Ethical Challenges in Plastic Surgery in the Era of Artificial Intelligence

Desafios éticos em Cirurgia Plástica na era da Inteligência Artificial

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Abstract

Introduction Plastic surgery aims to correct or improve multifactorial bodily dysfunctions or imperfections. In the era of artificial intelligence (AI), plastic surgeons face various ethical challenges.

Objective This study aimed to reflect on the ethical challenges in plastic surgery (PS) in the AI era.

Method Theoretical-reflective and review study.

Results The PubMed database had 46 publications with the descriptors "artificial intelligence," "plastic surgery," and "ethics." Among these, we selected 25 publications (16 reviews, two surveys, two studies on robotic surgical assistance, two on preoperative planning assistance, one comparing Generative Adversarial Networks models, and two on photographic assistance). We categorized the findings into Chat Generative Pre-Trained Transformer (ChatGPT), AI applications in PS, patient autonomy, and the responsibility of the plastic surgeon.

Conclusion We propose using informative, interpretative, and deliberative models in patient care for an ethical approach. The physician should deliberate with the patient to choose prudent alternatives, aiming to avoid unpleasant consequences and selecting the course of action that maximizes the best outcomes and procedural utility.

Keywords
- artificial intelligence
- bioethics
- ethics
- plastic
- research
- surgery

Resumo

Introdução A cirurgia plástica visa corrigir ou melhorar disfunções ou imperfeições corporais multifatoriais. Na era da Inteligência Artificial (IA), diversos desafios são enfrentados pelos cirurgiões plásticos.

Objetivo Refletir sobre os desafios na cirurgia plástica (CP) na era da IA.

Método Estudo teórico-reflexivo e revisão.

Resultados Na base de dados *PubMed*, foram selecionadas 25 publicações (16 de revisão, dois *surveys*, dois sobre assistência cirúrgica por robô, dois sobre uso para auxiliar no planejamento pré-operatório, um de comparação entre modelos de *Generative Adversarial Networks* e dois sobre assistência fotográfica). Os achados foram

Descritores
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divididos em: *Chat Generative Pre-Trained Transformer (ChatGPT),* aplicações da IA em CP, autonomia do paciente e responsabilidade do cirurgião plástico.
Conclusão Propõe-se o uso dos modelos informativo, interpretativo e deliberativo em CP. O CP deve deliberar com o paciente para escolher alternativas prudentes, visando evitar consequências desagradáveis e eleger o curso de ação que maximize os melhores resultados e a utilidade do procedimento.

Introduction

Plastic surgery, both cosmetic and reconstructive, aims to correct or improve body dysfunctions or imperfections resulting from congenital, traumatic, or physiological deformities for health and quality of life improvement. However, the changes are minimal in some situations, or there is a voluntary desire to modify the body's appearance and shape. Examples include dissatisfaction with the normal body image and the request for exaggerated procedures that expose the patient to risks and compromise privacy in gender reassignment procedures, for instance, generating ethical challenges for the specialty.[1,2]

The literature has few studies on the ethical principles in plastic surgery, and most focus on patient autonomy. The pioneering work in the area resulted in significant technical advances, safety improvements, better outcomes, and increased complexity in the doctor-patient relationship. These aspects are more relevant in the era of artificial intelligence (AI) as several social segments discuss ethical implications.[3–8] AI quickly compiles and connects a vast amount of information, providing tools for storage, data and image classification, assisting in decision-making, diagnosis, treatment, outcome prediction, evaluation, training, and healthcare research. Several AI subdisciplines, such as natural language processing, unstructured data organization for decision-making, and facial recognition, have emerged and are applicable in medicine.[3,4]

The dilemmas from patient autonomy and physician responsibility about what is possible or necessary and what is desired raise moral and ethical questions about the role of plastic surgeons as a moral guardian in the relationship with society, especially as an example for new generations of physicians. Chung et al.[2] presented the principles of autonomy, beneficence, non-maleficence, and justice in plastic surgery. Although these principles are widely used, there are criticisms about potential conflicts between patient autonomy and physician-promoted beneficence.[5] Many dilemmas remain unanswered or lead to "autonomy overvaluation," professional paternalism, or AI-related machine paternalism.

Paternalism is acting in someone's best interests against that person's expressed preference. Paternalism can be: 1. Soft or weak, involving acting in the best interests of someone with a reduced decision-making capacity or information base, i.e., the subject is not in a position to adequately assess what is in their best interests. 2. Severe or strong, when the physician acts in the best interests of a competent patient without their consent, i.e., acting against the judgment of a patient who is sufficiently competent and informed about their best interest.[3]

For over 40 years, plastic surgery has relied on evidence-based medicine (EBM) to ensure management, the logic of care, and the exchange of experience among plastic surgeons. However, challenges have emerged related to unnecessary procedures that do not provide clear benefits to patients. These procedures can involve additional risks since they often intend to improve self-esteem or meet social or recognition demands, rather than delivering concrete bodily benefits. When surgery indirectly influences people's mental health, additional ethical questions arise about the motivation and goals of these procedures. In this situation, Hoffman[9] described the issues presented in ►**Box 1**.

In addition, surgery can occur for purposes other than medical outcomes, such as seeking social recognition, for instance, in cases of genital modification for several reasons, or to confirm social constructs, such as gender identity. These aspects highlight the power of surgery in connecting mind, body, and society, challenging the traditional conception of plastic surgery.[6–9] Although it has enabled and expanded opportunities to help people, it broadens the goals and raises discussions about indications, outcome evaluation, and responsibility. An AI indication for surgery leads to fundamental questions on responsibility, the moral goals of procedures, the best treatment for pain, biological or physical dysfunction, well-being, mental and social functioning, and happiness improvement.[3,4] It is crucial to consider that mental and social effects can change over time, requiring an analysis of the surgeon's responsibility over this period.

This trend has led surgeons to deal with new phenomena, demands, skills, limits, duties, and responsibilities. Although changing or expanding objectives is not an issue, it may require special care, as it involves professional values and social norms. In addition, it alters the ethos of the profession. Ethos is the set of fundamental customs and habits in the behavioral (institutions, activities, etc.) and cultural (values, ideas, or beliefs) context characteristic of a given community, time, or region.[10] It is crucial to assess whether body modification will alter mental and social status and social relations, and whether the modifications will be sustainable in moral and social contexts, as aesthetic and social ideals and mental and normative effects change. We propose an ethical reflection in this context, combined with the benefits and harms of AI.

Box 1 Challenges for plastic surgeons regarding unnecessary surgical procedures, according to Hoffman[9]

1. The difficulty of evaluating outcomes based on high-quality evidence.
2. "Sculpting" bodies according to created aesthetic standards promotes and disseminates the norms of the "new normal", which can generate new mental problems.
3. Although surgery can benefit subjects and plastic surgeons, it may not benefit public health and social norms in general and may negatively influence society.
4. Surgery may only treat symptoms and not address the underlying cause, diverting attention from effective and necessary approaches to the main problem.
5. The line between reconstruction and construction may be crossed.
6. Setting limits may become difficult, for instance, when requesting the removal of well-functioning organs.
7. There may be implications of harm that go beyond the physical dimension, including psychosocial problems.

Objective

This study reflects on the challenges of autonomy and professional responsibility in PS in the AI era.

Methods

This paper is a qualitative theoretical-reflective study with a narrative review on plastic surgery and AI. Reflective thinking involves the internal dialogue of the plastic surgeon when facing actual problems, and it occurs when one evaluates values, beliefs, assumptions, and principles based on information and potential interpretations. Reflection is a valuable strategy for healthcare professionals requiring specialized knowledge, such as plastic surgeons, especially in complex and constantly changing environments, as those faced by these professionals.[11] We used the PubMed database for the narrative review, retrieving studies from the last 5 years, using the descriptors artificial intelligence, plastic surgery, and ethics.

Results

The PubMed database had 413 full-text publications from the last 5 years with the descriptors "artificial intelligence" and "plastic surgery". By applying the descriptor "ethics", we retrieved 46 papers, including 41 published in the last 2 years. We excluded 21 studies because they were editorials, did not address the central theme, or were about general, orthopedic, or other surgeries. Therefore, our sample had 25 publications, distributed as follows: 16 review articles, two surveys, two studies on robotic surgical assistance, two on the use of AI in preoperative planning, one comparing generative adversarial network models, and two on the use of AI for photographic aid.

Generative artificial intelligence (GAI) is a branch of AI for content creation, including texts, images, audio, videos, and software codes, based on patterns from training data sets. This technology has also been extended to create hospitals and robots in the testing phase, such as the Stable Diffusion and DALL-E, AI image generation models, and chatbots, like ChatGPT (built by OpenAI using GPT-3 and GPT-4), Bard (a chatbot from Google using the LaMDA model), and Microsoft Copilot (a chatbot from Microsoft which is an extension of OpenAI's GPT-4 language model). This technology has raised questions about its misuse, such as in fake news and deepfakes, i.e., the dissemination of false news and images published for various purposes. This scenario generates a growing need for discussion and regulation, especially regarding patient autonomy and professional responsibility. We adapted the topics discussed from the publications and subdivided them to facilitate their analysis.

Chat Generative Pre-Trained Transformer (ChatGPT)

ChatGPT is based on generative artificial intelligence and uses a versatile language model for several tasks in education, research, and practice. Launched in 2022, it has been used to write texts, emails, code, compose music, assist in medical licensing exams, provide pre- and postoperative guidance, produce medical communications to optimize workload, and provide basic information to patients in a quick and accessible way. ChatGPT is a significant tool in several areas, including PS.[12,13]

ChatGPT can improve the efficiency of the healthcare system by reducing the need for face-to-face consultations and improving patient flow. However, Sharma et al.[12] identified the following ethical implications of ChatGPT in PS: 1. lack of human interaction and emotional support; 2. lack of face-to-face support and empathy for patients and students in training; 3. lack of understanding of complex questions from patients or students with incomplete answers; 4. insecurity regarding data privacy and the construction of literature for predicting diagnosis and treatment. In addition, the effects of the inaccuracy of the generated responses are a concern since current versions cannot access updated sources. Abi-Rafeh[14] reviewed 175 articles, reporting 13 applications in PS and 116 in additional clinics categorized by area and purpose, including 34 PS-specific applications relevant to different target audiences, such as plastic surgeon assistants, trainees/educators, researchers/academics, and patients. Abi-Rafeh[14] also identified ChatGPT limitations and categorized them by training data, algorithm, and ethical considerations as presented by Sharma and other researchers.

AI Application in Plastic Surgery

In the narrative review on AI use in oral and maxillofacial surgery, we identified papers addressing algorithms assisting diagnosis, therapy, preoperative planning, prediction, and outcome evaluation.[15] Thanks to their learning, classification, prediction, and detection capabilities, AI algorithms have complemented human skills in these tasks.

AI can optimize medical practice without replacing it, assisting the performance of daily and regular tasks, such as writing letters, discharge summaries, surgical reports, communicating results, pre-, intra- and postoperative instructions, virtually training professionals, creating courses and scenarios, case studies, presentations, distance learning, providing personalized feedback, and organizing and analyzing research data.[15–17] However, papers have shown that AI has the following limitations:

1. Data trust: It is not possible to trust the information generated fully, as it may be entered manually and be incomplete, not reflect reality, and have superficial, imprecise, incomplete, biased, or incorrect content. The generated content always requires checking and, if necessary, correction.
2. Inability to produce accurate or sufficient references.
3. Facilitation of plagiarism and academic misconduct.
4. Distrust regarding the quality and security of data access.
5. Risks of data use and loss of patient privacy.

The interview study about the perception of 153 plastic surgeons on AI revealed that, although these professionals recognized the significance of AI for the specialty, they had limited knowledge about it and raised concerns about its use. They mentioned the risk of overreliance on the technology, potentially leading to errors, the need to adjust theory to practical training, the risk of exposing patient privacy, the need for patient consent for data use, and the creation of specific guidelines for the specialty. Surgeons often considered discharge summaries important to speed up care, but many were dissatisfied with the quality of these texts. They highlighted that low-quality hospital discharge summaries could increase readmissions and the risk of adverse events. They concluded that AI is a recent technology with great evolutionary potential as an auxiliary tool in PS activities.[18]

On Patient Autonomy and Consent in Plastic Surgery

PS procedures aim to improve form, appearance, function, and rehabilitation, respecting the patient's autonomy and subjective and psychological aspects, such as self-esteem, self-perception, and self-determination (in realistic terms), the social environment, and quality of life. These factors are essential in the professional, emotional, and social domains. It is common for patients to request procedures that they believe will improve their appearance and psychosocial condition, even when the surgeon disagrees, as in psychological disorders or excessive expectations promoted by unrealistic media. For instance, people with body dysmorphic disorder, a psychiatric condition featuring an obsession with a minor or nonexistent defect in physical appearance that leads to significant distress, may remain dissatisfied after multiple procedures due to unrealistic expectations. Other situations include patients with disorders requiring treatment before PS, such as morbid obesity, where there is a mistaken belief that the surgery alone would solve comorbidities and improve quality of life. It is crucial to assess the need and risks and provide guidance at the appropriate time to perform the procedure.

Autonomy is the ability to make independent decisions and act autonomously.[5] It is a right to choose, accept, or refuse a treatment, regardless of how this choice occurred, as long as there was reflection and consideration. The essential conditions for exercising autonomy are: 1) freedom; 2) the ability to act intentionally; and 3) understanding and acknowledging the situation. Autonomy is relational, i.e., it always refers to independence regarding something; selective, meaning that the subject may be independent in some respects but not others; and graduated, as some subjects may have more autonomy than others. However, patient autonomy should not oblige the physician to perform a procedure that is not clinically appropriate or that potentially causes unnecessary risks.[6–9]

The informed consent form is the document signed by the patient agreeing to the procedure's performance. It helps to protect against paternalistic and coercive practices. Informed consent presupposes the competence to understand and decide, voluntariness, disclosure of information, recommendation of a plan, understanding the information and plan presented, the decision, and its eventual authorization. Consent can be informed, implicit, presumed, or from third parties. It is critical to highlight that procedures intended to satisfy ephemeral desires, fads, or imitations of models and stereotypes without scientific support can increase expectations and, when not performed, lead to increased suffering and the judicialization of the doctor-patient relationship. We must avoid these procedures, as they may not contribute to people's well-being and quality of life.[6–8]

In Brazil, the General Data Protection Law (LGPD)[19] governs the use of personal data and prohibits its utilization without due consent. The consent forms for data use include:

- **Broad consent:** It allows subjects to consent to a wide range of future uses with more or less specification.
- **Meta-consent:** Subjects retain control over the consent type they wish to give for future uses (e.g., general consent for certain use types and specific consent for others).
- **Dynamic consent:** It is personalized and based on interactive online platforms, allowing participants to interact as needed, in real time.

Data presentation can occur either unidentified or anonymized for privacy protection, although there are risks of re-identification due to individual specificities. New authorities to manage data and their links can be created to protect confidentiality, as exemplified by the TRUST platform in Singapore.[20]

In addition, when the surgeon and patient agree to undergo the procedure, the patient must be fully aware of the possibilities and risks. In addition, the patient must know that most procedures are irreversible and result in scarring.

Therefore, consent must be obtained by signing the informed consent form.

On Data Quality and Surgeon's Responsibility

The risk of bias in databases can compromise the quality of AI-provided information, resulting in incomplete, inadequate, and harmful data. In these cases, responsibility for use and information is a crucial issue. The word "responsibility" comes from the Latin *respondere*, meaning to respond to something, i.e., to hold someone accountable for their actions, attributing the consequences of the behavior to their agent.[21,22]

From a legal perspective, responsibility refers to the obligation to submit to the consequences imposed by law regarding harmful conduct. Civil liability is reparative, i.e., it understands that the agent repairs the damage inflicted on the victim. The obligation to repair arises from a breach of an obligation or a legal precept (wrongful act). The duty to compensate for the damage occurs when someone fails to fulfill a contract (contractual liability) or does not observe the normative system governing the citizen's life (extracontractual liability). A contract is a legal agreement between two or more parties intended to regulate the interests between them to acquire, modify, or extinguish legal relationships of a patrimonial nature.

The elements necessary to characterize liability include the agent's conduct, the damage, offense or intent, and the causal link. According to article 186 of the Brazilian Civil Code,[23] *"anyone who, by voluntary action or omission, negligence, or incompetence, violates the right and causes harm to another, even if exclusively moral, commits an unlawful act."* Damage is the loss suffered by the victim and may be monetary (patrimonial) or psychological (moral). When someone commits to providing professional services and fails to fulfill them, they violate their legal duty, giving rise to liability, i.e., the duty to repair the damage caused by the failure to fulfill an obligation.[23]

Offense defines the type of liability, which may be subjective, objective, or presumed. Presumed liability is based on damage and justified by the risk theory, i.e., if someone performs an activity with special risks, they must be held liable for the damage they cause to third parties. In contrast, objective civil liability waives offense analysis and depends on the risk and damage occurrence. An example of this concept is in the Brazilian Consumer Protection Code, which provides for the protection of the consumer against products and services posing risks, without the need to analyze the responsibility of the person causing the damage. Civil liability guarantees the legal protection of the subject through reparation or compensation for the damage caused. This reparation may be punitive or preventive and include compensation for material or moral damages per article 944 of the Brazilian Civil Code.[23]

Criminal liability arises from the failure to comply with public law and the violation of rules regulating inalienable legal assets, such as life, liberty, and physical integrity. An offence occurs when there is a failure to observe a duty that the agent could have known. The knowledge and deliberate violation configure a civil offense or, in contractual matters, contractual fraud.

Discussion

The topics on AI use in PS discuss generated data security, the quality of algorithms for indicating surgical procedures, assistance in decision-making, training, and documentation organization. As described by Jarvis,[4] the study presented the ethical implications in the analysis of 14 articles using the terms "artificial intelligence," "machine learning," "natural language processing," "big data," "nanotechnology," and "plastic surgery." Regarding databases, authors highlighted the significance of data for studies on defining treatment, outcomes, and prognosis.

Esbroeck et al.[24] reported a support system training to determine the complexity and risk of surgical procedures using data from the American National Surgical Quality Improvement Project, obtaining results comparable to other known measures. The application of predictive models has been used to evaluate burn-related aspects, including degree, anatomical location of vascular pedicles, flap viability, vascularization, peripheral nerve recovery, cutaneous tumors, diagnostic algorithms, and the mortality and outcomes from breast reconstruction.

Leypold[18] analyzed the performance of GPT-4 in the context of upper limb reconstructive surgery procedures and scenarios. The study concluded that, although the program has not yet provided perfect answers, its capabilities left a positive impression on participants. The findings demonstrate that GPT-4 can analyze complex clinical situations, propose viable treatment options, and address comorbidities.

Other authors also discussed the risks associated with AI use, such as the possibility of violating patient privacy and the liability of the information provided by AI and plastic surgeons for potential errors.[24–26] They raised concerns about the promotion of social injustices due to the development of biased algorithms using data that are underrepresented in terms of society, including ethnicity, gender, and socioeconomic status, and that could lead to over-testing, over-treatment, and under-treatment. Data biases could generate bias in data collection and AI model degradation, especially in hospitals that potentially lack significant data and provide incomplete or incorrect information. In addition, authors mentioned the possibility of loss of autonomy, with people submitting themselves to AI-determined standards, which could result in mental health deterioration and bodily disorders.

It is crucial to remember the role of advertising on social media, i.e., to persuade people to take action through ads appealing to emotions (fears and desires) and associate their themes with overvalued attributes, such as a more youthful and sexually attractive appearance based on AI pre-established parameters.[18] A person with positive self-esteem and self-perception would hardly seek to undergo exaggerated or unnecessary aesthetic procedures just because of the influence of advertising. However, patients with negative self-

perception may identify unrealistic imperfections in their image, develop feelings of anguish and suffering, and seek a plastic surgeon for correction.

Online marketing in the AI era also raises questions about the loss of patient privacy, with the possibility of losing control over the images published or manipulating them for marketing interests. Another question is whether the outcomes underwent manipulation, showing the good one alone, or whether standardized models were used for the procedures. Furthermore, should plastic surgeons be held accountable for promoting and disseminating harmful beauty standards or being complicit in harmful conceptions of normality and conflicts of interest? One example is the Snapchat phenomenon, in which some surgeons expose their patients on the app under educational justifications. However, many are simply seeking publicity, personal and professional gain. One of the main features of Snapchat is using images, photos, instant messages, and videos, usually available for a short period before becoming inaccessible to the recipients. Uncritical media can promote abuse, blackmail, and fraud, undermining professional credibility and authenticity.

AI utilization in facial surgery allowed the creation of databases to categorize facial anatomy and evaluate outcomes. Many software programs have provided validated methods for determining postoperative outcomes for plastic surgeons. It is essential to carefully consider the indications and mental and social conditions of patients to ensure that the doctor-patient relationship, which is centered on trust, empathy, and shared decision-making, is not compromised.[26]

Another significant aspect to consider is that, although AI can analyze data and suggest procedures, it cannot engage in high-level conversations with patients. Therefore, AI cannot build the trust and empathy necessary for an effective doctor-patient relationship, which is essential for professional practice and obtaining favorable outcomes. Furthermore, AI systems evaluate beauty based on objective parameters, without considering subjective preferences. This can lead to an elevation of certain facial qualities as superior to others, defining a "perfect face" based on beauty standards derived from specific cultures. This would result in prejudice and discrimination by undervaluing qualities potentially deemed beautiful in other races or ethnicities. Consequently, AI may contribute to the decrease in diversity in perceptions of beauty and only inform the goals of subjects who share beauty ideals similar to those standardized in the algorithms.[26]

Lin et al.[26] investigated the ability of the AI models DALL-E 2, Midjourney, and Blue Willow to generate realistic images relevant to cosmetic surgery, combining generators from ChatGPT-4 and BARD with these Generative Adversarial Networks (GANs) to produce nose, face, and eyelid images. Four plastic surgeons evaluated the generated images, which predominantly featured female faces with lighter skin tones, with no representation of men, older women, or people with a body mass index above 20. Biases were evident when evaluating the results from GANs for rhinoplasty, blepharoplasty, and facelift.[26] DALL-E could create several synthetic images for a virtual simulation of the procedures and postoperative results, even before surgery.

Therefore, surgeons who use predictive software during consultations for aesthetic procedures should keep this in mind to minimize the risk of coercion in the search for an unrealistic result that is different from the patient's goals. It is vital to emphasize the role of AI as a tool assisting patients in making decisions, rather than as the main decision-maker.

Data and image cloud storage is a critical tool for training. However, it is necessary to reduce the risk of data loss or breach by protecting and masking identifying, personal, and confidential information before storing patient data in the cloud to ensure data quality, patient privacy, and the inclusion of people of different ethnicities in facial recognition, among others.[26]

AI regulation is a global concern. Recently, Europe approved the AI Act,[27] establishing guidelines for AI use, including transparency, accountability, security, and protection of individual rights. In Brazil, the discussion about AI regulation and its social, ethical, and legal impacts is ongoing. Bill PL 2338/23,[28] which aims to establish guidelines for the development and ethical use of AI in Brazil, is under analysis in the Senate for approval.

Can we trust AI? Moral philosophy differentiates two forms of trust: 1) trust per se, i.e., a deep interpersonal relationship, involving goodwill and vulnerability; and 2) reliability, a basic type of trust in the functioning of the world and things. Trust has normative and descriptive dimensions. In the normative dimension, it is assumed that people should act with the legitimate expectation that others will also act per pre-established laws and standards, legally ensuring that citizens can predict behaviors and consequences of their actions, promoting stability, legal security, and social order.[29]

Trust originates from interpersonal relationships and presupposes commitment and goodwill by those involved in a relationship in which subjects expect sincerity from each other; the lack of sincerity leads to a feeling of betrayal.[29] Trust implies granting a certain power to the other, who will be free to act as they wish within the limits of trust. When trust is based on professional responsibility, it involves goodwill and presupposes care by the person being trusted. The question is: which people will deserve trust when they use AI to put on a show of themselves, stand out in the media, cultivate superficiality, and live an imaginary life in the thoughts of others, privileging "appearance" over "being"? What must we do if new generations, based on AI criteria, begin to deny values for "being a trustworthy person"?

The deliberative process for decision-making is an intellectual process performed by professionals to choose prudent alternatives for carrying out procedures, defining what should be done or not, and allowing for reasonable and judicious decisions. In recent years, patient autonomy has been emphasized in the following decision-making models:[7]

1. **Informative**: in "shared decision-making," the physician provides information and the patient presents their moral and ethical values;

Box 2 Ethical challenges in artificial intelligence (AI) according to Krittanawong[34]

Ethical challenges	
Machine paternalism Moral pluralism and disagreement in values	These challenges refer to following the values of those programming the AI. A treatment recommendation might not know or respect the patient's values. What would be the interpretation of quality of life? What would constitute a good life or well-being for AI?
Data use consent	The informed consent form has a prerogative that the patient can withdraw consent at any time. However, after machine release, the publication scope may be uncertain and unattainable.
Responsibility	Who will be responsible if an error or mistake occurs in the machine's proposition? Its use requires knowledge of the consequences and data control.
Trust	Trust in someone with an adequate level of knowledge and skill (epistemic trust) and moral characteristics (moral trust), with good intentions and commitment to professional values. Trust requires a level of responsibility. Accountability and trust are key issues for AI in medicine.
Database use	Data protection precautions. It is difficult to predict how data will be used and to what extent subjects will consent to unknown future uses. Different consent models entered the traditional model to accommodate the possibilities opened up by databases.
Explanation and justification requirements	Ethics differentiates explanatory or motivating reasons (why someone acted) and normative or justifying reasons (whether the act was right). In medicine, values endorsed by patients and the validity conferred by adequate scientific research provide justification (e.g., prolonging life or improving its quality).
Obsolescence, dehumanization, and deskilling	A great fear surrounding AI is making humans obsolete, i.e., replacing their role in medicine, and their replacement, becoming a slave, or deskilling by AI as it can write reports, theses, and so on.
Dual use	Potential use to develop lethal drugs and existential threats, or the fact that it will become self-aware and pose an existential threat to humanity
Risks of promoting injustice, inequality, prejudice, discrimination, and inequity	As AI uses databases, there is the potential to group people into different categories, for instance, those subjected to discrimination and for whom differential treatment could be justified explicitly and convincingly. Discrimination occurs when similar cases receive different treatments with an insufficiently significant and morally relevant difference.
Risks of loss of privacy and confidentiality	Difficulty in controlling data in cloud storage and other sites
Effectiveness, reliability, and evaluation	How should ethical decisions about AI programming or assessment occur? Need for regulation.

2. **Interpretative**: the physician helps the patient to identify their values and respects their wishes;
3. **Deliberative**: the physician deliberates with the patient.

In all these models, prudence refers to calmness, thoughtfulness, common sense, and patience when dealing with delicate, difficult, or complex matters to avoid unpleasant consequences. In other words, the aim is to choose the course of action to maximize the best outcomes and the usefulness of the procedure.[30–33]

Pinto dos Santos et al.[33] surveyed 260 medical students on AI, recognizing that its appropriate use can contribute to efficient, accurate, and patient-centered care. The authors found that 96% disagreed that AI could replace doctors, and 71% agreed that medical training should incorporate AI, but with care. The authors highlighted the need to analyze the intersection between human thinking and virtual processing when considering using an AI as a tool to enhance doctors' capabilities to provide care, educate, and innovate. Barone highlighted the risk of dependence on AI systems, which can lead to overconfidence or reduced surgeon autonomy, reinforcing the significance of synergistic collaboration between AI and PS.

In summary, Krittanawong[34] highlighted that AI is incapable of engaging in high-level conversations with patients or building the trust and empathy necessary for an effective doctor-patient relationship, which is fundamental to positive outcomes. However, automating routine clinical tasks may help reduce physician burnout by allowing doctors to devote more time to the more sophisticated and human aspects of their practice. ►**Box 2** outlines these ethical challenges.[9,19,28]

Given the diversity of ethical risks arising from AI medical use, peers should discuss a general, adaptable approach to addressing these challenges. The literature recommends the following:[34]

a) Doctors must be aware of the standards of patient privacy and confidentiality in all environments, including online, and refrain from posting identifiable patient information online.
b) In social networking on the internet, doctors should use privacy settings to protect personal information and content to the extent possible. However, they should recognize that privacy settings are not absolute and that once content is online, it is likely to be there permanently.

Accordingly, they should routinely monitor their online presence to ensure that the personal and professional information on their websites and the content posted about them by others is accurate and appropriate.

c) When interacting with patients online, physicians should maintain appropriate boundaries in the doctor-patient relationship following the professional ethical guidelines, just as they would in any other context.

d) Doctors must consider separating personal and professional content online to maintain appropriate professional boundaries.

e) When observing content posted by colleagues that appears unprofessional, doctors have a responsibility to report such content to the appropriate authorities.

f) Doctors should recognize that their online actions and published content can negatively affect their reputation among patients and colleagues, have consequences for their careers (particularly for doctors in training and medical students), and undermine public trust in the medical profession.

Conclusion

As AI becomes particularly meaningful in several PS areas, we need to discuss ethical challenges. In this article, we reflected on AI significance and the issues potentially arising from AI use in PS, including databases, machine learning, paternalism, natural language processing, and facial recognition. Plastic surgeons can employ these examples of AI-based technology to improve their surgical practice. However, like any evolving technology, the use of AI in healthcare raises crucial ethical issues, such as respect for patient autonomy, professional responsibility, informed consent, confidentiality, privacy, and data use. These considerations are significant, as high ethical standards are fundamental to professional practice and the appropriate and long-term use of AI.

In addition, plastic surgeons deal with the physical and mental aspects of the patient, which are fundamental to their quality of life. As described, AI has several positive aspects. However, it has challenges, such as the possibility of errors in professional practice, which may be avoidable or lead to negative consequences and severe complications. The best interests of the patient must be a priority, even when professionals face sociocultural and commercial pressures.

In the AI era, plastic surgeons face moral forces: to alleviate the patient's suffering, regardless of the cause, and to address potentially harmful reasons that may have induced this suffering. Moreover, plastic surgeons have a special responsibility before society and a professional obligation. As such, we propose using informative, interpretative, and deliberative care models for an ethical approach. The physician must deliberate with the patient to choose prudent alternatives, aiming to avoid unpleasant consequences and select the course of action that maximizes the best outcomes and the utility of the procedure.

Author's Contribution

KTB: data analysis, interpretation, or both, statistical analysis, final manuscript approval, conceptualization; LMSP: writing - original draft preparation; ADB: writing - review & editing; JCR: study conception and design; JGSB: writing - original draft preparation; AGCNG: writing - original draft preparation.

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Clinical Trial

None.

Conflict of Interests

The authors have no conflict of interest to declare.

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