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# From scalpel to software: the potential role of AI in plastic surgery training - a scoping review

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## Abstract

**Aim:** The evolving capabilities of artificial intelligence (AI) are revolutionizing medicine, and AI integration into surgical training has produced novel tools that are altering the educational landscape. Therefore, the aim of this review is to demonstrate current and future applications of AI in plastic surgery training.

**Methods:** A detailed search was performed using PubMed and other search engines for applications of AI within surgical education.

**Results:** Of papers that met inclusion criteria, eight addressed AI in plastic surgery education, with others addressing general surgery ($n$ = 4), neurosurgery ($n$ = 3), endodontics ($n$ = 1), obstetrics/gynecology ($n$ = 1), orthopedic surgery ($n$ = 1), urology ($n$ = 1), and craniofacial surgery ($n$ = 1). Three key areas of research emerged: supplemental/independent learning, operative skills practice, and resident feedback.

**Conclusions:** Novel applications of various AI algorithms within these areas were explored. The limited integration of AI into plastic surgery education compared with other surgical specialties and the limitations inherent to AI were also highlighted. Though limited research has specifically examined the applications of AI in plastic surgery education, its potential as a versatile educational tool within the field is evident. Novel AI algorithms are already enhancing study tools, surgical skill acquisition, and feedback. Further study is imperative to investigate outlets that leverage AI for the advancement of plastic surgery education.

**Keywords:** Artificial intelligence, machine learning, natural language processing, surgical training, plastic surgery education

## INTRODUCTION

Artificial intelligence (AI) is the ability of a machine to perform human-like decision making[1]. AI algorithms utilize computer code to mimic human neural networks, abstracting user inputs and executing complex commands. Generative AI is capable of accessing large swaths of data to generate original material based on user requests. Its capabilities include performing mathematical calculations, generating original images, and creating novel text - all at speeds faster than humans[2]. This novel technology has, therefore, encouraged the integration of digital resources into all facets of medicine, including education[3].

As surgical advancements are made, surgeons are responsible for an ever-growing fund of knowledge and are expected to master an increasingly detailed skillset. Traditionally, resident education has been based on the Halsted apprenticeship model, with education occurring in the operating room, formal didactic sessions, and through individual pursuit of supplemental educational materials. However, increasing curriculum content coupled with limited resident work hours places constraints on resident learning, and leaders are calling for educational reform[4].

Innovations in AI may offer one solution to bridging current gaps in plastic surgery education. AI offers innovative and time-saving methods by which surgical trainees may both obtain information and practice surgical skills outside the operating room. AI may further enhance resident education by objectively assessing operative skills during simulation training or by evaluating the quality of resident feedback. AI language processing may assist residents with quality assessment of published works in preparation for exams and didactic education.

The integration of AI into resident education requires both the acceptance and investment of both surgeons and residents. Despite minimal experience applying AI in medicine, surgeons and residents have overall positive opinions regarding the usefulness of this technology in surgical education[5,6]. A worldwide survey of plastic surgeons revealed their desire to integrate AI into resident education[5]. Surgical residents have also expressed interest in the application of AI within surgery and believe that AI can advance medical education, specifically surgical skill acquisition[6,7]. As a response to the growing demand for the integration of AI in surgical training, in this review, we look to expound on the new and innovative ways in which AI is being incorporated to enhance plastic surgery resident education.

## METHODS

A scoping review was conducted according to the PRISMA-ScR guidelines[8]. The current literature discussing the application of AI in plastic surgery training was reviewed. A search of the PubMed, Cochrane, Scopus, and Google Scholar databases was performed by two independent authors (EH, SN). Given the rapidly evolving field of AI, Google Scholar was searched to include relevant innovations reported outside of traditional peer-reviewed literature. The initial search was completed on February 15th, 2025, with a follow-up search on June 6th, 2025. Search criteria were developed with the assistance of a medical librarian and key meshed search terms included "Artificial intelligence", "machine learning", "natural language processing", "plastic surgery training", "plastic surgery education", "plastic surgery resident", "surgical training", and "surgery resident education". Title, abstract, and full-text review was performed independently by two reviewers (EH, SN), with the senior author settling any disagreements (FH). The reference lists of included articles were also searched for relevant studies. Articles met inclusion criteria when they discussed a real-world application of a specific AI model in surgery resident education and included metrics on model performance. Exclusions were made for duplicate publications, literature reviews, abstracts without associated full texts, and non-English-language publications. No search restrictions were placed regarding publication date or country of origin. Data extraction was then performed by two independent reviewers (EH, SN). The following characteristics were extracted from each study: study design, surgical specialty, type of AI model, model performance, and application to surgical education. Data were then synthesized into a narrative description given the heterogeneous and qualitative nature of results and categorized by which areas of surgical training the AI model may be applied.

## RESULTS

The initial search yielded 1,037 papers, and the full-text review yielded 20 unique papers published between 2019 and 2025 that met inclusion criteria [Figure 1][9-28]. The majority of studies were proof-of-concept papers and piloted a novel use for AI. All studies included original data; however, three were published as correspondences or viewpoints due to their limited scope. Four studies analyzed ChatGPT, four involved the creation of a novel AI algorithm, three assessed natural language processing (NLP) models, and the remainder assessed applications of various AI platforms. Most papers concern the field of plastic surgery ($n = 8$). However, general surgery ($n = 4$), neurosurgery ($n = 3$), endodontics ($n = 1$), obstetrics/gynecology ($n = 1$), orthopedic surgery ($n = 1$), urology ($n = 1$), and craniofacial surgery ($n = 1$) were also included [Table 1]. The literature was classified into three distinct categories in which AI was used in resident education: supplemental learning, surgical skills training, and performance feedback.

To further characterize the scope of AI integration, each study was also analyzed according to the AI methodology utilized. Classifications included predictive AI and generative AI. Predictive AI models involve machine learning and deep learning algorithms that may classify, assess, or predict outcomes based on data. Specific models identified in this review included traditional machine learning algorithms (Saadya, Siyar, Fukata, Stahl), convolutional neural networks (Sayadi, Lei, Fang), deep neural networks (Yilmaz, Fazlollahi), and planning-based AI used in intelligent tutoring systems (Vannaprathip). NLP models were also used in predictive capacities (Ötleş, Solano, and Li). Generative AI models, on the other hand, leverage large language models and multimodal architectures to produce new text, dialogue, or images. Numerous studies utilized ChatGPT (Saadya, Hubany, Gupta, Humar, DiDonna, Shah, Zhang, Hui). Other large language models such as Google Bard, Google PaLM, Microsoft Bing, Claude, My AI by Snapchat, and Wondercraft were also studied (DiDonna, Shah, Saadya). A distinct generative AI model, DALL·E 2, was studied by Koljonen *et al.* for text-to-image generation[13].

### Augmentation of supplemental learning

Several contemporary studies have outlined how AI can augment supplemental learning methods[9-15]. AI image generation has the potential to enhance traditional textbook learning. Koljonen *et al.* used an AI algorithm to convert generic English text into clinical photographs, and photos of soft tissue and skin tumors were both realistic and accurate[13].

In addition, AI has the potential to create learning materials on nontraditional platforms such as podcasts. Podcasts addressing plastic surgery content have become increasingly common with the general rise in popularity of podcasting[29]. Saadya *et al.* showed that a podcast for plastic surgery education can be made using ChatGPT and Wondercraft.ai[14]. ChatGPT synthesized information to create a question-and-answer-styled script. Wondercraft.ai then converted this written script into an audio podcast that provided a "realistic auditory experience" while conveying complex surgical concepts[14].

AI-based tools have also shown promise in fostering independent academic learning. In craniofacial surgery, ChatGPT assisted residents in developing novel systematic review ideas, highlighting its potential

**Table 1. Details of included studies**

| Source1234567 | Year | Publication type | Surgical specialty | Major findings |
|---|---|---|---|---|
| **Supplemental learning** | | | | |
| DiDonna *et al.*[9] | 2024 | Original article | Plastic surgery | ChatGPT-4.0 outperformed other AI platforms and 95% of first-year plastic surgery residents on the PSITE |
| Gupta *et al.*[10] | 2023 | Original article | Plastic surgery | ChatGPT can identify correct answers for 55% of PSITE questions representing 43 topics, and access to external information was significantly associated with correct responses |
| Hubany *et al.*[11] | 2024 | Original article | Plastic surgery | ChatGPT-4.0 correctly answers most PSITE questions, significantly outperforming ChatGPT-3.5 and performing comparably to a sixth-year resident. It performed best in core surgical principles and lowest in craniomaxillofacial surgery |
| Humar *et al.*[12] | 2023 | Original article | Plastic surgery | ChatGPT performs at the level of a PGY-1 plastic surgery resident on PSITE |
| Koljonen *et al.*[13] | 2023 | Correspondence | Plastic surgery | AI-generated clinical photos of skin and soft tissue tumors are accurate |
| Saadya *et al.*[14] | 2024 | Viewpoint | Plastic surgery | AI algorithms may be used to create an educational plastic surgery podcast |
| Shah *et al.*[15] | 2023 | Correspondence | Plastic surgery | ChatGPT-3.0 and ChatGPT-4.0 did not differ in their correct answers on the PSITE, but the updated software gave more undecided responses instead of incorrect ones |
| Zhang *et al.*[16] | 2024 | Original article | Craniofacial surgery | ChatGPT assisted residents with developing novel systematic review ideas with 57.5% accuracy |
| Hui *et al.*[17] | 2025 | Original article | Urology | ChatGPT-assisted PBL group outperformed traditional teaching group, with statistically significant gains in theoretical knowledge, medical interviewing skills, clinical judgment, and overall clinical competence |
| Li *et al.*[18] | 2024 | Original article | Orthopedic surgery | SAIL voice assistant was as effective as traditional multiple-choice methods for learning orthopedic knowledge, offering a viable alternative study modality for trainees |
| **Operative skills** | | | | |
| Fazlollahi *et al.*[19] | 2022 | Original article | Neurosurgery | An AI operative assistance model proved superior to expert instruction in improving medical student performance during surgical simulation training |
| Fukata *et al.*[20] | 2024 | Original article | General surgery | Development of a new AI system to assess forceps manipulation in a surgical simulator |
| Sayadi *et al.*[21] | 2022 | Original article | Plastic surgery | Authors developed an AI algorithm that can identify anatomic landmarks for unilateral cleft lip repair |
| Siyar *et al.*[22] | 2019 | Original article | Neurosurgery | Identification of classifiers that may be used by AI algorithms to assess performance on the surgical simulator |
| Vannaprathip *et al.*[23] | 2021 | Original article | Endodontics | Created an AI algorithm that provides feedback on surgical decision making and determined its equivalence to human instructor-generated feedback |
| Yilmaz *et al.*[24] | 2022 | Original article | Neurosurgery | Authors created an AI software that effectively monitors and analyzes participant performance during surgical simulations |
| Lei *et al.*[25] | 2024 | Original article | OBGYN | Residents using an AI-assisted software achieved proficiency with fewer training cycles |
| **Feedback** | | | | |
| Ötleş *et al.*[26] | 2021 | Original article | General surgery | NLP demonstrated proficiency in classifying the quality of resident feedback in a pilot study |
| Solano *et al.*[27] | 2021 | Original article | General surgery | Expanding on the pilot study by Ötleş *et al.*, NLP models again demonstrated the ability to effectively classify the quality of surgical performance feedback[26] |
| Stahl *et al.*[28] | 2021 | Original article | General surgery | NLP accurately identified topics associated with each entrustment level within EPA feedback for surgical residents |

AI: Artificial intelligence; PSITE: Plastic Surgery Inservice Training Examination; PBL: problem-based learning; SAIL: Socratic AI Learning; NLP: natural language processing; EPA: entrustable professional activities.

in promoting research literacy and scholarly productivity[16]. Similarly, a randomized controlled trial in urology showed that residents trained via ChatGPT-assisted problem-based learning (PBL) significantly outperformed those receiving traditional instruction, with higher scores in theoretical knowledge, clinical judgment, interviewing skills, and overall competence[17]. In orthopedic surgery, the Socratic AI Learning (SAIL) voice assistant demonstrated comparable efficacy to traditional multiple-choice question banks,

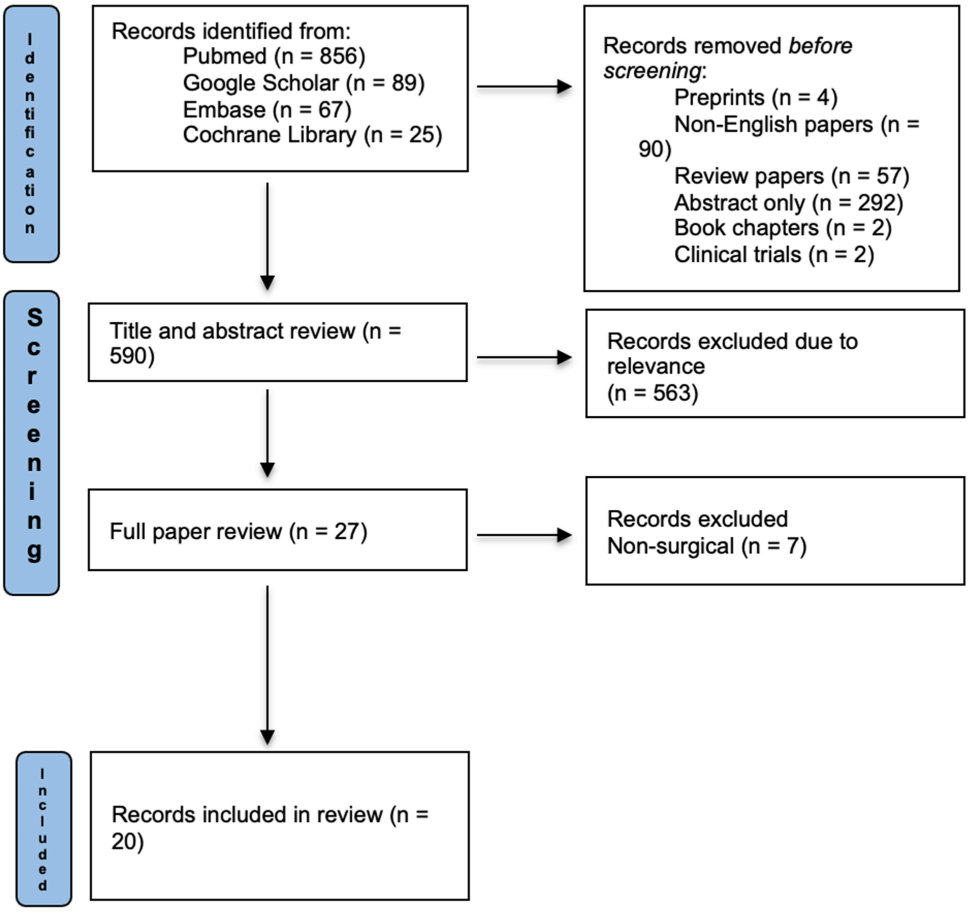


**Figure 1.** PRISMA flow chart detailing study selection and exclusion[39]. PRISMA: Preferred reporting items for systematic reviews and meta-analyses.

suggesting that AI-powered conversational tools may serve as effective alternative learning modalities[18].

With advancements in machine learning capabilities, AI software has the potential to provide an interactive database for plastic surgery residents. Current studies show that ChatGPT accurately answers questions on the Plastic Surgery Inservice Training Examination (PSITE), performing at a resident level, and performance has improved with software updates[9-12,15]. Most recent studies show ChatGPT-4.0 outperforming previous versions and other AI software on the PSITE, matching the performance of a sixth-year integrated plastic surgery resident[9,11]. Improvements with updated software imply that ChatGPT is evolving to admit uncertainty rather than provide an incorrect examination answer[15]. Furthermore, ChatGPT uses logical reasoning, internal information provided in the question, and external information to answer examination questions[10]. Gupta *et al.* determined that when answering incorrectly, ChatGPT was significantly less likely to have utilized external information, indicating that access to plastic surgery literature may be a limiting factor in the software's ability to answer correctly[10].

### AI and operative skills learning

Repeated practice of surgical skills within the operating room is essential for the training of competent surgical residents. AI has been used in various ways to augment learning in the operating room when human teachers are not accessible. One study developed an AI algorithm that accurately identified 21 anatomical landmarks on the unilateral cleft lip essential for the placement of nasolabial markings prior to cleft lip repair[21].

In addition, efforts to integrate AI into virtual reality (VR) surgical simulators have been successful. Software has been developed that can assess surgical skills during a simulation and distinguish novice from expert users[22,24]. In 2019, Siyar *et al.* showcased the ability of AI software to distinguish expert versus novice performance using a surgical skills simulator[22]. Neurosurgery trainees performed a VR tumor resection task, and the software assessed surgical trainees using classifiers of operative dexterity such as speed or applied force. Similarly, Fukuta *et al.* developed a novel algorithm that can assess forceps manipulation during surgical simulation[20]. However, the system cannot yet distinguish expert-level use of forceps from novice-level use. The authors reported plans to continue improving the AI model's forceps tracking abilities and develop a system to train surgeons in laparoscopic skills.

More recent studies show that AI can replace the human tutor. A trial conducted by Lei *et al.* demonstrated that the use of an AI-assisted ultrasound system helped residents reach proficiency milestones in fewer training cycles compared to those receiving standard instruction[25]. Similarly, Yilmaz *et al.* developed an AI-powered software using a long short-term memory (LSTM) network that analyzes sequences of movements over time to continuously monitor surgical skills and provide real-time feedback as would a human instructor[24]. Again, neurosurgical trainees at various levels of training were successfully distinguished by the algorithm. Within the field of endodontic surgery, Vannaprathip *et al.* developed the Surgical Decision-making Mentor (SDMentor) as the first AI-based system to teach surgical decision making, combining a VR simulator with an AI tutor[23]. The quality of SDMentor feedback was compared against that of human tutors, and the AI software performed better. Expert dental instructors were only able to correctly identify which suggestions were provided by the AI tutor 15% of the time[23].

Additionally, a randomized control trial showed that an AI-powered virtual operative assistant can effectively instruct users during surgical simulation training compared to users receiving expert or no guidance[19]. Performance was assessed using the AI skill assessment software developed by Yilmaz *et al.*[24]. The group receiving AI instruction experienced more improved performance than either the expert or control groups. However, the rate of improvement was similar to that of the group that received expert instruction. Surveyed participants reported increased positive emotions when receiving AI-generated feedback similar to that occurring with human feedback.

### Improving resident feedback

A cornerstone of resident education is the feedback provided by surgical faculty. In addition to examination, performance feedback is a primary method by which residents can review and use to improve their performance. No attempt to improve plastic surgery resident feedback is currently available in the literature. However, several papers detail novel attempts to use AI to quantify faculty feedback within the field of general surgery[26-28].

Stahl *et al.* used AI to successfully identify key topics among entrustable professional activities (EPA) feedback given to general surgery residents[28]. EPAs are micro assessments that standardize competency-based feedback regarding specific, essential activities of the competent surgeon, designed to facilitate immediate feedback during the daily workflow. However, performance attributed to each entrustment level was defined by experts' opinions, so Stahl *et al.* studied feedback data to determine what differentiates entrustment levels[28]. NLP software identified words within the EPA comments and determined which corresponded with each entrustment level. Unsurprisingly, surgeons used distinct words and sentence structures to comment on resident performance at different entrustment levels.

Second, Ötleş *et al.* were among the first to show the potential of NLP models to classify the quality of surgical trainee feedback[26]. Surgical faculty evaluations sourced from three general surgery residency programs consisted of narrative feedback, and machine learning systems were compared in their ability to classify feedback as either effective, mediocre, ineffective, or other. The support vector machine (SVM) model was most effective and achieved a mean accuracy of 0.64 when sorting feedback into the original categories and a mean accuracy of 0.83 when sorting data into either high-quality or low-quality feedback. A subsequent study tested the performance of the SVM model, which was identified to be most accurate by Solano *et al.*, on a larger dataset[27]. The SVM model performed similarly to the earlier study. Feedback was sorted into the original categories outlined by Ötleş *et al.* with an accuracy of 0.65[26]. When identifying only low-quality feedback, the model achieved an accuracy of 0.83, sensitivity of 0.37, and specificity of 0.97, reaffirming its ability to effectively measure feedback quality.

## DISCUSSION

The applications of AI in plastic surgery training remain in their infancy. Only eight studies were identified that specifically assessed uses for AI in plastic surgery. However, nascent studies of AI shed light on its potential for successful integration into surgical training of all kinds. Educational applications of AI have been more widely adapted and implemented in other surgical fields but demonstrate possible areas for growth in plastic surgery. Traditionally, plastic surgery trainees learn in the operating room and the lecture hall with independent study using textbooks, digital resources, and practice question databases. AI has proven successful in enhancing digital educational materials such as podcasts, which residents find to be a useful method of asynchronous learning but currently lack high-quality plastic surgery educational content[30-33]. High-speed, tailored generation of targeted information to benefit trainees' individual needs could provide an excellent means to study efficiently. Text-to-image software could circumvent the risk of breaching patient privacy tied to utilizing real patient photographs and could illustrate a broader range of pathologies from a more diverse patient population[13]. This could have novel applications in preparing board-style vignettes with accurate images or generating AI-drawn anatomical plates for particular pathologies or surgical approaches of interest to learners. AI's success in plastic surgery trainee examinations suggests its usefulness as a primary resource for plastic surgery information[9-15,29-33]. For example, based on its examination performance, ChatGPT could provide general knowledge, clarify complex topics, simulate case-based learning, summarize the literature, and formulate novel practice questions[9-12,15].

A key finding of this review is the methodological diversity among AI applications in surgical education, including a variety of predictive and generative AI. Predictive models including traditional learning algorithms, convolutional deep neural networks, and planning-based systems were primarily used to assess surgical performance, simulate procedural tasks, or provide individualized feedback[14,19-25,28,34]. These models require robust datasets and physician oversight, but have shown promise in skill differentiation and assessment validation[18,20,23-27]. Generative AI models, including LLMs and multimodal tools such as DALL·E 2, were leveraged to enhance educational content[9-17]. These tools facilitated the creation of podcasts, visual aids, and synthesized summaries, which highlights their potential for scalable, learner-centered educational innovations[10,12,14-17].

Given the rapid adoption of LLMs such as ChatGPT, Claude, and Bard, their role in surgical education deserves particular attention. For trainees, LLMs enable real-time access to personalized educational content, including case simulations, oral board-style questioning, concept clarification, and targeted literature synthesis[9,10,12,14,15,17]. These functions align closely with adult learning theory by supporting self-directed, flexible, and iterative learning. For assessors, LLMs may support feedback generation, formative assessment, and curriculum gap identification[18,26,27]. However, these tools are not without limitations. Their lack of domain specificity, potential for fabricated outputs, and reliance on generalized datasets raise concerns about safety and validity in high-stakes educational settings. As LLMs become more integrated into training environments, programs must implement guardrails to ensure clinical accuracy, ethical use, and oversight by qualified faculty.

While many studies in this review focused on the development and validation of novel AI tools, few demonstrated implementation within training programs. The gap between innovation and integration reflects the challenge of translating AI advancements into sustainable, real-world practices. None of the included studies reported routine, integrated use of AI in active plastic surgery curricula. Implementation of AI-based tools, particularly predictive models that require large datasets or generative models that rely on cloud infrastructure, requires thoughtful planning. At a minimum, programs considering integration should assess their existing digital infrastructure (e.g., access to simulation labs, high-speed internet, secure data storage) and designate faculty to oversee pilot testing (Vannaprathip *et al.*, Fang *et al.*, and Yilmaz *et al.* show examples of more tech-heavy predictive model requirements[23,24,34]). In resource-limited settings, lower-barrier tools such as ChatGPT or podcast-generating platforms can be introduced as supplements for asynchronous learning without the need for extensive hardware or software upgrades[9,14,15]. Starting with smaller-scale, low-cost implementations allows programs to evaluate feasibility and acceptability before broader rollout. As programs prepare to integrate more robust AI tools, collaboration with affiliated computer science programs or commercial AI vendors may be considered to facilitate access to technical expertise and potentially reduce implementation costs. Ultimately, successful integration will depend on institutional readiness, trainee engagement, and the presence of clear educational goals that AI can enhance without replacing.

AI applications for resident feedback analysis within the field of general surgery could be easily applied in plastic surgery training. NLP algorithms have proven capable of processing large volumes of text-based feedback on resident performance. In the future, algorithms could be developed that summarize narrative feedback into key components for each resident or compute summative scores from narrative comments so that faculty can focus on narrative feedback[26,28]. NLP algorithms can also flag assessors who repeatedly provide low-quality feedback[26,27].

Early applications of AI within the operating room show potential to revolutionize surgical training. For example, machine learning algorithms may provide assistance with preoperative planning by accurately identifying anthropomorphic landmarks prior to unilateral cleft lip repair[21]. When combined with VR and surgical simulators, AI can continuously assess surgical skills and synthesize immediate feedback[19,20,22-24]. Such applications during resident training could remove the burden from faculty and provide a source of effective operative instruction that is not limited by faculty schedules or biases.

Although AI-driven interventions in surgical education appear promising, it is important to recognize their limitations. AI should not be the sole source of objective information and will always require human oversight. For example, Koljonen *et al.* had to choose the most realistic AI-generated clinic image and their algorithm struggled to understand medical terminology[13]. It is limited by the extent to which its reasoning is logical and the inputs used to optimize its performance are accurate. The extent to which AI performance is affected by inaccurate input may be underrated. Machine learning algorithms will continue to require improvements to advance AI capabilities to parallel that of humans. For example, within the field of plastic surgery, residents may still prefer expert surgeon-produced instructions compared with those generated by AI[35]. Furthermore, the inner workings of AI algorithms are not transparent, and physicians may not understand the extent to which AI capabilities are limited by human error and can perpetuate biases built into their algorithms. It is imperative to understand these limitations prior to integrating AI into surgical training.

Current limitations of AI in medicine may have unintended ethical consequences, highlighting the need for further research into its possible negative impacts[36]. In addition to technical skills, surgeons must be compassionate communicators capable of ethical decision making, which cannot be taught by AI alone. Overreliance on AI education tools to teach non-technical skills would risk the strict ethical standards to which surgeons are held. Furthermore, AI program training is dependent on datasets, some of which are extrapolated from patient information and health records, raising concerns about potential ethical implications and breaches of patient confidentiality[37]. The use of patient photographs or clinical data without explicit, procedure-specific consent may result in privacy violations. Current consent forms rarely, if ever, address the use of personal data for machine learning training, leaving patients potentially unaware of the downstream applications of their personal data. Adaptations must be made to the release of patient information, data use agreements, and institutional review board requirements to account for these changes. Patients should be made aware that their data are being used to train, test, and validate AI models.

Furthermore, the economic practicalities of implementing novel AI-based resident education tools must be considered. An economic investment is required to initiate the use of AI models. However, AI-assisted education can provide cost benefits. For example, modalities that provide automated feedback can reduce training costs overall. In a randomized trial, Lohre *et al.* showed that resident training with a VR simulator was cost-effective due to reductions in training time[38]. In addition, AI reduces the training burden on surgeon educators, thereby increasing efficiency.

In conclusion, AI algorithms such as ChatGPT could serve as a versatile educational tool for plastic surgery residents, but the use of AI for plastic surgery resident training remains in its infancy. There exists an obvious dearth of studies regarding the applications of AI to plastic surgery-specific education. Educational uses of AI have been more studied in other surgical subspecialties. These applications can be translated into plastic surgery training. A small number of studies show potential applications of AI across varied areas of surgical education, including independent resident learning, surgical skill practice, and resident feedback. Further evidence is needed regarding the implementation and long-term success of specific algorithms. Further study should be pursued within the field of plastic surgery to evaluate the application of text-to-image and NLP software for generating practice questions, assess the ability of NLP software to enhance narrative resident feedback, and assess the application of existing AI models that provide real-time feedback for surgical skills specific to plastic surgery.

## DECLARATIONS

### Authors' contributions

Made substantial contributions to the conception and design of the work, acquisition and interpretation of the data, and drafting and revisions of the manuscript: Hogue E

Made substantial contributions to the conception of the work, acquisition and interpretation of the data, and drafting and revisions of the manuscript: Nottingham S

Made substantial revisions to the manuscript and contributed to the interpretation of the data: James A

Made substantial contributions to the conception and design of the work, interpretation of the data, and revisions of the manuscript: Herrera FA

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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

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