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Review

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Ethical issues of artificial intelligence in plastic surgery: a narrative review

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Abstract

The integration of artificial intelligence (AI) into plastic surgery is transforming the field by enhancing precision in preoperative planning, diagnostic accuracy, intraoperative assistance, and postoperative care. AI encompasses machine learning, natural language processing, computer vision, and artificial neural networks, each offering unique advancements to surgical practice. This narrative review explores the ethical challenges of AI in plastic surgery, addressing concerns such as data protection, algorithmic bias, transparency, accountability, and informed consent. A comprehensive search adhering to PRISMA guidelines identified 63 studies, with 15 selected for in-depth analysis. Findings indicate significant ethical issues: data privacy needs stringent cybersecurity, biases in AI models must be mitigated, and transparency in AI decision making is essential. The review emphasizes the necessity for updated Health Insurance Portability and Accountability Act (HIPAA) regulations, robust validation mechanisms, and the development of explainable AI models. It also highlights the need for an independent regulatory body to oversee AI integration, ensuring ethical standards and protecting patient welfare. Although AI presents promising benefits, its successful application in plastic surgery hinges on addressing these ethical challenges comprehensively.

Keywords: AI, machine learning, plastic surgery, bias, large language models

INTRODUCTION

The field of plastic surgery is undergoing a significant transformation with the integration of artificial intelligence (AI). AI is an umbrella term that encompasses various models of computer learning, and is revolutionizing numerous industries, including healthcare[1]. AI can be subdivided into four major categories: machine learning (ML), natural language processing (NLP), computer vision (CV), and artificial neural networks (ANN). ML involves algorithms that learn from data autonomously without explicit programming. NLP processes and interprets written texts into structured data, with subsets such as large language models (LLM) exemplified by systems like ChatGPT and Google Bard[2]. CV focuses on the analysis of visual inputs to emulate human vision, while ANN aims to replicate human brain functions through layers of computational units processing multimodal information[3,4].

Integrating AI in plastic surgery promises numerous benefits, including increased precision in preoperative planning, enhanced diagnostic accuracy, intraoperative assistance through augmented reality, and improved postoperative care management[5-8]. These advancements can potentially reduce surgical errors, personalize treatment plans, and ultimately enhance patient outcomes. AI algorithms can analyze extensive datasets to create customized surgical plans, while augmented reality can overlay critical information onto the surgical field, assisting surgeons during procedures. Current applications being developed and tested include AI-driven predictions of surgical outcomes, optimization of postoperative care, and precision diagnostics in breast cancer cases.

Despite the technological advancements and clinical benefits, the integration of AI in plastic surgery raises significant ethical issues. The resurgence of interest in AI, particularly with the advent of systems like ChatGPT, has spotlighted the need to address these ethical concerns comprehensively. Issues such as algorithmic bias, transparency, accountability, and patient privacy are paramount[9,10]. Biased datasets can lead to discriminatory practices, while the opaque nature of AI decision-making processes, often termed "black boxes", can undermine trust between patients and healthcare providers[11,12]. Additionally, the question of liability in cases where AI tools influence clinical decisions poses legal challenges[13]. To minimize potential patient harm and ensure the equitable application of AI, it is crucial to explore these ethical issues thoroughly.

Developing comprehensive guidelines and regulations is essential for navigating these challenges and ensuring that AI integration adheres to the highest standards of patient care. This narrative review examines the current literature on the ethical considerations of AI in plastic surgery and discusses future impacts on society if the unregulated use of AI continues. By addressing these ethical concerns, we aim to provide recommendations for the responsible integration of AI in surgical practice, ensuring that the benefits of this technology are realized while safeguarding patient welfare.

METHODS

Search strategy

The search strategy adhered to the PRISMA (2020) guidelines. Two independent authors, AS and IS, conducted comprehensive searches across multiple databases, including PubMed, Google Scholar, Scopus, and MEDLINE, covering the period from 1901 to May 2, 2024. They utilized specific search terms: (Ethics) AND (Artificial Intelligence) AND (Plastic Surgery OR Aesthetic Surgery OR Cosmetic Surgery Or Peripheral Nerve Surgery OR Hand Surgery OR Burn Surgery). To ensure thoroughness, Google Scholar was used as the gold standard to test the efficacy of the search terms. Any discrepancies or confusion encountered during the search process were resolved through discussion with a third author (BL).

Study selection and outcomes

The selection process involved a rigorous review of titles and abstracts, followed by a full-text analysis of eligible studies. The inclusion criteria were set to encompass articles specifically related to plastic surgery, those mentioning the ethical implications of AI, primary research studies (including randomized controlled trials, non-randomized trials, case studies, case-control studies, cohort studies, and observational studies), and secondary reviews (such as systematic reviews, narrative reviews, and other types of reviews). Studies not published in English, letters or editorials, studies without specific mention of plastic surgery, and studies that did not address ethical considerations were excluded.

Data collection and extraction

Identified studies were imported into EndNote 21 for preliminary screening. Titles and abstracts were reviewed to filter relevant studies, followed by a full-text analysis of the eligible ones. Despite the extensive search, no primary studies solely focused on the ethical implications of AI in plastic surgery. Consequently, the ethical barriers identified across various studies were compiled for a comprehensive tabular analysis. Consideration was also given to potential biases and confounding factors, such as the funding sources of the studies.

Synthesis of findings

The results extracted from the eligible studies were organized into a tabular format with the following headings: author, study design, number of patients/articles, study aim, findings, and limitations. These findings were then grouped under relevant themes and presented in a narrative format. Given the qualitative nature of the information, the studies included were heterogeneous.

Search terms

The search strategy included specific terms to ensure a comprehensive capture of relevant literature:

"Ethics AND Artificial Intelligence AND Plastic Surgery"

"Ethics AND Artificial Intelligence AND Aesthetic Surgery"

"Ethics AND Artificial Intelligence AND Cosmetic Surgery"

"Ethical implications AND AI AND Plastic Surgery"

"Ethical considerations AND AI AND Aesthetic Surgery"

"Ethical issues AND AI AND Cosmetic Surgery"

RESULTS

A total of 63 studies were identified based on the search criteria. After excluding duplicates, 55 studies remained. After reviewing abstracts and titles, 28 studies were excluded, leaving 27 for further assessment. After applying the inclusion and exclusion criteria, 15 studies were selected for in-depth analysis. These 15 studies included four narrative reviews, four systematic reviews, a brief report, a scoping analysis, two unspecified review types, two comparative studies, and one guideline/review-style study [Table 1]. The ethical challenges discussed in these studies included data protection and privacy, bias reduction and algorithmic fairness, liability and accountability, informed consent and transparency, validation and regulation, and research and educational ethics.

Singh *et al. Plast Aesthet Res* 2024;11:58 | https://dx.doi.org/10.20517/2347-9264.2024.108

Table 1. Summary of studies meeting inclusion criteria that were reviewed

Authors	Study designs	No. patients/No. articles	Study aim	Findings	Limitations
Kenig *et al.* (2024) (Ethics of AI in plastic surge)[14]	Guideline and review -14 articles were found that met the inclusion and exclusion criteria -Does not mention explicitly the type of review conducted	Review of 14 articles	Create a guideline for ethical implications of using AI in plastic surgery	Data protection -Large database is needed for accurate results -Plastics patients have sensitive images and data Bias reduction -Model only as good as the data set used to train Liability -Clear regulations defining liabilities involving developers, healthcare providers and legal entities are vital -While AI is in initial phase medical doctors will assume full responsibility -Needs to be a plan for when AI is advanced Transparency -Promote explainable AI models -Documentation and consistent reviews of AI decisions can increase trust -Continuous oversight can ensure alignment with medical standards Informed consent -Patients must be informed about the role,risks and benefits of AI Validation -Need to go through rigorous testing -An independent model to test AI Regulation -Physicians to help lawmakers in creating rules based on the respective field	-Only searched PubMed -Did not mention the year that they conducted the search or the authors that conducted the search
Liu *et al.* (2023) (Can ChatGPT be the plastic surgeon's new digital assistant? A bibliometric analysis and scoping review of ChatGPT in plastic surgery literature[15]	Scoping review on publications from December 2022 to July 2023	30 studies included in the review	Examine the presence of ChatGPT, an AI chatbot, in the literature of plastic surgery	Applications in research/creation -Incorrect or biased outputs -Responsibility lies with user Clinical application -ChatGPT can offer prompt medical guidance for common inquiries without jargon -The misleading information may mislead those who do not have previous medical knowledge -ChatGPT in microsurgery w/breast reconstruction and head and neck reconstruction and complex wound reconstruction	

				-Can provide visual aid and simulation -Issues include: non-specific answers, reliance on existing knowledge, fake references and breach of patient privacy Surgical education -Can already pass the USMLE step 1 and 2 exams -Not yet at consultant level of knowledge -Therefore complex questions asked may result in incorrect answers Ethics -Patient privacy -Access to sensitive images -Confidentiality issues and data breaches -Lack of accountability and oversight can cause harm -Plagiarism -Accuracy
Farid *et al.* (2024) (AI in plastic surgery: insights from plastic surgeons)[18]	Comparative study 34 question survey on the role of AI in plastic surgery	153 surgeons worldwide with most being in Latin America	Understand the attitudes towards using AI in plastic surgery	Patient privacy -Data encryption and access control -HIPAA compliance Data quality -Audits and validate the data to reduce bias -Anomaly detection Algorithmic biases -Diverse patient population for training the AI -Continuous monitoring Explainability and transparency - provide explanations for the decisions that were taken
Cevik *et al.* (2023) (Transforming breast reconstruction: the pioneering role of artificial intelligence in preoperative planning)[6]	Brief report	N/A	Role of AI in preoperative planning of breast reconstruction	Bias -Socioeconomic, racial, or geographic disparities in healthcare access -Ensure fairness in data algorithms they are trained on Could lead to inaccurate predictions hence inaccurate pre op decisions Patient consent, privacy and transparency -Transparency of AI decision-making -"black box problem" making recommendations without a clear and understandable rationale
Abi-Rafeh *et al.* (2024) (Large language models and artificial intelligence: A primer for plastic surgeons on the demonstrated and potential applications, promises, and	Systematic review	175 articles included	Systematic review on the current and proposed clinical applications of ChatGPT in medicine and surgery	Limitation to data training -Influence of data on which ChatGPT was trained -ChatGPT trained in 2021

limitations of ChatGPT)[16]				Intrinsic to algorithm -Lack of transparency into methods and processes used to generate output -Inaccurate, incomplete or nonsensical answers -Outputs can be variable for same input (lack of reproducibility) -Lack of deciphering between different levels of evidence Extrinsic -Academic integrity and lack of producing accurate references (plagiarism) -HIPAA compliance, confidentiality, cybersecurity -Potential for inequity in adoption due to monetary issues -Uncontrolled and self-propagated evolution of AI -Infringement on human creativity, originality, creative thinking, and analysis	
Lim *et al.* (2023) (Using generative artificial intelligence tools in cosmetic surgery: A study on rhinoplasty, facelifts, and blepharoplasty procedures)[20]	Comparative study -GANs compared to LLM AI for rhinoplasty, blepharoplasty, and facelifts -4 board certified plastic surgeons were consulted	N/A	Use AI models to assist with diagnosis, teaching, data collection, research	Patient privacy -Using AI image formations could help preop planning without using actual patient photos Consent -Ensure transparency when using AI for pre-op planning Surgical education -Education required patient data but with AI generated images, this could be bypassed Biases -Did not include men -Did not generate images of darken skin tones -Did not include women of larger body habitus or older age group -If the model can be trained to be more life-like or accurate, the access medical education is standardized (distributive justice) Liability/Accountability -Avenue for redress when AI makes errors	
Murphy *et al.* (2020) (Artificial intelligence in plastic surgery: What is it? Where are we now? What is on the horizon?)[24]	Review style study: MEDLINE, EMBASE, cochrane central register of controlled trials and cumulative index of nursing and allied health literature	unknown-not mentioned	Review of literature surrounding current application of plastic surgery and possible future application	Data protection -AI can successfully predict age based on facial features -South Korean cosmetic surgical group has used motion sensor surgical instruments to collect data in real-time	-Not mentioned what type of review was conducted -No mention of how many studies were analysed -No mention of the authors conducting the

				-Mentions using surgical recordings to train AI Validity -Validate and audit the algorithms biases -Biases based on racial minorities and females Job security -Job losses -De-diversify humanity if models are created based on social stereotypes	search
Choi *et al.* (2023) (Artificial intelligence in facial plastic surgery: A review of current applications, future applications, and ethical considerations)[17]	Review	N/A	Provide an overview of AI an discuss current uses, future possibilities and ethical implications of AI in plastic surgery	Job Losses -Ethical consideration in this paper is more around AI replacing healthcare using robotic surgery Bias -Racial, socio economic or gender bias -Automation bias in form of patient documentation (accepting documentation without confirmation of its accuracy) Data protection -AI can be used to identify and mask out personal identifying information and other sensitive information before patient data is stored on the cloud	-Type of review not mentioned
Jarvis *et al.* (2020) (Artificial intelligence in plastic surgery: current applications, future directions, and ethical implications) [25]	Systematic literature review of all available publications as of 2020 -mentions the authors that completed the study -129 articles of which 14 were analysed	14 studies analysed	The article highlights the current applications of AI in plastic surgery, future implications and possible ethical considerations	Informed consent -Data use agreement between providers and aggregators Quality assurance -Ensure that data used for training is representative of patient population Integrity of doctor-patient relationship -AI does not impact on trust, empathy and shared decision making	
Rasteau *et al.* (2022) (Artificial intelligence for oral and maxillo-facial surgery: A narrative review)[19]	Narrative review	N/A	(1) Provide essential technical elements to maxillofacial surgeons to enable them to apprehend possibilities offered by AI; (2) Provide overview of most common applications of AI in OMFS; (3) Assess future prospects and challenges in clinical practice	Data protection and privacy -Patient data is considered sensitive information Bias reduction/algorithmic fairness -Difficult to recruit a high volume of patients to create an accurate enough AI -AI must be representative of the population -Avoid automation bias for practitioners Pillars of medical ethics -Harm of inaccurate model -Decisions of AI should not conflict with the freedom of recipients to act on their own beliefs (autonomy)	

				-Should be accessible to as many people as possible (distributive justice) -Replacing healthcare worker is unrealistic currently -Does not have the skill of contextualisation, empathy or listening	
Sharma *et al.* (2023) (ChatGPT in plastic and reconstructive surgery)[27]	Narrative review	N/A	Summary of current literature on ChatGPT and plastic surgery and provide direction for future research	Research ethics -Plagiarism, inability for research and referencing -Cannot access paid research journals	-Number of studies not stated
Espinosa Reyes *et al.* (2023) (Artificial intelligence in facial plastic and reconstructive surgery: a systematic review)[26]	Systematic review	17 articles were included in study	Review literature regarding AI applications in facial plastic and reconstructive surgery	Data protection -Informed consent and data use agreement Regulation -Developers could have economic incentive and use the private data for profit generation Transparency -Black box phenomenon where the process used by the AI is not transparent Liability -If used intraoperatively, who would be responsible if things go wrong? Bias reduction -If a certain population is used to train the AI model, there could be misrepresentation of beauty standards which would lead to discrimination -Data should be representative of the population	
Seth *et al.* (2023) (Use of artificial intelligence in the advancement of breast surgery and implications for breast reconstruction: a narrative review)[28]	Narrative review	24 studies included	Exploring the role of AI in breast reconstruction, outlining its potential to refine surgical procedures, enhance outcomes and streamline decision making	-Potential job losses -Economic implications -Lack of human touch	
Souza *et al.* (2024) (Applications of artificial intelligence in facial plastic and reconstructive surgery: a systematic review)[22]	Systematic review	Reviewed 41 articles within the last 18 months	Systematic review of the most recent artificial intelligence advances in facial plastic surgery	Privacy -Ensuring data privacy Bias -Avoiding racial and sex bias in modeling Liability -Medicolegal liability of decisions made using artificial intelligence tools Informed consent -Informed consent when using AI for pre-op planning -Patient autonomy in decision-making	
Rokhshad *et al.* (2023) (Artificial intelligence applications and ethical	Narrative review		Review of the current applications of AI in OMF cosmetic surgery in	Bias -Ethnic and gender discrimination	

challenges in oral and maxillo-facial cosmetic surgery: a narrative review)[21]	various setting and its ethical considerations	-AI could lead to propagation of racial divide and loss of diversity -Insufficient data set size for the training of CNN -Black patients are underrepresented in rhinoplasty and blepharoplasty Validity -Lot of data used currently is from dating profiles, the validity of this must be questioned

AI: Artificial intelligence; HIPAA: Health Insurance Portability and Accountability Act; LLM: large language models; CNN: central neural networks.

Data protection and privacy

The privacy of patient images and information is paramount, especially for sensitive procedures such as breast augmentation[14,15]. Ensuring data protection requires a heightened focus on cybersecurity[16]. One study proposed using AI to identify and mask sensitive information that could reveal a patient's identity before it is used for AI model training[17]. Additionally, two studies suggested revising Health Insurance Portability and Accountability Act (HIPAA) compliance regulations to accommodate the use of patient data for AI model training[16,18]. Rasteau *et al.* similarly highlighted the need for sensitive data handling, representative AI models, and alignment with medical ethics to minimize harm, respect autonomy, promote fairness, and complement rather than replace healthcare professionals[19].

Bias reduction and algorithmic fairness

The efficacy of AI models heavily depends on the diversity and representativeness of the training datasets[14]. Lim *et al.* conducted a study using DALL-E to generate AI images for preoperative planning, revealing biases toward producing images of women and excluding those with darker skin tones, larger body habitus, and older adults[20]. Several other studies echoed these concerns, noting racial, bodily, and gender biases in AI datasets[17,21-24]. Furthermore, Choi *et al.* highlighted that supervised ML involves human input, which can vary significantly among surgeons due to differing clinical experiences, potentially exacerbating biases in future AI models[17].

Liability and accountability

Lim *et al.* raised concerns about compensation avenues if AI models make incorrect decisions, suggesting clinicians should initially bear liability for incorrect outputs from AI[20]. This viewpoint underscores the need for clear guidelines on accountability as AI integration in clinical settings progresses[14].

Informed consent and transparency

The issue of informed consent and transparency of AI models was mentioned in several studies. Patients must be informed about the use of AI at every stage, whether for model generation or using NLP to synthesize patient data[14,24]. AI can also assist in preoperative patient consent, with LLMs such as ChatGPT answering basic pre-op and post-op care questions[22]. Jarvis *et al.* highlighted numerous AI applications in plastic surgery, such as machine learning and facial

recognition, while stressing the ethical challenges, particularly the need for robust informed consent, to ensure AI's responsible and sustainable use in healthcare.[25] However, the complex nature of some plastic surgery procedures may lead to AI providing incorrect suggestions[15]. The transparency issue, often called the "black box" phenomenon, arises when AI models do not explain how they reach their conclusions[24,26]. Kenig *et al.* suggested using explainable AI models to mitigate this issue[14].

Validation and regulation

AI models have been reported to produce inaccurate, incomplete, and nonsensical answers to diagnostic questions in plastic surgery[16]. ChatGPT, for example, can answer the same questions differently, indicating a lack of reproducibility[16]. Moreover, the data used to train LLMs like ChatGPT are based on information up to 2021, which may be outdated[16]. ChatGPT's lack of access to paid journals and evidence-based databases further limits the accuracy of its information[27]. Rokhshad *et al.* pointed out that some data used to train AI models are based on dating profiles, which raises questions about such data's validity and ethical implications[21]. Regular audits of AI models and establishing an independent body to test AI technology before its use in plastic surgery are recommended[14]. Regulation should also ensure that companies responsible for AI modeling do not sell private data for profit[26].

Research and education

AI's role in research is growing, but it poses challenges such as the inability to provide accurate references, making papers produced with AI assistance vulnerable to plagiarism and academic misconduct[15,27]. However, AI can be beneficial for training new surgeons[19]. For instance, DALL-E could replace patient images in educational materials, offering a novel approach to trainee education[19]. Seth *et al.* highlighted ethical concerns with AI in breast surgery, emphasizing its experimental nature, economic impacts, and the need for regulation and equitable access globally.[28]

DISCUSSION

The reviewed studies highlighted numerous ethical challenges associated with integrating AI into plastic surgery. Key issues include data protection and privacy, algorithmic bias, liability and accountability, informed consent, transparency, and the use of AI in research and education.

Data protection and privacy are paramount in plastic surgery, especially for procedures involving sensitive information, such as breast augmentation, where clinical images are frequently retained. The intersection of technological advancement and data privacy presents significant ethical challenges, as the development of advanced AI models frequently requires access to sensitive patient data. HIPAA mandates the protection of protected health information (PHI) through administrative, physical, and technical safeguards; however, any breach of patient data during AI model training could profoundly undermine trust in the healthcare system[29]. Moreover, patients may experience a loss of autonomy if sensitive information, particularly clinical images, is leaked, leading to emotional distress and social stigma that further erodes trust in the medical profession[30]. To address these risks, robust cybersecurity measures are critical in securing databases that store sensitive patient data. A promising solution involves employing AI to identify and anonymize sensitive information before it is used in model training, thus protecting patient privacy while supporting model development. Although HIPAA permits the use of de-identified health information without explicit patient consent, it remains ethically correct to ensure patients are informed about potential data usage in AI training. Leveraging AI-driven anonymization techniques offers a viable pathway to reconcile the demands of AI development with rigorous data protection and privacy standards, aligning with current HIPAA mandates[17].

Algorithmic bias and fairness are significant ethical issues in AI models used in plastic surgery. The efficacy of AI models heavily relies on the diversity and representativeness of their training datasets. Current models often lack diversity, leading to inaccurate preoperative planning, unequal treatment outcomes, and potential patient harm. Mitigating bias is complex due to the subjective nature of beauty, which varies across ethnicities and cultures. For instance, some models have been found to produce biased outputs favoring certain demographics while excluding others, such as individuals with darker skin tones, more significant body types, or older adults. Biases in these models may unintentionally reinforce limited or unrealistic aesthetic ideals, which are influenced by cultural and societal biases about beauty standards. This can marginalize features associated with certain ethnicities, promoting a homogenized standard of beauty that fails to respect individual and cultural diversity. These biases not only risk making AI tools less accurate for underrepresented groups but may also discourage these individuals from seeking cosmetic or reconstructive surgery due to perceived inadequacies in the technology. Furthermore, biased AI models can negatively impact patients' mental health by promoting narrow definitions of beauty that contribute to issues around body image and self-esteem. Enhancing AI fairness requires increased representation of minority ethnicities, men, and bariatric patients in training datasets. Addressing these biases is crucial to developing AI models that are accurate, equitable, and sensitive to diverse aesthetic needs.

Liability and accountability are crucial when AI usage results in adverse patient outcomes. Initially, clinicians should bear responsibility for AI decisions. However, as AI technology evolves, a comprehensive medicolegal framework involving clinicians, lawmakers, AI developers, and insurance companies must be established. This framework should ensure that AI tools undergo rigorous oversight and regular evaluation to prevent outdated, biased, or inaccurate models from influencing clinical decisions, safeguarding patient safety and tool accuracy. Preventing the unethical shifting of responsibility is also crucial, as providers or institutions might otherwise attribute errors solely to AI systems, thereby avoiding transparency and diminishing their duty to provide responsible care. A well-defined liability structure would clarify that both AI developers and healthcare providers must remain accountable for the system's reliability and ethical use. Finally, patients must have clear avenues for redress in cases of AI-related errors, which not only protects their rights but also encourages stakeholders to address potential risks proactively. Establishing such a framework reinforces ethical standards, promotes transparency, and upholds trust in AI-driven clinical decisions within plastic surgery and beyond.

Transparency and informed consent are vital to maintaining the integrity of the doctor-patient relationship. Patients must be informed about the use of AI at every stage, from model generation to data synthesis. Open disclosure and informed consent are necessary to uphold ethical standards. AI capabilities are sufficient for straightforward procedures, but clinician oversight remains essential. The AI's inability to explain its decision-making process, known as the black box phenomenon, poses a significant limitation for complex procedures. Developing explainable AI models would allow clinicians to understand and adjust the AI's decision-making steps, thereby enhancing transparency and trust.

AI models in plastic surgery have produced inaccurate and incomplete answers to diagnostic questions, underscoring the need for regular audits and establishing an independent body to test and validate AI technology before its clinical use. This body should ensure that AI models are up-to-date, free from inherent biases, and capable of producing explainable outputs. Additionally, regulating AI companies is necessary to prevent private data misuse for-profit and ensure ethical standards are maintained. Inaccurate AI diagnostics can also lead to significant psychological distress for patients, particularly in plastic surgery, where outcomes impact body image and self-esteem. By ensuring the accuracy and reliability of AI tools, these regulatory measures can help protect patients from the emotional and psychological harms associated

with diagnostic errors.

AI's role in research and education presents unique ethical challenges. Current AI models cannot access paid journals, limiting their ability to generate high-quality research papers and increasing the risk of plagiarism due to inaccurate referencing. Prestigious journals have prohibited AI-generated articles due to data security concerns[31]. A regulatory body granting journal access to specialized medical AI developers could enable better training of AI models to review extensive research literature efficiently. In education, generative AI models like DALL-E could replace actual patient images, addressing consent issues. However, current AI models, such as ChatGPT-3, have demonstrated limited proficiency in specialized examinations, indicating they are inadequate for providing surgical education[15]. Ongoing evaluations with more advanced models such as ChatGPT-4 are necessary to assess their potential in educational settings.

The studies analyzed in this review have several limitations. Some studies exclusively used PubMed as their database, and there was a lack of clarity on search timelines and authors in certain reviews. The four reviews did not mention the number of analyzed studies. These limitations increase the risk of bias and reduce the generalizability of findings. However, this paper's strengths include analyzing the most up-to-date evidence regarding AI ethics in plastic surgery and adhering to PRISMA 2020 guidelines for systematic searches. A quality assessment of included studies was conducted to enhance the rigor of this review. The qualitative nature of this narrative review introduces heterogeneity, making meta-analysis difficult. Furthermore, the absence of quantitative studies on AI ethics in plastic surgery highlights the need for broader research, including other surgical fields, to develop comprehensive ethical guidelines for AI integration in healthcare.

CONCLUSION

This paper underscores the critical ethical challenges associated with the integration of AI in plastic surgery and emphasizes the necessity for substantial resources to ensure its ethical use. Key recommendations include enhancing cybersecurity measures, re-evaluating HIPAA regulations, and establishing an independent regulatory body dedicated to overseeing AI implementation. This regulatory body should address algorithmic bias, provide avenues for redress in cases of AI-related errors, and ensure access to quality medical journals and the development of explainable AI models. While AI holds the potential to resolve several ethical issues, such as patient data protection and informed consent, its successful integration into clinical practice demands careful consideration and ongoing scrutiny.

DECLARATIONS

Authors' contributions

Performed data acquisition, as well as providing administrative, technical, and material support: Singh A, Seth I, Lim B

All authors made substantial contributions to the conception and design of the study and performed data analysis and interpretation.

Availability of data and materials

Not applicable.

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Conflicts of interest

All authors declared that there are no conflicts of interest.

Ethical approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

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