

Reviews

Artificial Intelligence in Reproductive Medicine: Transforming Assisted Reproductive Technologies

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Question Asked

How is artificial intelligence (AI) transforming assisted reproductive technologies (ART), particularly in vitro fertilization (IVF), and what are its clinical impacts and limitations?

Background

AI offers potential to address ART challenges, including high costs, variable success rates, and rising infertility. Applications in embryo selection, gamete assessment, and personalized protocols aim to enhance objectivity and outcomes.

Literature Search

A systematic review of peer-reviewed articles (2019–2025) was conducted, using terms such as “artificial intelligence” and “IVF.” Studies focused on AI tools (DeepEmbryo, icONE, iDAScore, ERICA) and their performance in ART.

Materials and Methods

Selected studies evaluated AI applications in embryo selection, gamete assessment, personalized protocols, and outcome prediction. Performance metrics, validation scope, and clinical outcomes were analyzed, prioritizing tools with quantitative data.

Results and Discussion

AI tools improved clinical pregnancy rates (up to 77.3%), implantation accuracy (92%), and efficiency (35%). icONE and ERICA outperformed traditional methods, reducing subjectivity. However, validation is often limited to single-center studies, with surrogate endpoints (e.g., pregnancy rates) rather than live birth rates. Algorithmic bias, regional data privacy regulations, and high costs limit generalizability and accessibility. Ethical concerns, including data privacy and equity, require robust frameworks.

Conclusions

AI enhances ART efficacy and personalization but faces validation and ethical challenges. Multicenter studies focusing on live birth rates and inclusive datasets are needed to ensure equitable, clinically relevant adoption.

INTRODUCTION

CHALLENGES IN REPRODUCTIVE MEDICINE

Despite four decades of progress since the first IVF baby, ART faces significant hurdles. Infertility affects over 186 million individuals globally, with demand for fertility services rising due to delayed childbearing and disruptions

from the COVID-19 pandemic, which delayed treatments during lockdowns.¹ High treatment costs, often exceeding \$10,000 per IVF cycle, lengthy procedures, and variable success rates—ranging from 20–40% per cycle and plateaued over the past decade—limit access and efficacy.² These challenges highlight the urgent need for innovative solutions to enhance clinical outcomes and affordability in reproductive medicine.

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AI Integration Across the ART Pipeline

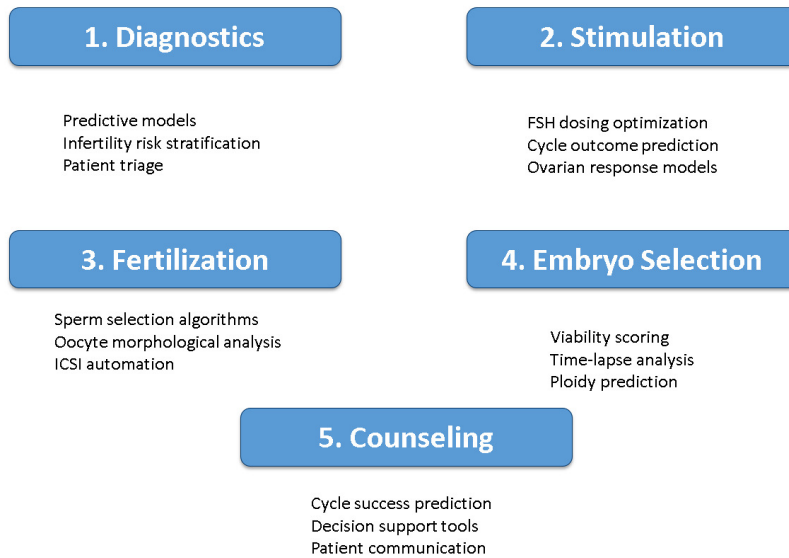


Figure 1. Overview of AI applications across the ART pipeline.

Artificial intelligence supports each stage of the assisted reproductive technology (ART) process. In **diagnostics**, AI enables data-driven intake assessments and risk stratification. During **ovarian stimulation**, it optimizes gonadotropin dosing based on patient-specific variables. In **gamete assessment**, AI analyzes oocyte and sperm morphology and motility with enhanced precision. For **embryo selection**, AI integrates morphokinetic, genetic, and clinical data to rank embryos by viability or ploidy. Finally, in **patient counseling**, predictive models assist in estimating treatment outcomes and tailoring protocols, improving personalization and shared decision-making.

THE PROMISE OF ARTIFICIAL INTELLIGENCE

AI holds transformative potential for ART by leveraging large datasets to improve efficacy and reduce subjectivity.⁵ AI applications in embryo selection, gamete assessment, and personalized treatment protocols aim to optimize outcomes and streamline care, though ethical concerns like algorithmic bias must be addressed.⁴ This manuscript reviews AI's role in ART, evaluating its clinical and economic impacts, ethical considerations, and future directions.

LITERATURE SEARCH METHODOLOGY

A systematic review of peer-reviewed articles published between 2019 and 2025 was conducted using databases including PubMed, Scopus, and Web of Science. Search terms such as “artificial intelligence,” “assisted reproductive technologies,” “in vitro fertilization,” and related concepts were combined using Boolean operators (e.g., AND, OR) to identify relevant studies. Articles were sourced from high-impact journals in reproductive medicine. Studies were included based on their focus on AI applications in ART, specifically embryo selection, gamete assessment, personalized protocols, genetic testing, outcome prediction, and workflow optimization. Exclusion criteria encompassed non-peer-reviewed sources, non-English studies, and irrelevant topics. A total of 152 studies were screened, with 42 included for analysis. Priority was given to studies evaluating key AI tools (DeepEmbryo, icONE, iDAScore, ERICA)

and their performance metrics, ensuring a focus on quantitative outcomes.

RESULTS

AI APPLICATIONS IN ART

AI has significantly advanced ART, improving accuracy, clinical outcomes, and efficiency across multiple processes. Below, we detail key applications, supported by quantitative data, while noting validation scopes and limitations.

EMBRYO SELECTION

AI-driven embryo selection tools surpass traditional morphological assessments by offering objective, data-driven evaluations.

[Table 1](#) summarizes leading tools' performance.

These tools reduce subjectivity, with icONE achieving a 77.3% clinical pregnancy rate compared to 50% in non-AI groups.⁶ iDAScore matches manual assessments while reducing evaluation time by 30%, enhancing laboratory efficiency.⁷ However, most outcomes reflect surrogate endpoints, with live birth rates underreported.

PERSONALIZED TREATMENT PROTOCOLS

AI optimizes drug selection and dosing using patient-specific variables, improving ovarian stimulation and reducing treatment cycles.^{10,11} AI-optimized protocols reduced folli-

Table 1

AI Tool	Description	Accuracy/Outcome	Reference
DeepEmbryo	Analyzes static embryo images using Convolutional Neural Network with transfer learning	75% clinical pregnancy prediction accuracy (single-center)	5
icONE	Integrates genetic and clinical data for embryo viability	92% implantation accuracy, 77.3% clinical pregnancy rate (multicenter)	6
iDAScore	Grades embryos via time-lapse videos	Matches manual outcomes, 60% euploid prioritization (multicenter)	7
ERICA	Ranks embryos by ploidy status	51% biochemical pregnancy rate for "optimal" embryos (limited validation)	8,9

Table 2

Application	Technology	Impact	Reference
Personalized Protocols	Machine learning	Optimized drug dosing, 20% FSH reduction	10,11
Gamete Assessment	AI-based image analysis	15% improved sperm/oocyte selection accuracy	13,14
Workflow Optimization	Machine learning, Internet of Things (IoT)	35% faster processing, 25% cost reduction	16

cle-stimulating hormone (FSH) usage by up to 20%, potentially lowering medication costs.¹²

GAMETE ASSESSMENT

AI improves sperm and oocyte quality analysis, enhancing fertilization success. Image analysis algorithms assess morphological features, increasing sperm motility assessment accuracy by 15% compared to human evaluations, thus reducing variability.^{13,14}

OUTCOME PREDICTION AND WORKFLOW OPTIMIZATION

AI predicts IVF success rates, supporting patient counseling and treatment planning.¹⁵ Full-cycle management systems integrating machine learning and IoT reduced laboratory processing time by 35%, cut costs by 25%, and increased pregnancy rates by 12%.¹⁶

[Table 2](#) summarizes these applications.

Despite these advancements, small sample sizes and single-center studies limit generalizability for some applications.

DISCUSSION

CLINICAL AND ECONOMIC IMPACTS

AI enhances ART by improving objectivity, personalization, and efficiency. Tools like icONE and ERICA reduce subjective judgment, achieving clinical pregnancy rates of 77.3% and 51% (biochemical), respectively, compared to 50% in non-AI groups.^{6,8} Personalized protocols optimize outcomes, reducing the need for multiple IVF cycles and alleviating emotional and financial burdens.² AI-driven workflow systems, such as sperm bank management, cut laboratory

costs by 25% (e.g., ~\$2,000 per cycle) and improve efficiency by 35%.¹⁶ However, high initial investments in software and training may limit access in smaller clinics.¹⁷ Longitudinal cost-benefit analyses are needed to confirm AI's economic viability across diverse healthcare systems.¹⁸

ETHICAL AND REGULATORY CONSIDERATIONS

AI integration in ART raises several ethical challenges, particularly around data privacy, algorithmic transparency, and equity. Tools like DeepEmbryo and icONE process sensitive genetic and clinical data, necessitating compliance with data protection frameworks such as the EU's General Data Protection Regulation (GDPR), which mandates informed consent and algorithmic accountability.^{5,6,19} In contrast, the U.S. Health Insurance Portability and Accountability Act (HIPAA) permits more flexible data sharing under certain conditions, leading to variability in AI deployment across jurisdictions.²⁰

A major ethical concern is algorithmic bias resulting from non-representative training datasets. Many AI models are developed using data predominantly from Western or homogeneous populations, which may reduce accuracy and reliability when applied to diverse patient groups. This underrepresentation risks exacerbating existing disparities in access and outcomes, as AI systems may underperform in populations with different genetic backgrounds, socioeconomic profiles, or cultural contexts. Ensuring the inclusion of diverse, global datasets is essential to avoid perpetuating inequities in fertility care.^{7,21}

Regulatory oversight is also evolving. Tools like iDAScore have received CE mark certification in Europe, while others remain in pre-clinical or pilot phases. Regulatory frameworks such as the FDA's "Software as a Medical Device" (SaMD) guidance are essential for ensuring safety, espe-

Table 3. Comparison of AI Tools in Assisted Reproductive Technologies (ART)

AI Tool	Function	Reported Accuracy/ Outcome	Validation Scope	Reported Outcome Type	Estimated Cost/ Infrastructure	Regulatory Status	Clinical Adoption
DeepEmbryo	Embryo image analysis (CNNs)	75% pregnancy prediction accuracy	Single-center, retrospective	Clinical pregnancy (surrogate)	Moderate (software only)	Pre-clinical; not FDA/CE listed	Experimental/ research use
icONE	Embryo viability prediction using clinical + genetic data	92% implantation accuracy, 77.3% pregnancy rate	Multicenter, industry-sponsored	Implantation and pregnancy rate (clinical)	High (genomic + clinical integration)	Limited CE use; research setting	Early clinical use in select centers
iDAScore	Embryo grading via time-lapse analysis	Matches manual grading, 60% euploid prioritization	Multicenter pre-clinical validation	Euploidy prioritization, manual agreement (surrogate)	Moderate (time-lapse system required)	CE-marked, clinical pilot use	Adopted in European fertility centers
ERICA	Embryo ranking by ploidy prediction	51% pregnancy rate for 'optimal' embryos	Limited clinical validation	Pregnancy rate and ploidy rank (surrogate)	Low to moderate (data analysis layer)	No formal clearance reported	Pilot usage in AI-focused clinics

side-by-side comparison table of leading AI tools in ART, summarizing their function, performance, validation scope, cost, regulatory status, **and** clinical adoption

cially as AI algorithms become adaptive and dynamic over time.^{22,23} However, current approval processes are often ill-suited to continuously learning systems, highlighting the need for harmonized global standards that balance innovation with patient protection.²⁴

Robust ethical frameworks, emphasizing transparency, fairness, and inclusivity, are critical for the responsible deployment of AI in ART. Collaboration between clinicians, data scientists, ethicists, and regulators will be essential to address these complex issues and foster trust in AI-assisted reproductive care.

PATIENT PERSPECTIVES

Patient trust is critical for AI adoption in ART. Tools like ERICA and icONE improve outcomes, but fears of depersonalization may hinder acceptance.^{6,8}

The study of Cromack et al. provides relevant data on the trust of IVF patients in AI. This study surveyed 200 patients undergoing IVF or frozen embryo transfers, assessing their demographics, technological affinity, and perceptions of AI in fertility care. The results indicated that while 93% of respondents were familiar with AI and 55% supported its use in medicine, only 46% trusted AI-informed reproductive care. Additionally, patients showed a preference for physician-based recommendations over AI in treatment-related decisions, although a notable proportion favored AI for gamete and embryo selection compared to gonadotropin dosing or stimulation length.²⁵

This study provides a comprehensive overview of patient trust in AI within the context of fertility treatments, highlighting both the potential and the reservations patients have regarding AI applications in this field.

TECHNOLOGY INTEGRATION

AI's potential is amplified by integration with genomics, wearables, and robotics. icONE's genomic-clinical data fusion achieves 92% implantation accuracy, improving euploid embryo selection.^{3,6} Wearables enable real-time hormonal monitoring, personalizing stimulation protocols, while AI-driven robotics in sperm banks boost efficiency by 35%.^{10,16}

LONGITUDINAL STUDIES AND REAL-WORLD IMPACT

AI's long-term impact, particularly on live birth rates (LBR), remains understudied. DeepEmbryo's 75% clinical pregnancy prediction and iDAScore's 60% euploid prioritization lack diverse, real-world validation.^{5,7} ERICA's 51% biochemical pregnancy rate requires LBR confirmation.⁸ iDAScore's 46.5% clinical pregnancy rate slightly underperforms morphology-based selection (48.2%), while ERICA's 0.79 positive predictive value for euploidy surpasses embryologists.^{26,27} Longitudinal studies should assess patient satisfaction, equity, and standardized metrics to ensure sustainable benefits.^{18,28}

STUDY LIMITATIONS AND PUBLICATION BIAS

Many AI tools (e.g., DeepEmbryo, ERICA) are validated in single-center studies, limiting generalizability across diverse populations.^{22,29} Most studies report surrogate endpoints (e.g., clinical pregnancy) rather than LBR, the definitive ART success measure.¹⁸ Publication bias may introduce optimism bias in reported outcomes, particularly in industry-sponsored studies like icONE, may inflate efficacy; trial preregistration could mitigate this.³⁰ Large-scale, multicenter trials are critical for robust, equitable AI application in ART.³¹

CONCLUSION

Artificial intelligence has catalyzed a transformative shift in assisted reproductive technologies, optimizing embryo selection, gamete assessment, personalized protocols, and workflow efficiency. Advanced tools achieve high clinical pregnancy rates and implantation accuracy, minimizing subjectivity and enhancing outcomes. Despite substantial initial infrastructure costs, AI-driven systems reduce expenses and improve efficiency, alleviating the financial burden of IVF cycles. However, challenges persist, including limited validation scopes, reliance on surrogate endpoints, and ethical concerns such as data privacy and algorithmic bias. Regulatory disparities and publication bias further hinder equitable adoption. To fully harness AI's potential, large-scale, multicenter trials must prioritize live birth rates, patient satisfaction, and inclusive datasets. Integration with genomics, wearables, and robotics offers prospects for precision fertility care, though interoperability and affordability remain critical barriers. As global infertility rates rise, AI's continued evolution, driven by rigorous validation, ethical frameworks, and harmonized regulations, will be essential for delivering accessible, equitable, and effective reproductive healthcare.

FUTURE DIRECTIONS IN AI FOR REPRODUCTIVE MEDICINE

- Conduct large-scale, multicenter validation studies to assess AI tool performance across diverse populations and clinical settings.
- Standardize outcome reporting by prioritizing hard clinical endpoints such as live birth rate, cumulative live birth per cycle, and long-term neonatal outcomes.
- Develop robust ethical frameworks to address data privacy, algorithmic transparency, and equity in access to AI technologies.
- Advance regulatory harmonization across jurisdictions (e.g., FDA, CE mark) to streamline approval and ensure patient safety.
- Incorporate patient-reported outcomes (PROs) to evaluate the psychological, emotional, and experiential aspects of AI-guided fertility care.

- Ensure inclusivity in algorithm training datasets to minimize bias and improve generalizability for underrepresented populations.
- Explore AI integration with emerging technologies such as genomics, wearables, and robotic systems for next-generation fertility solutions.
- Promote interdisciplinary collaboration between clinicians, data scientists, ethicists, and policymakers for sustainable AI deployment.

CONFLICT OF INTEREST

None to declared

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REFERENCES

1. Chow DJ, Wijesinghe P, Dholakia K, Dunning KR. Does artificial intelligence have a role in the IVF clinic? *Reprod Fertil*. 2021;2(3):C29-C34. doi:[10.1530/RAF-21-0043](https://doi.org/10.1530/RAF-21-0043)
2. Puri A, Mathur R, Sindhu N. Enhancing assisted reproductive technology with AI: addressing concerns and challenges. *Int J Sci Res Arch*. 2024;11(1):1507-1516.
3. Wang R, Pan W, Jin L, et al. Artificial intelligence in reproductive medicine. *Reproduction*. 2019;158(4):R139-R154. doi:[10.1530/REP-18-0523](https://doi.org/10.1530/REP-18-0523)
4. Tadepalli SK, Lakshmi PV. Application of machine learning and artificial intelligence techniques for IVF analysis and prediction. In: *Research Anthology on Advancements in Women's Health and Reproductive Rights*. IGI Global; 2022:544-555. doi:[10.4018/978-1-6684-6299-7.ch029](https://doi.org/10.4018/978-1-6684-6299-7.ch029)
5. Borna MR, Sepehri MM, Maleki B. An artificial intelligence algorithm to select most viable embryos considering current process in IVF labs. *Front Artif Intell*. 2024;7:1375474. doi:[10.3389/frai.2024.1375474](https://doi.org/10.3389/frai.2024.1375474)
6. Tang YA, Chien C, Lee SJ, et al. P-201 Embryo prioritization through an AI-powered evaluation system improves the clinical outcome in IVF cycles. *Hum Reprod*. 2024;39(Suppl 1):deae108.241. doi:[10.1093/humrep/deae108.241](https://doi.org/10.1093/humrep/deae108.241)
7. Cimadomo D, Chiappetta V, Innocenti F, Saturno G, Taggi M, Marconetto A, et al. Towards automation in IVF: pre-clinical validation of a deep learning-based embryo grading system during PGT-A cycles. *J Clin Med*. 2023;12(5):1806. doi:[10.3390/jcm12051806](https://doi.org/10.3390/jcm12051806)
8. Liu L, Liu B, Liao M, et al. Identifying key predictive features for live birth rate in advanced maternal age patients undergoing single vitrified-warmed blastocyst transfer. *Reprod Biol Endocrinol*. 2024;22(1):1. doi:[10.1186/s12958-023-01174-2](https://doi.org/10.1186/s12958-023-01174-2)
9. Drakeley A, Flores-Saiffe Farias A, Chavez-Badiola A, et al. P-244 ERICA's (embryo ranking intelligent classification assistant) ranking, based on ploidy prediction, is strongly correlated with pregnancy outcomes. *Hum Reprod*. 2021;36(Suppl 1):deab130.243. doi:[10.1093/humrep/deab130.243](https://doi.org/10.1093/humrep/deab130.243)
10. Mapari SA, Shrivastava D, Bedi GN, et al. Revolutionizing reproduction: the impact of robotics and artificial intelligence (AI) in assisted reproductive technology: a comprehensive review. *Cureus*. 2024;16(6):e63072. doi:[10.7759/cureus.63072](https://doi.org/10.7759/cureus.63072)
11. Hanassab S, Abbara A, Yeung AC, et al. The prospect of artificial intelligence to personalize assisted reproductive technology. *NPJ Digit Med*. 2024;7(1):55. doi:[10.1038/s41746-024-01006-x](https://doi.org/10.1038/s41746-024-01006-x)
12. Canon C, Leibner L, Fanton M, et al. Optimizing oocyte yield utilizing a machine learning model for dose and trigger decisions, a multi-center, prospective study. *Sci Rep*. 2024;14(1):18721. doi:[10.1038/s41598-024-69165-1](https://doi.org/10.1038/s41598-024-69165-1)
13. Ghayda RA, Cannarella R, Calogero AE, et al. Artificial intelligence in andrology: from semen analysis to image diagnostics. *World J Mens Health*. 2024;42(1):39-61. doi:[10.5534/wjmh.230050](https://doi.org/10.5534/wjmh.230050)
14. Orovou E, Tzimourta KD, Tzitziridou-Chatzopoulou M, et al. Artificial intelligence in assisted reproductive technology: a new era in fertility treatment. *Cureus*. 2025;17(1):e52076. doi:[10.7759/cureus.52076](https://doi.org/10.7759/cureus.52076)
15. Kakkar P, Gupta S, Paschopoulou KI, et al. The integration of artificial intelligence in assisted reproduction: a comprehensive review. *Front Reprod Health*. 2025;7:1520919. doi:[10.3389/frph.2025.1520919](https://doi.org/10.3389/frph.2025.1520919)
16. Wan L, Liu B, Huang J, Yang J. Innovative research on an AI-integrated full-cycle intelligent management system for donor semen specimens in human sperm banks. *J Inf Syst Eng Manag*. 2025;10(1):2025008.
17. Olive E, Bull C, Gordon A, et al. Economic evaluations of assisted reproductive technologies in high-income countries: a systematic review. *Hum Reprod*. 2024;39(5):981-991. doi:[10.1093/humrep/deae039](https://doi.org/10.1093/humrep/deae039)
18. Cohen J, Silvestri G, Paredes O, et al. Artificial intelligence in assisted reproductive technology: separating the dream from reality. *Reprod Biomed Online*. 2025;50(4):104855. doi:[10.1016/j.rbmo.2025.104855](https://doi.org/10.1016/j.rbmo.2025.104855)
19. Medenica S, Zivanovic D, Batkoska L, et al. The future is coming: artificial intelligence in the treatment of infertility could improve assisted reproduction outcomes—the value of regulatory frameworks. *Diagnostics (Basel)*. 2022;12(12):2979. doi:[10.3390/diagnostics12122979](https://doi.org/10.3390/diagnostics12122979)
20. Curchoe CL. Unlock the algorithms: regulation of adaptive algorithms in reproduction. *Fertil Steril*. 2023;120(1):38-43. doi:[10.1016/j.fertnstert.2023.05.152](https://doi.org/10.1016/j.fertnstert.2023.05.152)

21. Sadegh-Zadeh SA, Khanjani S, Javanmardi S, Bayat B, Naderi Z, Hajiyavand AM. Catalyzing IVF outcome prediction: exploring advanced machine learning paradigms for enhanced success rate prognostication. *Front Artif Intell.* 2024;7:1392611. doi:[10.3389/frai.2024.1392611](https://doi.org/10.3389/frai.2024.1392611)
22. Letterie G. Artificial intelligence and assisted reproductive technologies: 2023. Ready for prime time? Or not. *Fertil Steril.* 2023;120(1):32-37. doi:[10.1016/j.fertnstert.2023.05.146](https://doi.org/10.1016/j.fertnstert.2023.05.146)
23. Hariton E, Pavlovic Z, Fanton M, Jiang VS. Applications of artificial intelligence in ovarian stimulation: a tool for improving efficiency and outcomes. *Fertil Steril.* 2023;120(1):8-16. doi:[10.1016/j.fertnstert.2023.05.148](https://doi.org/10.1016/j.fertnstert.2023.05.148)
24. Koplin JJ, Johnston M, Webb ANS, Whittaker A, Mills C. Ethics of artificial intelligence in embryo assessment: mapping the terrain. *Hum Reprod.* 2025;40(2):179-185. doi:[10.1093/humrep/deae264](https://doi.org/10.1093/humrep/deae264)
25. Cromack SC, Lew AM, Bazzetta SE, Xu S, Walter JR. The perception of artificial intelligence and infertility care among patients undergoing fertility treatment. *J Assist Reprod Genet.* 2025;42(3):855-863. doi:[10.1007/s10815-024-03382-5](https://doi.org/10.1007/s10815-024-03382-5)
26. Illingworth PJ, Venetis C, Gardner DK, et al. Deep learning versus manual morphology-based embryo selection in IVF: a randomized, double-blind noninferiority trial. *Nat Med.* 2024;30(11):3114-3120. doi:[10.1038/s41591-024-03166-5](https://doi.org/10.1038/s41591-024-03166-5)
27. Chavez-Badiola A, Flores-Saiffe-Farías A, Mendizabal-Ruiz G, Drakeley AJ, Cohen J. Embryo Ranking Intelligent Classification Algorithm (ERICA): artificial intelligence clinical assistant predicting embryo ploidy and implantation. *Reprod Biomed Online.* 2020;41(4):585-593. doi:[10.1016/j.rbmo.2020.07.003](https://doi.org/10.1016/j.rbmo.2020.07.003)
28. Afaq M, Abraham D, Patel SH, Al-Dhoon A, Arshad Z. Empowering women's health: a global perspective on artificial intelligence and robotics. *Cureus.* 2023;15(8):e43926. doi:[10.7759/cureus.43926](https://doi.org/10.7759/cureus.43926)
29. Riegler MA, Stensen MH, Witczak O, et al. Artificial intelligence in the fertility clinic: status, pitfalls and possibilities. *Hum Reprod.* 2021;36(9):2429-2442. doi:[10.1093/humrep/deab168](https://doi.org/10.1093/humrep/deab168)
30. Bhaskar D, Chang TA, Wang S. Current trends in artificial intelligence in reproductive endocrinology. *Curr Opin Obstet Gynecol.* 2022;34(4):159-163. doi:[10.1097/GCO.0000000000000796](https://doi.org/10.1097/GCO.0000000000000796)
31. Jiang VS, Bormann CL. Artificial intelligence in the in vitro fertilization laboratory: a review of advancements over the last decade. *Fertil Steril.* 2023;120(1):17-23. doi:[10.1016/j.fertnstert.2023.05.149](https://doi.org/10.1016/j.fertnstert.2023.05.149)