

Surgical ethics: contemporary challenges

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Abstract

This is a critical integrative review with an analytical-descriptive approach that provides a comprehensive and reflective analysis of contemporary dilemmas in surgical ethics. Owing to its invasive and inherently uncertain nature, surgical practice requires a balance among *techné*, *episteme*, and *phronesis*. The article examines historical dimensions and addresses informed consent, unexpected intraoperative findings, the training of residents and researchers, performance assessment systems, and the four evils of modern surgery. It also discusses the impact of innovations such as robotics, artificial intelligence, and transcontinental remote surgery, as well as the use of social media in the surgeon-patient relationship. It concludes that the sustainability of surgical practice depends on the integration of rigorous ethical training, professional self-regulation, and legal frameworks adapted to emerging technologies, while prioritizing patient dignity alongside technical excellence.

Keywords: Ethics, medical. Informed consent. Artificial intelligence. Bioethical issues.

Resumo

Ética cirúrgica: desafios contemporâneos

Trata-se de revisão integrativa crítica, de caráter analítico-descritivo, que oferece análise panorâmica e reflexiva de dilemas contemporâneos da ética cirúrgica. A prática cirúrgica, por sua natureza invasiva e incerta, exige equilíbrio entre *techné*, *episteme* e *phronesis*. O artigo examina dimensões históricas e aborda consentimento informado, achados transoperatórios inesperados, formação de residentes e pesquisadores, sistemas de avaliação de performance e os quatro males da cirurgia moderna. Discute, ainda, impactos de inovações como robótica, inteligência artificial e cirurgia remota transcontinental, além do uso de mídias sociais na relação cirurgião-paciente. Conclui-se que a sustentabilidade da prática cirúrgica requer integração entre formação ética rigorosa, autorregulação profissional e arcabouços legais adaptados às tecnologias emergentes, priorizando a dignidade do paciente associada a eficiência técnica.

Palavras-chave: Ética médica. Consentimento livre e esclarecido. Inteligência artificial. Temas bioéticos.

Resumen

Ética quirúrgica: desafíos contemporáneos

Se trata de una revisión integradora crítica, de carácter analítico-descriptivo, que ofrece un análisis panorámico y reflexivo de los dilemas contemporáneos de la ética quirúrgica. La práctica quirúrgica, por su naturaleza invasiva e incierta, exige un equilibrio entre *techné*, *episteme* y *phronesis*. El artículo examina dimensiones históricas y aborda el consentimiento informado, los hallazgos transoperatorios inesperados, la formación de residentes e investigadores, los sistemas de evaluación del desempeño y los cuatro males de la cirugía moderna. Asimismo, analiza el impacto de innovaciones como la robótica, la inteligencia artificial y la cirugía remota transcontinental, además del uso de las redes sociales en la relación entre el cirujano y el paciente. Se concluye que la sostenibilidad de la práctica quirúrgica requiere la integración de una formación ética rigurosa, la autorregulación profesional y marcos jurídicos adaptados a las tecnologías emergentes, priorizando la dignidad del paciente en conjunto con la excelencia técnica.

Palabras clave: Ética médica. Consentimiento informado. Inteligencia artificial. Discusiones bioéticas.

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Medical ethics plays a crucial role in daily clinical practice and is grounded in the ethical values described by Beauchamp and Childress¹ in 1979, namely patient autonomy, beneficence, nonmaleficence, and justice. Specifically in the surgical setting, these ethical issues become even more complex because of the invasive, unpredictable, and urgent nature of surgical interventions, which ultimately cause patient discomfort before a cure is achieved and directly involve matters of life and death.

Of Greek origin, surgery (*cheirurgie*) symbolizes manual work, and ethics (*ethos*), character or custom. In this manual work grounded in customary ethics, surgeons must be trained in clinical judgment, decision-making, and collaboration with other healthcare professionals. In addition to mastering knowledge of surgery itself, they must demonstrate objectivity and compassion, place the patient's interests first, always treat the patient with dignity and individuality, and never forget that their art is fallible. Paradoxically, in surgical emergencies, without consent, the surgeon makes quick and profound decisions in the patient's best interest, has direct access to the patient's internal anatomy, and often spends more time with the patient during the surgical procedure than during consultations.

The evolution of surgical ethics is intrinsically linked to technological development and the socioeconomic demands that shape contemporary medical practice. As highlighted by Brown², although its roots date back to Mesopotamian civilizations, it was from the 18th century onward that surgery became established as an autonomous profession and began to require a broad and specific ethical framework. Once again, surgical ethics adapts to the singularities of surgical intervention, such as invasiveness, the immediacy of action, and the unique relationship between surgeon and patient³. McCullough and collaborators⁴ reinforce that the procedural nature of surgery redefines concepts such as virtue, justice, and nonmaleficence, thus requiring a particular ethical approach.

According to Cardenas³, surgery presents an interesting ethical dilemma: its therapeutic effectiveness is based on an action that initially

causes harm, the incision, and only afterward promotes healing. Today's surgeons also perform punctures, fixations, ligations, anastomoses, sutures, clipping, clamping, embolizations, aspirations, implants, infiltrations, perforations, resections, or navigational procedures. This duality regarding the principle of nonmaleficence, expressed as "do no harm," requires specific ethical consideration, quite different from general medical ethics, because it involves decisions made amid uncertainty and imminent risks⁴. The Latin expression "*primum non nocere*" (first, do no harm) is used in contrast to the principle of beneficence (first, do good).

Technological progress in surgery, with the adoption of less invasive techniques, brings with it ethical issues that deserve special attention, both with regard to obtaining informed consent from patients and to the careful assessment of risks compared with benefits associated with advanced surgical procedures, which in the recent past were not performed because of prohibitive risks.

Surgeons must combine technical and ethical skills with clinical caution⁵. This stresses the importance of a solid ethical foundation that involves not only technical competencies but also ethical-humanistic reflection to ensure that scientific advancement does not compromise patient dignity. An ethical dilemma arises when surgeons must choose between two equally unfavorable courses of action. They must choose the least undesirable action, considering not only their individual view but also that of the society they represent. Sometimes, recommending against surgery reflects surgical experience and maturity.

Physicians are part of the society in which they practice, and this presupposes the establishment of laws, regulations, and norms that confer rights and obligations and govern their practice⁶. The surgeon-patient relationship, the core of surgical ethics, is mediated by technoscience, a term coined by neurosurgeon Anne-Laure Boch⁵ to describe the symbiosis between scientific knowledge and technological advancement.

This dynamic requires the surgeon to balance the Greek concepts of *techné* (technical skill), *episteme* (knowledge), and *phronesis* (practical wisdom or capacity for judgment). Surgeons operate daily within a landscape of moral

choices. Surgical ethics is structured around three axes: 1) ethics of action, which consists of the immediate decisions made by the surgeon; 2) ethics of the body, which concerns the invasion of bodily integrity, in which the body is considered an object; and 3) relational ethics, in which the human relationship is of central importance. Surgical dexterity without an appropriately attentive relationship may prove futile, as proposed by Boch⁵. In modern times, some authors distinguish surgical medical practice from nonsurgical practice precisely through the framework of accountability and the possible serious harm that may be caused.

The aim of this review is to discuss the various dimensions of surgical ethics, covering issues such as historical developments, new technologies, the use of social media by surgeons, unexpected intraoperative findings, the training of residents and researchers, surgical *performance* assessment systems, and the “four evils of modern surgery,” namely, unjustified surgery, ghost surgery, fee-splitting, and exorbitant fees.

Method

This is a critical integrative literature review with an analytical and descriptive approach, designed to map and discuss the challenges of contemporary surgical ethics in its multiple dimensions. The searches were conducted in March 2025 in the PubMed, SciELO, and Google Scholar electronic databases, complemented by consultation of widely accessed websites and institutional portals of surgical and bioethics societies. Notably, the aim of this review is not to cover the topics exhaustively, but to present an overview of the main contemporary dilemmas.

The inclusion of journalistic and institutional sources was intentional and justified, with the purpose of capturing: 1) reported cases that illustrate emerging ethical dilemmas in surgical practice; 2) positions and guidelines of medical entities not published in indexed journals; and 3) documentary records of technological innovations, such as transcontinental remote surgery, still little discussed in scientific articles.

The descriptors were used in Portuguese, English, and Spanish, combined by Boolean

operators. The search strategy was based on the following main combination, adapted according to the resources of each database: “ética médica” OR “medical ethics” OR “ética médica” AND “consentimento informado” OR “informed consent” OR “consentimiento informado” AND “inteligência artificial” OR “artificial intelligence” OR “inteligencia artificial” AND “cirurgia” OR “surgery” OR “cirugía” AND “inovações” OR “innovations” OR “innovaciones” AND “robótica” OR “robotics” OR “robótica.”

The following filters were applied: time frame between January 2015 and March 2026; full texts available in Portuguese, Spanish, or English. The inclusion criteria encompassed articles, essays, normative documents, and investigative reports whose focus included: challenges of surgical ethics and its historical dimensions; technological innovations in surgery, robotics, artificial intelligence (AI), and transcontinental remote surgery; surgical informed consent; unexpected intraoperative findings; ethical training of residents and researchers; surgical performance assessment systems; and the so-called “four evils of modern surgery.”

Exclusion criteria were: texts with tangential or insufficient information on the topic, duplicates, and those that did not add contributions beyond those already covered in other selected documents. The selection process was conducted in three stages. In the first stage, the titles and abstracts, when available, of all retrieved records were read, applying the inclusion and exclusion criteria. In the second stage, the texts approved in the initial screening were read in full to confirm eligibility. Initially, 98 studies were identified. After removal of duplicates and screening by title and abstract, 79 works were selected for full-text review; of these, 42 fully met the inclusion criteria and constituted the final corpus of the review.

Exceptionally and justifiably, given the historical and conceptual nature of the topic, classic and normative references published before 2015 were incorporated into the debate, such as the works of Aristotle, Schneiderman, and several others. These texts are treated as foundational literature, essential for providing a theoretical foundation for the dimensions of surgical ethics, and their inclusion was not part of the systematic search

strategy but rather of the conceptual foundation of the review.

Surgical ethics

This section begins with the reflection introduced by Angelos on the role of the surgeon: *When the clinician's patient dies, the natural question colleagues ask is "What happened?" When a surgeon's patient dies, colleagues ask "What did you do?"* (our translation)⁶. Surgical excellence transcends technical dexterity and incorporates fundamental virtues for decisions in contexts of uncertainty, such as *phronesis*, practical wisdom. Aristotle defines *phronesis* as a rational disposition oriented toward the human good, essential for balancing beneficence and nonmaleficence in invasive procedures⁷. Surgery, by its aggressive nature, requires rigorous assessment of proportionality and avoidance of medical futility⁸. This latter term represents one of the dilemmas of surgical practice in relation to the fundamental issue of preserving quality of life.

Surgical ethics also presents additional ethical conflicts, such as distributive justice in settings involving scarce resources. The fair distribution of highly complex surgical procedures, such as robotic interventions, often clashes with socioeconomic disparities that require professionals to establish transparent criteria that promote effectiveness and equitable access⁹. The challenge is even more complicated in public health systems, in which difficult choices must be made, such as deciding to prioritize patients with greater chances of survival or those in a terminal condition, which goes against the principle of equality⁹.

In traditional surgical culture, grounded in perfectionism and paternalistic authoritarianism, resistance to transparency in disclosing failures is often present, and this perpetuates a cycle of underreporting that does not allow self-criticism. These patterns conflict with the ethical principles of full accountability, which not only require reparation for affected patients but also call for institutional processes⁹. It is also important to consider the legal and emotional consequences for the surgeons involved¹⁰,

to avoid costly litigation or even leaving the profession due to poor results, especially early in their careers.

In contemporary bioethics, some patients have questionable indications for surgery and, in some cases, this threshold is crossed, at which point surgical futility may be considered, with useless or disproportionate treatments, especially in patients with terminal or severe cancer. One consequence would be therapeutic obstinacy or dysthanasia. There is a distinction between quantitative surgical futility—low probability of success—and qualitative futility—unsustainable quality of life—and the controversies surrounding these distinctions, especially in cultures with divergent moral values¹¹.

Miles Little¹² structured surgical ethics into five experiential dimensions: rescue, proximity, ordeal, consequences, and presence. Rescue symbolizes the duality of the surgeon as savior and, paradoxically, as someone who also needs help in complex situations. Proximity emphasizes the empathy necessary to understand the patient's suffering, while presence demands continuous ethical engagement and the great mission of not abandoning the patient. Ordeal refers to offering not only technical competence but also compassion, empathy, and emotional support to the patient and family. The dimension of consequences provides a good illustration of the benefits and risks present in the surgical act. Harrell¹³ adds that the ideal surgeon combines: 1) ethical knowledge, humanism, and moral integrity; 2) technical skills, including expertise and knowledge; and 3) clinical judgment.

History of surgery

Surgical ethics is deeply connected to the historical development of the art of operating, which for centuries was marked by improvisations, errors, risks, sequelae, pitfalls, and deaths. According to Pantoja and collaborators¹⁴, the first records of surgical practices date back to the Sumerians and then to the Babylonians, who established punitive norms for medical errors in the Code of Hammurabi (1,800 BC), considered the first written legislation for surgeons. It was the time of "an eye for an eye, a tooth for a tooth."

Surgeries were limited to amputations, suturing of wounds, treatment of burns, craniotomies, drainage of abscesses, tooth extractions, ophthalmic and hernia surgery, bloodletting, and childbirth. In Ancient Greece, the Hippocratic Oath already spoke of not performing “perineal lithotomy.” Only from the late 19th century onward were the thorax, abdomen, and pelvis explored surgically, a practice considered a surgical frivolity at the time.

The advancement of surgery at that time depended on four pillars: anatomy, control of hemorrhage, pain, and infection¹⁴. In antiquity, medicine was entirely based on mystical and religious beliefs. Later, the surgical act became confined to monasteries, until in 1299 a papal edict by Boniface VIII prohibited physicians and monks from performing operations. In Europe, there was then the rise of barber surgeons known as surgeons of the short robe, with extensive training in guilds.

Andreas Vesalius, the father of human anatomy, advocated human dissection, recording his discoveries in *De humani corporis fabrica*¹⁴. On the war front, Ambroise Paré introduced hemostatic techniques, such as vessel ligation. Pain, one of the greatest obstacles, was mitigated with the discovery of anesthesia by William Morton in 1846. Joseph Lister implemented antisepsis with bactericidal substances, and Ignaz Semmelweis recognized the importance of handwashing in preventing puerperal fever.

Regarding surgical ethics, John Gregory formed the philosophical basis of medical ethics, and Thomas Percival, in 1791, wrote the regulations of etiquette and conduct among physicians¹⁴. Both were the basis of medical professionalism and of the first Code of Medical Ethics of the American Medical Association, in 1847. In 1894, the Irish surgeon William Stokes¹⁵ coined the term “surgical ethics” in his book *The Ethics of Operative Surgery*, which already included surgical informed consent and the surgeon’s moral responsibility.

In the 20th and 21st centuries, new discoveries occurred, such as penicillin by Fleming¹⁶, greater understanding of immunology and nutrition, improvement of surgical instruments and imaging studies, development of antibiotics and anesthetic agents, intensive care, and the use of 3-D microcameras, culminating more recently in

the development of minimally invasive surgeries, such as videolaparoscopy, in 1987, in France, by Philippe Mouret¹⁷.

Evolution continued with the popularization of robotic surgery from the 2010s onward, driven by the company Intuitive Surgical, which stood out for innovations in design and increased computing power¹⁸. In 2025, the use of artificial intelligence (AI) revolutionized the field, when the autonomous system SRT-H successfully performed a cholecystectomy using *ex vivo* porcine tissue, fully autonomously, that is, without any human assistance, marking the first demonstration of an autonomous surgical robot capable of adapting to individual anatomical variations in real time¹⁹.

Also in 2024, another notable feat was the first large-scale transcontinental robotic telesurgery, performed between Italy and China. Chinese physician Zhang Xu remotely operated on a patient in Beijing who had prostate cancer, over more than 8,000 kilometers. This unprecedented procedure used a 5G network and fiber optic connection²⁰.

New technologies and surgical ethics

Surgical innovation, although it drives advances, introduces ethical dilemmas related to unknown risks and lack of genuine informed consent. Reitsma and Moreno²¹ warn that innovative techniques such as the surgical robot may be implemented without robust safety evidence, exposing patients to potential harm. In 2013, there was limited reporting of statistics involving 174 serious cases and another 71 deaths related to a pioneering robotic surgical platform in the United States.

Ferreres and collaborators²² identified that surgeons frequently face dilemmas involving new technologies, terminal patients, palliative care, surgical futility, advance directives, treatment refusal, decisions to resuscitate or not, and breaking bad news, due to the greater bodily invasiveness, higher risk, and complexity of the operation in an intolerant, instant-gratification society. All this reinforces the need for clear ethical guidelines.

The advancement of techniques such as robotics, AI, minimally invasive surgery, and high-complexity implants requires critical reflection

on benefits, risks, and moral implications²³. Robotic surgery offers greater precision, fewer complications, and faster recovery, but also presents ethical challenges, such as a learning curve, high costs, and possible disparities in access³⁰. Devices such as smart implants and biochips raise questions about patient data privacy and confidentiality, since they continuously collect physiological information²⁴.

Transcontinental remote surgery represents a paradigm shift in contemporary medicine. Such innovations promise to democratize access to specialists and optimize intraoperative decisions, but they also introduce complex ethical dilemmas, ranging from legal liability to patient autonomy²⁵. Remote surgery reduces geographic barriers but faces challenges such as latency and technical safety. Delays in data transmission may compromise critical responses, raising questions about the principle of nonmaleficence²⁶. Questions also arise about legal liability, because in cases of failure the allocation of liability among surgeon, equipment manufacturer, and network provider is ambiguous, thus requiring new legal frameworks²⁶.

Equity in access is also highlighted, since the necessary infrastructure may exacerbate disparities between health systems²⁷. Moreover, AI, capable of analyzing big data and proposing unconventional surgical techniques, challenges traditional notions of medical conduct and may end up limiting autonomous decision-making, because algorithms that learn from global datasets may suggest courses of action not validated in local guidelines and thus generate conflicts with the principle of beneficence²⁸.

Surgical informed consent

Surgical informed consent is a mandatory document in the management of surgical conditions and is relevant to all parties involved. It documents the patient's self-determination and confirms that the procedure, its risks and benefits, alternative treatment options, and the option of no treatment have been discussed, and that refusal of treatment at any stage is an option, without coercion or persuasion²⁹. The document must list three components: 1) decision-making

capacity and voluntariness; 2) disclosure of information and its full comprehension; and 3) written consent signed by the patient or legal representative. It enables shared decision-making, in which the patient's preferences and values are always heard and the patient is placed at the center of care.

Research indicates that surgical informed consent goes beyond a mere formal legal procedure and has become an ongoing ethical dialogue²⁹, a genuine agreement between the parties. In highly complex situations, such as oncologic or robotic surgeries, the quality of consent depends directly on the surgeon's ability to communicate technical risks to the patient, without using medical jargon and without underestimating the patient's capacity to make decisions³⁰.

According to Cardenas³, practical wisdom is fundamental in the context of informed consent, since the lack of transparency in this process, with false promises or failure to provide adequate information, may be considered a complex ethical issue, even when the surgery is technically successful.

Studies indicate that errors in completing the consent form are among the main causes of ethical disputes in modern surgery³¹. A multicenter study conducted in 2022 found that 40% of patients undergoing elective procedures did not fully understand the risks mentioned in the surgical informed consent, nor did they remember the surgeon's name after a few weeks, facts that indicate a gap in physician-patient communication³¹. Another key point is that these challenges are more intense in vulnerable groups, such as older adults or people with lower educational attainment, in whom inequity in access to information may infringe the principle of justice³⁰.

To reduce these threats, authors such as Miller and collaborators³² suggest integrating complementary methods into the standard informed consent process, such as educational audiovisual resources, shared decision-making between physicians and proactive patients, and support from interdisciplinary teams in less straightforward decisions, which consider the uncertainties and fears involving surgical procedures. Contemporary surgical ethics should view informed consent as an ongoing conversation

that accompanies technological advances and the growing need for humanization in medicine³².

Based on the reflections presented by Boch⁵, the field of surgical technoscience requires a stance guided by the “ethics of responsibility,” in which the priority is to ensure adequate patient care while promoting scientific advancement. With technological advances, informed consent faces additional challenges that require adaptive ethical protocols to guarantee autonomy without compromising treatment efficacy²⁹.

Regarding the scientific validation of these technologies, many medical devices are introduced to the market based on limited studies and at exorbitant costs. The lack of rigorous regulation in some contexts may expose patients to unknown risks, including the chance of death. Informed consent in emerging technologies must be customized to include clear explanations about possible nontraditional complications, such as software failures or electromagnetic interference²⁴.

Informed consent for surgical procedures using AI requires a set of additional considerations, distinct according to the specific application of the technology. In this context, it is necessary to conceptually differentiate: clinical decision support systems, which provide probabilistic recommendations; teleoperated surgical robots, such as Da Vinci, controlled remotely by a local surgeon; autonomous surgery, in which AI plans and executes movements without direct human intervention; telesurgery, which consists of operating at a distance, generally involving potentially critical latency; and AI-based training systems, simulation, and feedback for surgeons. Each of these categories involves partially distinct ethical, legal, and safety risks, which call for differentiated informed consent³³⁻³⁵.

Based on this distinction, informed consent for procedures involving AI, especially in autonomous, decision support, and telesurgery modalities, must include the following considerations:

1. Explanation of the probabilistic nature of AI recommendations, because the patient must be informed that AI outputs are not deterministic but are expressed in terms of probabilities, subject to uncertainties inherent to statistical models and training data. This transparency

is required by the principles of explainability and patient autonomy³³.

2. Disclosure of conflicts of interest. It must be declared whether the AI device or surgical robot is sponsored, donated, or supplied by technology companies, as well as the existence of any financial or academic ties of the surgeons or the institution with the manufacturers. Such conflicts may influence the recommendation of the procedure and must be included in the informed consent³³.
3. Applicable regulations and risk classification. The patient must be informed about the regulatory framework of the AI system used. In the European Union, the Artificial Intelligence Act (REGULATION (EU) 2024/1689) classifies surgical AI systems as “high risk,” subject to rigorous certifications, external audits, and continuous human oversight. The informed consent must mention whether the device in question has obtained such certifications or operates in an experimental context³⁴.
4. Possibility of severe AI hallucinations. For generative systems or systems based on large language models (LLMs) integrated into decision-making, patients must be warned about the phenomenon of hallucination, the production of plausible but factually incorrect or clinically dangerous outputs. Although more studied in LLMs, hallucinations may also occur in computer vision models used in autonomous surgery, such as erroneous identification of anatomical structures³⁵. Informed consent must explain that, despite testing, the complete absence of hallucinations cannot be guaranteed and that human oversight or algorithmic redundancy mechanisms are in place.

Surgeons and the use of social media

Surgical ethics in the context of social media demands critical reflection on professional representation and the responsibility inherent in the practice of surgery, as highlighted by the American College of Surgeons (ACS)³⁶. The ACS warns that all content posted on digital platforms, even on personal profiles, is subject to public scrutiny, including by patients, institutions,

and regulatory bodies, requiring conduct aligned with the principles of medical professionalism³⁶.

The ambiguity between informal contexts and public perception is illustrated by the case of the “surgical selfie,” in which a surgical image without patient identification is interpreted as inappropriate, highlighting the dissonance between the surgeon’s intention and the socially expected ethical standards³⁶. Moreover, posts considered unethical, such as those associated with unlawful conduct or undue exposure of procedures, may lead to institutional sanctions and damage professional reputation, reinforcing the need for a reflective approach, called “pause before posting,” before sharing content online³⁵.

The practice known as patient-targeted googling consists of a health professional searching the internet for information about the patient, without the individual’s prior knowledge or consent. Although in some contexts it may be motivated by the duty of care, as in the attempt to understand unreported psychosocial risks or to locate family members in emergency situations, this conduct seriously strains the ethical limits of the clinical relationship. By suppressing consent and transparency regarding the source of data, it creates an ambiguous form of proximity that easily slips into invasion of privacy and breach of confidentiality, and may be interpreted less as professional zeal and more as curiosity or voyeurism on the part of the clinician³⁶.

Unexpected intraoperative findings

Unexpected intraoperative findings, or incidental findings (IF), represent a significant ethical challenge in surgical practice and are defined as unanticipated discoveries unrelated to the primary indication of the procedure, ranging from benign conditions to serious pathologies³⁷. The inclusion of specific clauses in the surgical informed consent about the possibility of IF has been debated under the principles of autonomy, beneficence, and justice¹.

Wolf and collaborators³⁷ developed a tool that uses the same dynamic as a traffic light: when facing an IF on which it is possible to act intraoperatively, this is classified as a green-light case. A red-light case occurs when action is

not possible. A yellow-light case demands time, reflection, and care to determine the type of surgical decision to be made, with the assistance of an available specialist.

The patient’s right to be informed about potential IF must be weighed against the risk of causing unnecessary anxiety about a diagnosis or even leading to the nocebo effect. The decision to investigate or ignore an IF must weigh the benefits of early intervention against the risks of unnecessary procedures, such as invasive biopsies³⁷. In oncologic surgeries, IF such as adrenal nodules may completely alter the therapeutic plan, requiring immediate ethical judgment³⁷. IF may lead to costly additional tests, questioning equity in health systems with limited resources.

Surgical informed consent must explicitly mention the possibility of IF and the possible approaches: documentation, immediate investigation, or follow-up³⁷, in addition to defining clear limits on which types of findings will be communicated and including the patient’s preferences, such as whether the patient wishes to be informed about all findings, even those of uncertain significance³⁷.

In Brazil, the Federal Council of Medicine (CFM), through Resolution 2,232/2019³⁸, requires that the patient have full autonomy over decisions concerning them and their consequences. Based on this premise, intraoperative findings with prognostic impact must be formally documented and communicated, creating an ethical and legal duty to ensure continuity of care. The legal dimension of medical interventions in these cases is particularly complex when it involves unauthorized actions or actions that affect patient autonomy.

As observed by Sarker³⁹, the case *Reeves versus The Queen*, in which a gynecologist performed an extensive genital resection without consent, illustrates that unjustified surgical conduct may be classified as serious bodily harm, with criminal repercussions. The author argues that the adoption of intraoperative risk classification tools, such as the “traffic light model,” could reduce decision-making errors, especially in oncologic cases, in which immediate conduct directly affects patient survival.

Academic training in surgical ethics

Education in surgical ethics for residents and researchers constitutes a fundamental pillar of contemporary medical training, although few services currently offer such training. Few surgeons are academically interested in this subject, although their practice constantly involves ethical decision-making. Current educational paradigms, their challenges, and proposals for improvement from the perspective of bioethical dimensions show that the traditional approach is predominantly based on decontextualized lectures, on William Halsted's early 20th-century model of learning by observation—"see one, do one, teach one"—and case-based discussions in ethics rounds⁴⁰, which places little emphasis on resolving contemporary dilemmas⁴¹.

Modern practices that depart from traditional logic can be implemented through realistic simulations to train clinicians to break bad news, analyze real cases involving medical errors and conflicts of interest, and use virtual reality to experience patient perspectives⁴².

It is necessary to consider the balance among learning, patient safety, progressive exposure, and error management during the learning curve. Medical education must also emphasize the ability to judge "what a reasonable body of surgeons would do," aiming at teamwork and adapting to expectations of shared decision-making⁴¹. Through continuous training, the medical curriculum must include ethical demands in all surgical specialties and, when the ethical conflict cannot be overcome, ethics committees should be convened promptly.

Surgical performance assessment system

Surgical performance assessment or rating systems have gained relevance in high-complexity care and are a useful tool for payers to direct patients to more experienced surgeons. However, this practice raises important ethical issues, particularly regarding the potential selection of easier cases by surgeons (cherry-picking) to improve their performance metrics⁴³.

The metrics usually used by performance systems are based on mortality and morbidity rates, operative times, reoperation rates, hospital costs, and patient satisfaction⁴⁴. However, such metrics still cannot adequately account for complications, comorbidities, case complexity, surgical volume, and differences in the population served for more reliable statistical analyses⁴⁵.

Cherry-picking, which consists of selecting less complicated cases, demonstrates that rating systems may encourage surgeons to refuse high-risk patients or even transfer complex cases to other professionals⁴⁶. As mentioned, payers prefer complex cases to be directed to more experienced teams to avoid costs and negative outcomes, even if the patient lives far away. The advancement of telesurgery may provide a solution in this context of geographic distance and limited experience.

Another relevant point concerns distributive justice, since more seriously ill patients may have reduced access to the best surgeons, as well as inequities in resident training and the potential conflict of interest when systems are administered by health insurance plans⁴⁷. Although these systems may improve the overall quality of care, their implementation without adequate ethical safeguards may lead to harmful distortions for patients and society.

The "four evils" of modern surgery

The ACS, the world's largest association of surgeons, identifies the "four evils" in the surgical context, which should be viewed through a bioethical lens: unjustified surgery, ghost surgery, fee-splitting, and exorbitant fees, representing serious distortions in the surgeon-patient relationship⁴⁸. In response to the ethical vacuum, the ACS has sought to combat these evils since its creation in 1913. Unjustified surgery, defined as intervention based on inadequate indications or contrary to practical consensus, frequently manifests in unnecessary procedures, as illustrated by documented cases exposed in the media, highlighting serious failures in informed consent and in risk-benefit assessment.

Ghost surgery, characterized by concealment or false identification of the primary surgeon to the

patient, generates intense public debate, straining the balance between transparency and patient rights⁴⁹. There are other dangerous situations within the surgical arena, such as concurrent, simultaneous, or overlapping surgeries, in which the roles of the surgeon and assistants become unclear and may compromise the outcome of the procedure^{48,49}.

Fee-splitting, or sharing of medical fees, understood as the illegitimate sharing of fees between surgeon and referring physician, creates perverse financial incentives that subvert surgical indication based on the patient's primary interest, which raises broader concerns about patient care and the physician-patient relationship⁴⁹. In the 20th century, in the United States and Europe, there was the figure of the itinerant surgeon, who arrived by cart and had already scheduled operations for several patients. Once the work was concluded, he divided the money with local medical assistants (fee-splitting) and left for another place.

Exorbitant fees, amounts disproportionate to the complexity of the service or the patient's financial capacity, undermine public trust and reflect the lack of objective parameters for remuneration, especially after the migration of surgeries to hospitals and the increase in medical corporatism^{48,49}. If not properly regulated, telesurgery may soon become a new form of itinerant surgery, with illicit fee-splitting by a ghost surgeon and exorbitant charges.

Given this disruptive environment, the concept of quaternary prevention involves identifying patients or populations at risk of overmedicalization or overtreatment (including surgical), in order to protect them from invasive medical intervention and to recommend only procedures that are scientifically and ethically acceptable⁵⁰. In other words, one form of prevention is to resist overdiagnosis and overtreatment, which may generate unnecessary surgeries, often driven by pressure from the pharmaceutical and technology industry⁵⁰.

The ACS, in 2016, promulgated a statement of principles requiring all new members to uphold the following responsibilities in perioperative care⁴⁸ in order to avoid these evils and other serious ethical lapses:

- be an advocate for patients' needs;
- discuss therapeutic options, including risks and benefits;
- resolve any conflict of interest that negatively impacts surgical care;
- be sensitive to and respectful of the patient considering their vulnerability before surgery;
- discuss adverse events and medical errors;
- understand patients' social, psychological, cultural, and spiritual needs;
- provide support to patients' families;
- respect the knowledge, dignity, and perspective of other healthcare professionals;
- participate in training throughout their careers;
- embrace values such as honesty, humility, trust, and altruism;
- work to establish a fair, effective, and efficient distribution of resources;
- not discriminate based on sex, race, disability, religion, social status, or ability to pay.

Applying these concepts to the Brazilian regulatory context, the Code of Medical Ethics (CEM) offers clear benchmarks that directly address the four distortions. Unjustified surgery and ghost surgery violate fundamental principles such as informed consent (Article 22), which requires clarification about the procedure, its indication, and the responsible professional, and the right to refuse treatment (Article 24)⁵¹.

The omission or false identification of the primary surgeon, in addition to infringing the duty of transparency, constitutes a violation of professional confidentiality and the trust the patient places in the physician, and may be classified as a violation of professional responsibility as provided for in Chapter III of the CEM. Fee-splitting, in turn, is expressly prohibited in Article 58, which prohibits practicing medicine in association with pharmaceutical, industrial, or other entities for the purpose of obtaining an undue advantage, and in Article 59, which prohibits physician participation in the division of fees with unqualified persons or persons who did not effectively participate in the professional act, provisions that are connected to the need to manage conflicts of interest so that surgical indication remains patient-centered⁵¹.

Regarding exorbitant fees and medical advertising, the CFM establishes that remuneration must correspond to the complexity and responsibility of the act, and abusive charges that exploit the patient's vulnerability are prohibited (Article 20). CFM Resolution 1,974/2011⁵², which regulates medical advertising, prevents the disclosure of fees or payment methods as a strategy for attracting clients, curbing practices that associate the surgical act with commercial appeal and reduce the clinical relationship to a commercial transaction.

Thus, the Brazilian regulatory framework, anchored in the CEM and in CFM guidelines^{51,52}, offers tools to address the four distortions indicated by the ACS, reinforcing the primacy of transparency, nonmaleficence, and justice, and underlining that strict adherence to such precepts is an indispensable condition for a surgical practice that honors the duty of care and the social trust placed in the profession. In summary, citing Ferreres and collaborators: "those devoted to their surgical practice must excel not only in science or art, but also in kindness and candor of spirit, always guided by highly ethical values and virtues"²².

Final considerations

Surgical ethics constitutes a unique and dynamic domain due to the invasive, immediate, and paradoxical nature of the surgical act, which demands a careful balance among technical competence, knowledge, and practical wisdom. Its historical evolution is intrinsically linked to technological advances and socioeconomic demands, a characteristic that creates dilemmas

in contexts of resource scarcity and in managing ethical deviations transparently.

Informed consent is a dialogic medical-legal process that produces engagement and equality between the parties, essential to preserve the autonomy of the surgical patient, especially in the face of innovations that still lack regulation, such as transcontinental remote surgery. The incorporation of social media into professional practice requires a rigorous distinction between personal and professional spheres, at the risk of compromising public trust and the surgeon-patient relationship. In addition, unexpected intraoperative findings, surgical performance assessment systems, and the training of residents and researchers regarding surgical ethics expose tensions between beneficence and nonmaleficence, which, in turn, require adaptive ethical protocols.

The literature contains criticism about the normative fragility in the face of AI-based emerging technologies, which challenge traditional notions of moral responsibility and aggravate asymmetries in access and communication, intensifying vulnerabilities and failures. Other systemic obstacles include the already recognized practice of unnecessary surgical indications, ghost surgery, itinerant surgery, fee-splitting, and exorbitant fees, long-standing manifestations of surgeon misconduct driven by financial gain.

It is urgent to structure surgical ethics around the triad of action, body, and relationship, and to integrate continuous training in surgical ethics for residents, surgeons, and researchers with professional self-regulation and updated legal frameworks.

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