health: right to health and technology

Impactos das inovações tecnológicas na saúde: direito à saúde e tecnologia

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ABSTRACT

This article examines the impact of technological innovations on the right to health. With the rapid advance of technology, especially in the areas of telemedicine, artificial intelligence (AI) and genetics, significant opportunities and challenges arise to guarantee the fundamental right to health. Through an interdisciplinary analysis, we address the legal and ethical aspects related to the use of these technologies, considering issues such as privacy, data security, GDPR and technology in public services. We explore the role of telemedicine in healthcare delivery, the impact of AI on medical practice and patients' rights, as well as the legal and ethical implications of the use of genetics in healthcare. Based on a comprehensive literature review. Aims to analyze the effects of technological innovations on health, particularly in relation to individuals' right to health. It explores how disruptive technologies have influenced the accessibility, quality and efficiency of health services, while also assessing the ethical and legal challenges that arise from these transformations. It concludes that while technological innovations have brought substantial advances to health, it is essential to comprehensively address the ethical, legal, economic and inequality of access challenges, ensuring that such technologies benefit all sections of society. The research highlights the need for solid regulations and public policies that promote the ethical and quantitative application of technological innovations in healthcare.

Keywords: Right to health. Technological innovations. Ethical challenges.

RESUMO

Este artigo examina o impacto das inovações tecnológicas no direito à saúde. Com o rápido avanço da tecnologia, especialmente nas áreas de telemedicina, inteligência artificial (IA) e genética, surgem oportunidades e desafios significativos para garantir o direito fundamental à saúde. Através de uma análise interdisciplinas,

abordamos os aspectos legais e éticos relacionados ao uso dessas tecnologias, considerando questões como privacidade, segurança de dados, LGPD e Tecnologia em serviços públicos. Exploramos o papel da telemedicina na prestação de cuidados de saúde, o impacto da IA na prática média e nos direitos dos pacientes, bem como as implicações legais e éticas do uso da genética na saúde. Com base em uma revisão abrangente da literatura. Como objetivo analisar os efeitos das inovações tecnológicas na saúde, particularmente em relação ao direito à saúde dos indivíduos. Explora como tecnologias disruptivas têm influenciado a acessibilidade, qualidade e eficiência dos serviços de saúde, enquanto também avalia os desafios éticos e legais que surgem dessas transformações. Conclui-se que, embora as inovações tecnológicas tenham trazido avanços substanciais à saúde, é essencial enfrentar de forma abrangente os desafios éticos, legais, econômicos e de desigualdade no acesso, assegurando que tais tecnologias beneficiem todas as camadas da sociedade. A pesquisa destaca a necessidade de regulamentações sólidas e políticas públicas que promovam a aplicação ética e quantitativa das inovações tecnológicas na área da saúde.

Palavras-chave: Direito à saúde. Inovações tecnológicas. Desafios éticos.

Introduction

The role of technology in healthcare is becoming increasingly important, with significant advances in areas such as AI, telemedicine, electronic medical records, and connected medical devices. However, the implementation of these technologies brings with it several legal and ethical implications that need to be carefully analyzed.

Innovation in healthcare encompasses a set of innovative technologies and approaches aimed at preventing, diagnosing, and treating a wide range of diseases and conditions that impact society. The renewal of medicine through innovation leads to significant increases in people's well-being (FAESA, 2023). This article investigates the legal and ethical issues involved in the use of these technologies, focusing on the areas of privacy, security, and responsibility. The aim is to understand how disruptive technologies have affected access, quality, and efficiency of health services, as well as to assess the ethical and legal challenges arising from these changes. The right to health and technological innovations have emerged as a key area of interest, driven by the rapid advancement of technology in sectors such as telemedicine, artificial intelligence, and genetics. The right to health is a fundamental principle recognized globally, which ensures everyone has access to adequate and quality healthcare. The right to health is set out in the 1948 Universal Declaration of Human Rights, in article XXV. This establishes that everyone has the right to a standard of living that ensures health and well-being for themselves and their families, including food,

clothing, housing, medical care and essential social services. This implies that the right to health is intrinsically linked to the right to life, based on the principle of equality between individuals (UDHR, 1948).

The Federal Constitution of 1988, Article 196, states that "health is a right of all and a duty of the State, guaranteed through social and economic policies that aim to reduce the risk of diseases and other health problems, guaranteeing universal and equal access to actions and services for promotion, protection and recovery" (CF, 1988).

The large-scale collection, storage, and analysis of health data, for example, raises questions regarding privacy, security, and informed consent.

1 Privacy and data protection

The discussion highlights the need to identify the target of the regulation stipulated by the Data Protection Law (LGPD), examining its connection with the right to privacy and the performance of sovereign nations in containing the spread of the virus. It also highlights the absence of a legislation that safeguards privacy, preventing abuses by States and ensuring the preservation of the private sphere. Subsequently, the experiences of comparative law will be explored, as well as the way in which Brazil has approached the protection of personal data.

1.1 General Data Protection Law

The use of health technologies involves the collection, storage, and sharing of patients' personal and medical information. This section will examine the regulations relating to privacy and data protection, including the General Data Protection Law (LGPD), and analyze how they apply to the healthcare context. This section will examine concerns involving identifying sensitive data, obtaining informed consent, anonymization techniques, and security in sharing medical data. In the absence of personal data protection legislation (LGPD), it is challenging to ascertain whether information obtained from different subjects will be used for commercial discrimination purposes, as an example. Currently, data processing must be transparent to the user, who has the right to refuse sharing (ALMEIDA, 2020).

The rights protected by the LGPD ensure full protection of your freedom, privacy, security, explicit consent, access to your information, corrections, and prompt assistance if

you choose to delete your personal data. The LGPD offers guarantees of protection to all data whose holders are natural persons, regardless of whether they are in physical or digital format. Accordingly, the LGPD does not extend to data held by legal entities, which are not considered personal data under the terms of the law (LGPD, 2018).

The LGPD defines personal data broadly as information associated with an identified or identifiable natural person. In addition to the essential information typically associated with an individual, such as name, National Register of Individuals (CPF) number and residential address, personal data is also considered to be data related to an individual, covering their consumption patterns, appearance and aspects of their personality. In accordance with the LGPD, personal data can also be considered personal data used to profile the behavior of a specific individual who can be identified (LGPD, 2018).

Please clarify which cases the LGPD applies to the processing of personal data. The law applies to any operation that involves the processing of personal data and is carried out in Brazilian territory. What if the company is based abroad? If a company offers products or services to individuals in Brazil and collects user data for this purpose, the LGPD is also applicable.

The primary LGPD guidelines pertain to the principles that must be adhered to when processing personal data, including purpose, necessity, non-discrimination, and security (UFSC, 2023).

This implies that the institution must adhere to certain guidelines if it intends to employ technological methods, including in the healthcare sector.

2 Security and reliability

Healthcare technologies, such as AI and connected medical devices, must be designed and implemented securely and reliably. This section will discuss the regulatory requirements for the security of medical devices and software, as well as the challenges associated with detecting and preventing security breaches, protecting against cyberattacks, and ensuring data integrity.

> Science and technology are essential tools for improving health and treating diseases, as well as for building a civilized, peaceful, and dignified society. In this context, it is crucial to engage in a constructive debate about the terms technology and technological innovation, as they are of paramount importance for the health sector and society (Lorenzetti *et al*. 2012).

The classification of health technologies is divided into three categories:

Soft: These are relational technologies, such as those that facilitate the formation of bonds, autonomy, and empowerment. By welcoming, we mean treating the individual seeking care with kindness and providing answers to their questions or concerns. Hardware tools, such as equipment, devices, standards, and organizational structures, are also included in this category. The value of each technology is contingent upon its relationship with the problem, the user's health, and its effectiveness in addressing the health need.

The soft-hard distinction also applies to knowledge technologies, which are structured knowledge that operate in the health work process, such as medical clinics, pediatric clinics, psychoanalytic clinics, and epidemiology (Merhy, 2002).

The following scheme classifies health-related technologies into a hierarchical structure, taking into account the elements used at each level.

Figure 1 – Health care technologies.
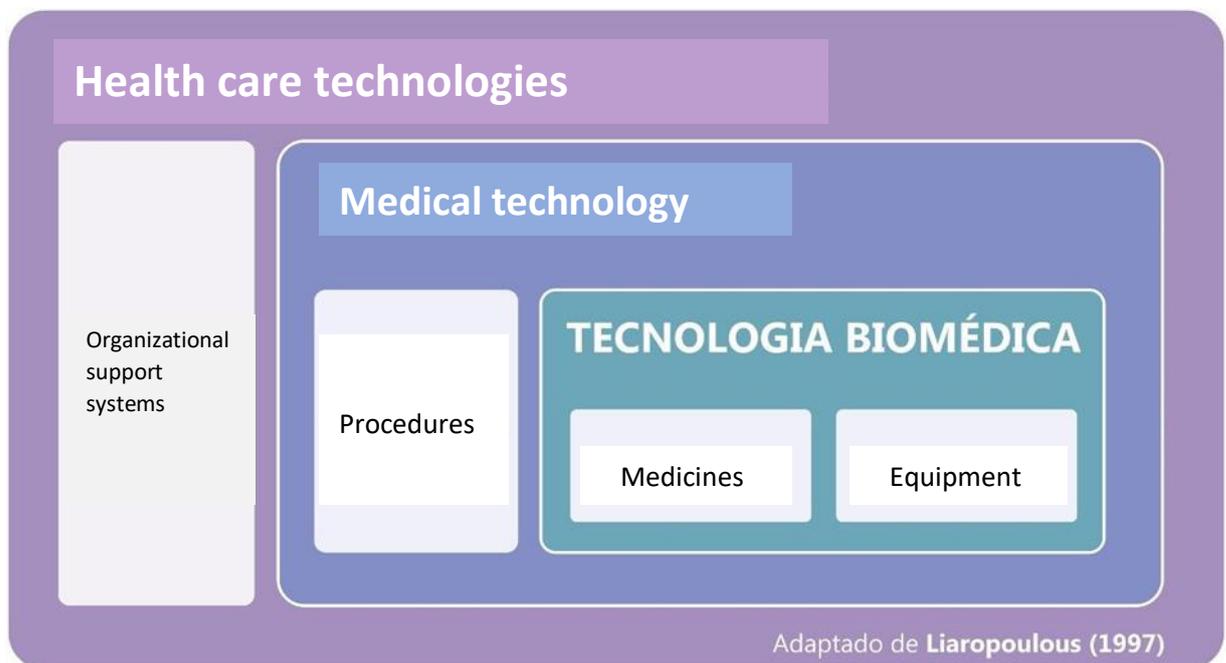
Source: SUS Collaborating Center. Adapted from Liaropoulous (1997).

When organizational support elements originate from contexts outside the health sector, such as basic sanitation, labor rights, and education, the integration of these elements constitutes health technologies. Technological innovations in healthcare are continuously

evolving and have the potential to significantly transform the way we care for our health. This summary will highlight some of the promising transformations in this field.

1. Robot Origami: Origami-shaped robots, which are highly flexible and small enough to be ingested, are being developed with the intention of performing medical tasks, such as removing objects or repairing organs within the human body.

2. Cell Cultivation in the Laboratory: The technique of bioprinting or tissue engineering is enabling the cultivation of cells to form organs and tissues in the laboratory, which could transform the field of transplants and tissue repair.

3. The Smart Life Cycle Ergometer has been developed for patients with injuries and disabilities. It allows for movement and physical activities, even for those who would otherwise be immobilized.

4. Smart Contact Lenses: Contact lenses equipped with sensors are being designed to monitor health indicators such as blood sugar levels and can even integrate with smart devices such as phones and augmented reality.

5. Digital Pills: Pills with integrated sensors can be ingested and, upon contact with gastric juice, monitor adherence to treatment, allowing data to be shared with medical professionals and health systems.

These innovations have the potential to transform the landscape of healthcare, offering more effective, personalized, and connected solutions. Nevertheless, these developments also present ethical and regulatory challenges that must be carefully considered as we enter this new technological landscape (MEDX, 2022).

A few innovations and technological advances have contributed to improvements in healthcare, encompassing areas such as examinations, treatments, and prevention. Notable among these advances is the discovery of X-rays and their pioneering application in the internal visualization of the human body by German physicist Wilhelm Conrad Röntgen in 1895 (MEDX, 2022). This pivotal discovery enabled the non-invasive study of the human body, transforming the diagnostic approach that had previously relied on exploratory surgical procedures.

The unceasing advancement of technology has led to enhancements in diagnostic procedures, culminating in the advent of contemporary CT, MRI, and other imaging techniques. Moreover, the integration of technology in the health sector has yielded benefits

such as successful transplants and the facilitation of communication through information and communication technologies (ICTs), including telemedicine platforms.

In the context of technology, it is possible to distinguish between two broad categories: "hard" and "soft" technologies. Hard technologies encompass machines, tools, robots, and telecommunications networks. These tangible elements are distinguished by their innovation, ability to improve tasks, and greater efficiency compared to traditional methods. (CONEXÂO, 2023). Conversely, although not tangible, soft technologies play a foundational role in the functioning of institutions and organizations. Such innovations are applied in business contexts, commercial activities, and services, adopting educational approaches, accounting systems, logistics, or marketing strategies as representative examples of this type of innovation.

The 7th Civil Panel of the Federal District Court of Justice ruled in favor of a decision for compensation for material and moral damages after the patient's request was denied by the Bradesco agreement.

Even though the procedure was not included in the ANS list, the patient underwent the surgery as an emergency and sought reimbursement for expenses, including the kit of supplies not covered by the health plan. The court deemed the denial to be abusive, emphasizing that the chosen technique by the health professional cannot be disregarded by the plan. Consequently, the Court of Justice of the Federal District and Territories (TJDFT) ordered Bradesco Saúde to pay R$16 thousand for material damages and R$5 thousand for moral damages.

3 Technology in public health

Health care technologies encompass a range of elements, including medicines, equipment, technical procedures, organizational, educational, and support systems, care programs and protocols. These technologies facilitate the delivery of health care and attention to the population. The study of health technologies can be approached from a historical perspective, with an emphasis on identifying the knowledge, explanations, and techniques employed in different historical periods, from the origins of humanity to the present (Lorenzetti, 2012).

According to the ANS (National Health Agency), since 2018, approximately four million individuals have chosen to abandon their health plans and have come to depend exclusively

on the SUS (Unified Health System) for their medical needs, including consultations, treatments, and surgical procedures. The number of individuals who have chosen to abandon their health plans and have come to depend exclusively on the SUS for their medical needs has increased significantly since 2018.

This transition was precipitated by an increase in unemployment and debt among the population, as well as an increase in the cost of health plans. This influx of patients has placed a significant burden on the SUS, which has had to rely on technological advances in the field of public health to meet this growing demand. Furthermore, the significant health crisis precipitated by the novel coronavirus pandemic has compounded the necessity for human resources on the front line, as well as beds, pharmaceuticals, and medical devices, including mechanical breathing apparatus.

Although the SUS is widely regarded as one of the most efficient health systems globally, its effectiveness is undermined by inadequate management and the misappropriation of resources. According to the World Health Organization (WHO), approximately 40% of healthcare spending is wasted due to administrative inefficiency, representing an amount of approximately R$164 billion annually that is not allocated to the sector.

This reality underscores the pressing need to invest in technologies designed to enhance public health, with the objective of mitigating delays in bed queues, optimizing the distribution of medicines, accelerating diagnostic processes, and numerous other benefits. In this context, some of the technologies applicable to public health include: The following technologies are applicable to public health: electronic medical records, telemedicine, management systems, applications, biometrics tools, monitoring cameras, cloud computing, and remote laboratory tests (RLTs) (CONEXA, 2022).

The healthcare scenario has undergone significant changes, especially since 2020. After approximately one year of work, the project to develop a low-cost respirator has reached its conclusive stage. The initiative was the result of a collaborative effort between the State University of Ceará (UECE), CriarCE, which is linked to the Secretariat of Science, Technology and Higher Education (SECITECE), and the Development, Strategy and Knowledge Institute (IDESCO), with the support of the Science Foundation, Technology and Innovation (CITINOVA). The device has been designated the name "Abanar," which is an allusion to a typical expression in the Ceará dialect.

The project emerged in response to the significant health crisis caused by the coronavirus pandemic that affected the entire world. The necessity for an increased supply of mechanical ventilators in intensive care units (ICU) became evident in the context of the public health challenges caused by this crisis. With the scientific leadership of Prof. Sales Ávila, coordinator of the Respiratory Biophysics Laboratory (LBR/Uece), the Abanar prototype was designed in 2020 and is currently in the final phase of development.

For the Ceará-made respirator to enter the market, it is necessary to seek partnerships, as emphasized by the Uece researcher. He highlights: The next step is to obtain financing to adjust the prototype in accordance with ANVISA requirements for health products. Professor Sales also highlights the importance of this equipment, noting that it is relevant because it makes mechanical fans viable at a lower cost compared to the market, allowing assembly with parts that are easy to acquire on the national market. Furthermore, the equipment uses components from the automotive industry, which makes it easier to obtain parts throughout the country.

3.1 Health Technology and the SUS

The 1988 Constitution establishes health as a fundamental right for all citizens and a core responsibility of the state. Nevertheless, the concept of comprehensive care should not be interpreted as offering "all technologies available on the market to all people," as this would compromise the sustainability of the healthcare system. Moreover, not all of these technologies offer tangible benefits or adequate security compared to other options. Consequently, health managers are tasked with identifying the genuine health needs of the population, evaluating existing technologies, prioritizing the most pertinent ones, and organizing access to services and products. The objective of Health Technology Assessment (ATS) is to achieve equity and universality within the Unified Health System (SUS).

About the principal types of HTA studies, they encompass a few distinct approaches. Each of these methodologies is designed to address a specific research question within a given context. Primary studies, that is, original studies, can be utilized, as well as secondary studies, in which primary studies are employed to generate novel conclusions (CCATES, 2022).

Figure 2 – ATS studies.
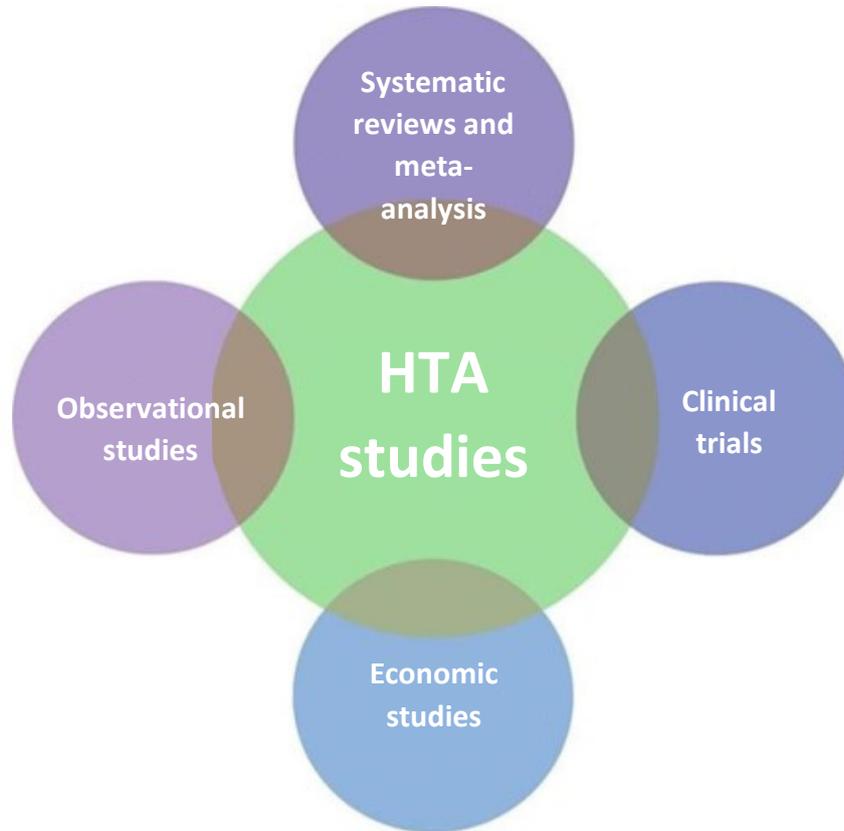
Source: SUS Collaborating Center.

Health Technology Assessment (HTA or ATS in Portuguese) encompasses a variety of study categories, each of which is designed for the purpose of addressing a particular issue within a specific context. This included the use of primary studies, that is, original ones, as well as secondary studies.

The initial process of Health Technology Assessment (HTA) entails identifying the necessity for research into the efficacy, effectiveness, safety, and cost of various health technologies, in comparison with corresponding conventional treatments, to determine whether they should be made available to the community (CCATES, 2022). Consequently, the subsequent phases delineate the trajectory necessary to develop recommendations regarding the technology subject to evaluation.

Conclusion

The analysis indicates that technological innovations have brought significant advances to the health area, contributing to the right to health by improving access, diagnosis, and treatment.

However, the ethical, legal, economic, and inequality of access challenges must be addressed comprehensively to ensure that these technologies benefit all layers of society. The research highlights the importance of effective regulation and public policies that promote the ethical and equitable use of technological innovations in health. The benefits resulting from technological progress are widely recognized and there is broad agreement in this regard. Not only has technical capacity elevated humans to the position of dominant species on the planet, but the evolution of practices and technologies has also started to influence the human experience in all its dimensions, including the sphere of subjectivity. The legal regulation of health technology is a complex challenge, involving the protection of privacy, security, and accountability while promoting innovation and advancement in healthcare.

The legal and ethical implications of this issue are significant, and it is crucial to find a balance between protecting patients' rights and encouraging the responsible and safe adoption of health technologies.

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