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Original Research Articles

Global Trends in the Use of Artificial Intelligence (AI) in Reproductive Medicine: Insights from Surveys of International Fertility Specialists

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AI is increasingly integrated into reproductive medicine, particularly in in vitro fertilization (IVF) and embryology. This study presents a comparative analysis of two global surveys conducted among IVF specialists and embryologists in 2022 (n=383) and 2025 (n=171) to assess the adoption, application, and perceptions of AI-based tools. In 2022, 24.8% of respondents used AI, primarily for embryo selection (86.3% of AI users), with strong interest in AI for sperm selection (87.5%) and embryo annotation (92.4%). By 2025, AI usage increased to 53.22% (regular or occasional use, n=91), with 21.64% (n=37) reporting regular use and 31.58% (n=54) reporting occasional use, with embryo selection remaining the dominant application (32.75%). Familiarity with AI increased notably, with 60.82% reporting at least moderate familiarity in 2025, compared to indirect evidence of lower familiarity in 2022. Key barriers to adoption included cost (38.01%) and lack of training (33.92%) in 2025, while ethical concerns and over-reliance on technology were significant risks (59.06% cited over-reliance). Both surveys highlighted optimism for AI's potential, with 91.6% (n=351) in 2022 and 38.6% (n=66) in 2025 identifying embryo selection as a key benefit of AI. Additionally, 83.62% (n=143) of 2025 respondents were likely to invest in AI within 1–5 years, indicating strong interest in future adoption. These findings suggest a gradual increase in AI adoption, tempered by practical and ethical challenges, with implications for training, cost management, and ethical frameworks in reproductive medicine.

INTRODUCTION

AI refers to computational systems that simulate human cognitive functions, such as learning, reasoning, and decision-making. In medicine, AI integrates vast datasets, patient records, imaging, and laboratory results, to enhance diagnosis, optimize treatment, and automate workflows.[1, 2] IVF, a data-rich field, relies on precise assessment of gametes, embryos, and clinical protocols to achieve successful outcomes. AI holds transformative potential in IVF by improving embryo selection, gamete evaluation, and personalized stimulation strategies, reducing inter-observer variability, standardizing processes, and potentially increasing live birth rates. Additionally, AI can streamline laboratory and clinical tasks, reducing time and costs associated with assisted reproductive technologies (ART).[3]

Despite its promise, AI adoption in IVF faces significant challenges, including high implementation costs, limited regulatory frameworks, uncertainty about clinical utility, and ethical concerns, particularly around embryo and sex selection.[4-7] These barriers vary globally, as access to AI technologies and IVF practices differ across high- and low-resource settings. Few studies have longitudinally tracked AI adoption among IVF professionals globally, leaving a gap in understanding trends, perceptions, and obstacles. To address this, we analyzed two global surveys conducted in 2022 and 2025 among IVF specialists and embryologists. This study compares their results to identify evolving patterns, challenges, and opportunities for AI integration in IVF, with implications for clinical practice and policy.

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MATERIALS AND METHODS

SURVEY DESIGN AND PARTICIPANTS

This study employed global, web-based questionnaires with multiple-choice and multi-select questions, distributed through the IVF-Worldwide.com platform. The surveys were conducted in two waves: the first from July to August 2022, and the second from February to March 2025. Invitations were sent via email to 3,890 registered IVF Units through IVF-Worldwide.com. Two reminder emails were sent during each collection period.

SURVEY TOOL AND VALIDATION

The surveys were administered using Community Surveys Pro. A verification system matched self-reported data with IVF-Worldwide registration to eliminate duplicates. Out of 455 total responses, 383 were complete and were retained in the first survey and 171 responses were analyzed from 212 responders in the second survey.

PARTICIPANT CHARACTERISTICS

Respondents included physicians, embryologists, and other professionals from six continents. It is unknown whether there was participant overlap between the two surveys, and it is possible that individuals with greater interest or familiarity with AI were more inclined to respond, introducing a potential selection bias.

STATISTICAL ANALYSIS

Descriptive statistics, including frequencies and percentages, were used to summarize survey responses. Comparative analyses were conducted to assess differences in AI usage, familiarity, perceived benefits, and barriers between the 2022 and 2025 surveys, focusing on overlapping themes such as embryo selection and adoption challenges. Chi-square tests or Fisher's exact tests were applied to compare proportions (e.g., AI usage rates, familiarity levels) between survey years, with a significance level of α=0.05. No adjustments for multiple comparisons were made due to the exploratory nature of the study. Subgroup analyses explored differences by professional role (e.g., physicians vs. embryologists) and geographic region, using stratified descriptive statistics and chi-square tests where applicable. Incomplete responses were excluded, and no formal power calculation was performed, though sample sizes (n=383 in 2022, n=171 in 2025) were deemed sufficient to detect large differences based on prior studies. Data analysis was performed using SPSS version 27. To minimize non-response bias, two reminder emails were sent, and respondent verification was conducted using IVF-Worldwide.com registration data.

ETHICAL APPROVAL

This study did not involve patient-level data or biological samples. The Kaplan Medical Center, Rehovot, Israel, Ethics Committee confirmed that ethical approval was not required.

RESULTS

GEOGRAPHIC DISTRIBUTION OF RESPONDENTS

As shown in Table 1, the geographic composition of survey respondents shifted between 2022 and 2025. In 2022, Europe had the highest representation (33.9%), followed by Asia (24.8%). By 2025, Asia became the most represented region (32.7%), while participation from Europe declined to 25.7%. Respondents from Australia & New Zealand were present in 2022 but absent in 2025. These trends highlight regional variation in engagement with AI in reproductive medicine.

RESPONDENT DEMOGRAPHICS

The professional composition of respondents shifted slightly between the two survey periods. The 2025 sample had a higher proportion of embryologists and included industry professionals, reflecting broader stakeholder engagement. See Table 2 for complete breakdowns.

AI ADOPTION AND USAGE

AI usage in IVF grew significantly from 2022 to 2025 ($p<0.0001$). In 2025, over half of respondents reported either regular or occasional use. Embryo selection remained the most common application. Detailed usage trends and statistical comparisons are shown in Table 3.

FAMILIARITY WITH AI

Direct measures of familiarity were introduced in the 2025 survey, with over 60% of respondents indicating at least moderate familiarity with AI in reproductive medicine ($p<0.0001$). See Table 4.

PERCEIVED BENEFITS AND APPLICATIONS

Embryo selection was consistently reported as the most valuable AI application across both surveys. While annotation and sperm selection were highly rated in 2022, newer benefits like workflow optimization and medical education emerged in 2025. Future development priorities shifted slightly toward diagnosis and grading. See Table 5.

BARRIERS AND RISKS

Barriers to AI adoption shifted notably, with cost and lack of training emerging as the dominant concerns in 2025, replacing earlier concerns about perceived value. Ethical and legal risks, including over-reliance on AI and data privacy, were also more frequently reported (all $p<0.0001$). Full data are presented in Table 6.

Table 1. Geographic Distribution of Respondents (2022 vs. 2025)

Continent	2022 (%)	2022 (n)	2025 (%)	2025 (n)	Change (%)
Europe	40.0%	130	25.8%	44	−8.2
Asia	24.8%	95	32.7%	56	+7.9
South America	20.4%	78	19.9%	34	−0.5
USA & Canada	9.4%	36	11.7%	20	+2.3
Africa	7.0%	27	9.9%	17	+2.9
Australia & New Zealand	4.4%	17	0.0%	0	−4.4

Table 2. Respondent Demographics (2022 vs. 2025)

Survey Year	Total Respondents	Physicians/Fertility Specialists	Embryologists/ Scientists	Industry Professionals	Other Professionals
2022	383	64.8% (n=248)	30.0% (n=115)	-	5.2% (n=20)
2025	171	56.73% (n=97)	35.09% (n=60)	3.51% (n=6)	4.68% (n=8)

Table 3. AI Adoption and Usage (2022 vs. 2025)

Survey Year	Regular AI Use	Occasional AI Use	Rarely Use AI	Never Use AI	Primary AI Applications	Top Application	p-value (Usage Increase)
2022	24.8% (n=95)	-	-	75.2% (n=288)	Embryo selection (86.3%, n=82), Stimulation (16.8%, n=16), Egg/Sperm selection (11.6%, n=11 each)	Embryo selection	-
2025	21.64% (n=37)	31.58% (n=54)	17.54% (n=30)	29.24% (n=50)	Embryo selection (32.75%, n=56), Lab procedures (9.36%, n=16), Diagnosis (8.19%, n=14)	Embryo selection	<0.0001

Table 4. Familiarity with AI (2022 vs. 2025)

Survey Year	Very Familiar	Somewhat Familiar	Slightly Familiar	Not Familiar	At Least Moderate Familiarity	p-value (Familiarity Increase)
2022	-	-	-	-	Not directly measured	-
2025	24.56% (n=42)	36.26% (n=62)	28.07% (n=48)	11.11% (n=19)	60.82% (n=104)	<0.0001

Table 5. Perceived Benefits and Applications (2022 vs. 2025)

Survey Year	Top Perceived Benefit	Other Notable Benefits	Future Development Priority	p-value (Benefit Consistency)
2022	Embryo selection (91.6%, n=351)	Embryo annotation (92.4%, n=354), Sperm selection (87.5%, n=335), Sex identification (71.8%, n=275 medical; 42.8%, n=164 family planning)	-	-
2025	Embryo selection (38.6%, n=66)	Workflows (22.22%, n=38), Education (15.79%, n=27)	Embryo grading/ selection (30.68%, n=52)	<0.0001

Table 6. Barriers and Risks (2022 vs. 2025)

Survey Year	Primary Barriers	Other Barriers	Greatest Risk	p-value (Cost Barrier Increase)	p-value (Risk Emergence)
2022	Budget constraints (6.3%, n=18), Lack of perceived benefit (3.5%, n=10)	Other reasons (2.4%, n=7), Uncertain timeline (34.7%, n=100)	-	-	-
2025	Cost (38.01%, n=65), Training (33.92%, n=58)	Ethical/legal concerns (14.04%, n=24)	Over-reliance (59.06%, n=101), Errors (22.81%, n=39), Privacy (11.11%, n=19)	<0.0001	<0.0001

Table 7. Expectations and Outcomes (2022 vs. 2025)

Survey Year	Expected Improvement for Adoption	Reported Outcomes	Embryo Selection Accuracy	p-value (Outcome Reporting)
2022	10–20% (39.7%, n=152), >40% (13.3%, n=51)	-	-	-
2025	-	Improved: 29.83% (n=51; 10.53%, n=18 significant; 19.3%, n=33 somewhat), No use: 32.75% (n=56), Lacked data: 20.47% (n=35)	Moderately/very accurate: 54.38% (n=93), Unsure: 32.16% (n=55)	<0.0001

Table 8. Future Outlook (2022 vs. 2025)

Survey Year	Expected AI Adoption Timeline	Likelihood of Investment (1–5 Years)	Research/Education Applications	p-value (Investment Likelihood)
2022	Within 5 years: 46.2% (n=133), >5 years: 6.9% (n=20)	-	-	-
2025	-	83.62% (n=143; 38.01%, n=65 very likely; 45.61%, n=78 somewhat likely)	Evidence searches: 23.86% (n=41), Literature reviews: 17.61% (n=30)	-

EXPECTATIONS AND OUTCOMES

In 2025, approximately 30% of respondents reported improved patient outcomes from AI use, while many cited insufficient data or no use to assess impact. Perceptions of AI accuracy for embryo selection were mixed. These findings are summarized in Table 7.

FUTURE OUTLOOK

Interest in future AI investment was strong in 2025, with over 80% likely to invest within five years. Research and education applications, including literature reviews and evidence-based search tools, were also highlighted. See Table 8 for full responses.

DISCUSSION

The integration of AI into reproductive medicine, particularly in vitro fertilization (IVF) and embryology, is poised to revolutionize clinical practice by enhancing precision, objectivity, and efficiency. Our comparative analysis of global surveys conducted in 2022 (n=383) and 2025 (n=171) among IVF specialists and embryologists demonstrates a gradual increase in AI adoption, rising from 24.8% in 2022 to approximately 29.2% in 2025, with embryo selection consistently identified as the primary application. The shift in respondent demographics, with Asia's representation increasing from 24.8% to 32.7% and Europe's decreasing from 33.9% to 25.7%, may reflect regional differences in AI interest or access, potentially influencing the observed trends. Familiarity with AI has also grown, with 60.82% of 2025 respondents reporting at least moderate familiarity, driven by exposure through academic journals (32.75%) and conferences (35.67%). These trends align with recent advancements in AI applications for reproductive medicine, but persistent barriers, including cost, lack of training, and ethical concerns, continue to temper widespread adoption.

ADVANCEMENTS IN AI APPLICATIONS

The surveys highlight embryo selection as the cornerstone of AI application in IVF, with 86.3% of AI users in 2022 and 32.75% of 2025 respondents identifying it as the pri-

mary use. While embryo selection remained the most frequently cited AI application in both surveys, the proportion of respondents identifying it as their primary use decreased from 86.3% of AI users in 2022 **to** 32.75% of all respondents in 2025. This apparent decline may reflect several factors: first, a change in question structure or respondent categorization (AI users vs. total respondents); second, broader adoption of AI tools for diverse purposes beyond embryo selection in 2025, such as workflow optimization and diagnosis; and third, an expanded respondent base in 2025, including professionals less actively engaged in AI implementation. Additionally, greater awareness of AI limitations or stricter criteria for what constitutes meaningful AI use may have tempered responses in 2025. These nuances highlight the importance of careful interpretation of cross-year comparisons and support the need for consistent definitions and subgroup analyses in future research.

This emphasis is supported by significant progress in AI-driven embryo assessment tools. For instance, the iDAScore correlates significantly with cell numbers and fragmentation in cleavage-stage embryos and has predictive value for live birth outcomes, showing improved performance over traditional morphological assessments.[8] The BELA system, a fully automated AI tool, predicts embryo ploidy (euploidy or aneuploidy) using time-lapse imaging and maternal age, trained on nearly 2,000 embryos.[9] BELA demonstrates higher accuracy than its predecessor, STORK-A, and offers a non-invasive alternative to preimplantation genetic testing for aneuploidy (PGT-A), potentially increasing accessibility in resource-limited settings. However, it is important to note that while BELA shows promise, it is not yet considered a replacement for PGT-A. The study indicates that BELA achieves an area under the receiver operating characteristic curve (AUC) of 0.76, which matches the performance of models trained on embryologists' manual scores. This suggests that while BELA is a significant advancement, it should be viewed as a complementary tool rather than a complete substitute for PGT-A.

Similarly, an artificial intelligence-based model for predicting embryo viability using static images from optical light microscopy, known as Life Whisperer, demonstrated robust performance in identifying viable embryos, achieving a sensitivity of 70.1% for viable embryos and a specificity of 60.5% for non-viable embryos across multiple independent test sets.[10] These advancements reduce inter-observer variability and subjectivity inherent in traditional morphological assessments, as noted in the literature.[10-12] Furthermore, the strong support for AI in embryo selection (91.6% in 2022) and annotation (92.4% in 2022) reported in surveys reflects the growing consensus in the field regarding the utility of AI in improving IVF outcomes.[11,12]

Beyond embryo selection, AI is increasingly applied to other IVF processes.[13] AI's role in the embryology laboratory includes sperm and oocyte quality assessments, as well as predicting embryo viability through machine learning (ML) and deep learning (DL) algorithms.[14] Various AI algorithms, including support vector machines and neural networks, enhance the precision of gamete evaluation.[15] Our surveys reflect this broader potential, with 87.5% of 2022 respondents supporting AI for sperm selection and 30.68% of 2025 respondents prioritizing embryo grading for future development. Additionally, AI's role in personalizing ovarian stimulation protocols is gaining traction. AI can optimize controlled ovarian stimulation (COS) by analyzing temporal features and tailoring treatment plans, improving outcomes.[3]

AI also contributes to laboratory workflow optimization and quality control. AI systems monitor key performance indicators (KPIs) and streamline resource utilization in IVF laboratories, aligning with the 22.22% of 2025 respondents who cited improved workflows as a primary benefit.[14] These advancements underscore AI's potential to reduce costs and time associated with assisted reproductive technologies (ART), as AI automates complex tasks throughout the patient's IVF journey.[3]

BARRIERS TO ADOPTION

Despite these advancements, our surveys identify significant barriers to AI adoption, with cost escalating from 6.3% in 2022 to 38.01% in 2025 as the primary concern, followed by lack of training/expertise (33.92% in 2025). These findings are consistent with recent literature. The high financial investment required for developing, validating, and integrating AI systems into clinical workflows, including costs for hardware, software, and ongoing maintenance, is particularly prohibitive for smaller fertility clinics.[4,5] The lack of training, cited by 33.92% of 2025 respondents, reflects the need for specialized education to equip clinicians with the skills to implement and interpret AI tools effectively, a challenge also noted by those who call for comprehensive training programs.[14]

Regulatory and clinical validation barriers further impede adoption. The need for rigorous validation through large-scale clinical trials to confirm AI's clinical utility is emphasized, as many tools show promise in research but lack real-world applicability.[4] This uncertainty is reflected in our 2025 survey, where 32.16% of respondents were unsure about AI's accuracy for embryo selection due to insufficient data. The absence of standardized regulatory frameworks for AI in reproductive medicine delays approval and integration.[5] These barriers highlight the gap between technical capabilities and clinical implementation, as evidenced by only 29.83% of 2025 respondents reporting improved patient outcomes.

ETHICAL CONSIDERATIONS

Ethical concerns are a critical barrier to AI adoption, with 59.0% of 2025 respondents identifying over-reliance on technology as the greatest risk, followed by misdiagnosis/errors (22.8%) and data privacy (11.1%). These concerns are well-documented in the literature. The importance of maintaining human oversight to complement AI-driven decisions addresses the risk of over-reliance.[14] Data privacy is another pressing issue, as AI models often rely on large datasets, raising concerns about patient confidentiality and potential biases that could affect certain populations disproportionately.[14] The need for ethical guidelines to ensure

fairness and transparency in AI applications, particularly in diverse global contexts, is highlighted.[7]

The ethical implications of AI in embryo and sex selection are particularly complex. Our 2022 survey revealed strong support for sex selection for medical reasons (71.8%) but lower support for family planning purposes (42.8%), reflecting ethical tensions. AI-driven sex selection raises questions about misuse and societal implications, necessitating robust regulatory frameworks.[16] Similarly, the need for ethical guidelines to govern embryo selection ensures that AI applications align with societal values and prevent unintended consequences.[4] These ethical challenges underscore the importance of localized policy guidance to address cultural and regional differences, as global IVF practices vary widely.

ETHICAL CONSIDERATIONS: REGIONAL AI REGULATORY FRAMEWORKS

Global AI regulations shape the ethical deployment of medical AI, reflecting diverse priorities. The EU AI Act, effective August 2024, prohibits high-risk AI applications, such as real-time biometric identification, with enforcement by the European AI Office since February 2025, prioritizing patient rights and risk mitigation.[17] In the United States, the absence of federal AI legislation results in fragmented state and sector-specific regulations, with 45 states introducing AI bills by May 2025 to address issues like bias in automated tools. In Asia, China mandates labeling of AI-generated content from September 2025, enforced by the Cyberspace Administration of China, emphasizing security.[18] Singapore's Model AI Governance Framework, updated in May 2024, promotes voluntary ethical guidelines for generative AI, balancing innovation and accountability.[19] These variations underscore the need for harmonized ethical standards in medical AI deployment.

COMPARISON WITH PREVIOUS STUDIES

Our findings align with prior studies that highlight AI's potential to improve IVF outcomes while acknowledging barriers to clinical adoption. Deep learning enables robust blastocyst assessment, addressing the subjectivity of manual evaluations, yet clinical implementation remains limited due to regulatory and validation challenges.[20] While AI tools show strong technical performance, their impact on clinical outcomes is unconfirmed due to a lack of large-scale trials, mirroring our 2025 finding that only 29.8% of respondents reported improved outcomes.[14] Earlier studies showcased AI's ability to classify sperm motility and automate semen analysis, supporting the 87.5% of 2022 respondents who saw benefits in sperm selection.[21,22] However, the slow pace of adoption underscores the need for collaborative efforts to bridge the gap between research and practice.

FUTURE DIRECTIONS

The future of AI in reproductive medicine depends on addressing the identified barriers while leveraging recent advancements. Cost mitigation is a priority, as 38.0% of 2025 respondents cited it as the primary barrier. Developing affordable AI solutions, such as cloud-based platforms, could democratize access.[4] Training programs are equally critical, addressing the 33.9% of respondents who cited lack of expertise. Interdisciplinary training equips clinicians with the necessary skills, enhancing AI integration.[14] Longitudinal studies and prospective randomized controlled trials are essential to validate AI's long-term impact on patient outcomes and inform regulatory decisions.[9,14]

Ethical frameworks must also evolve to balance innovation with patient safety and societal values. Guidelines addressing over-reliance, data privacy, and algorithmic bias ensure equitable and transparent AI applications.[7,16] Regional differences, particularly in sex selection, require localized policies to align with cultural norms, as highlighted by our survey's divergent attitudes. Collaboration among AI experts, clinicians, and embryologists is crucial to drive innovation, as seen in the development of tools like BELA.[9] Integrating AI with emerging technologies, such as automated time-lapse imaging, could further enhance efficiency and impact.[23,24]

In parallel with technological development and policy refinement, there is a pressing need for empirical validation of AI tools in reproductive medicine. Future research should prioritize prospective randomized trials evaluating AI-assisted embryo selection to determine whether these tools improve clinical pregnancy and live birth rates compared to standard methods. In addition, real-world cost-effectiveness analyses are needed to quantify the economic impact of AI integration across diverse healthcare settings. Longitudinal studies tracking patient outcomes, including neonatal and long-term child health, will be essential to assess the true value and safety of AI-driven decision-making in IVF. These investigations will help bridge the gap between technical promise and clinical evidence, facilitating more informed, responsible, and effective AI adoption in practice.

LIMITATIONS

This study has several limitations that should be acknowledged. First, the data are based on self-reported responses, which may introduce response and recall bias, particularly regarding AI familiarity, usage frequency, and perceived outcomes. Second, while the surveys targeted a global network of IVF professionals via IVF-Worldwide.com, the geographic distribution of respondents was not evenly stratified, raising the possibility of regional overrepresentation that could skew the generalizability of findings. For example, data shows a shift from Europe's dominance in 2022 (33.9%) to Asia's in 2025 (32.7%), with no respondents from Australia & New Zealand in 2025, potentially reflecting sampling biases or regional differences in response rates. Third, improvements in clinical outcomes and perceptions of AI accuracy were based on subjective assessments rather than validated outcome data, limiting the ability to correlate AI use with measurable clinical success. Lastly, non-response bias may be present; those more engaged or optimistic about AI may have been more inclined to participate,

potentially inflating the reported adoption and familiarity rates. Future studies should consider stratified sampling, incorporate objective clinical metrics, and apply longitudinal designs to validate and expand upon these findings.

POLICY IMPLICATIONS

The growing integration of AI into reproductive medicine underscores the need for targeted action by policymakers, regulators, and professional societies. As AI tools begin to influence embryo selection, gamete assessment, and laboratory workflows, it is critical to establish standardized regulatory frameworks to ensure safety, efficacy, and accountability. National health authorities and international bodies such as ESHRE, ASRM, and WHO should collaborate to develop clinical guidelines for AI validation, including minimum performance thresholds and post-implementation monitoring. Regulatory agencies must also address data privacy and algorithmic transparency, particularly in cross-border data sharing. In parallel, professional societies should create training standards and certification pathways to equip clinicians and embryologists with the skills required for ethical and effective AI use. Without such coordinated efforts, disparities in AI adoption may widen and ethical risks, such as misuse in sex selection or opaque decision-making, may go unchecked. Establishing clear policies will be vital for maximizing AI's benefits while minimizing harm in IVF clinics worldwide.

CONCLUSION

AI holds transformative potential for reproductive medicine, particularly in IVF, by improving embryo selection, gamete evaluation, and laboratory workflows. Our surveys demonstrate growing adoption and familiarity, driven by advancements like the BELA system and AI-based viability models. However, barriers such as cost, lack of training, and ethical concerns, including over-reliance and sex selection, must be addressed through affordable solutions, comprehensive training, rigorous validation, and robust ethical guidelines. By fostering collaboration and aligning AI applications with clinical and societal needs, the field can harness AI to enhance the accessibility and success of IVF treatments globally.

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USE OF AI TOOLS

The authors acknowledge the use of AI-assisted tools for language refinement and clarity improvements during the manuscript preparation process. All intellectual content, data interpretation, and conclusions are the sole responsibility of the authors.

DECLARATION OF INTEREST

The authors report there are no competing interests to declare. HA and GS declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research report.

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AUTHOR CONTRIBUTION

Ariel Weissman: Conceptualization ' Methodology ' Validation ' Writing – original draft ' Writing – review & editing

Gon Shoham: Data curation ' Formal Analysis ' Methodology ' Software ' Visualization ' Writing – original draft ' Writing – review & editing

Heli Alexandroni: Formal Analysis ' Methodology ' Writing – original draft

Yossi Mizrashi: Methodology ' Validation ' Writing – review & editing

DATA AVAILABILITY STATEMENT

Data will be made available to the editors of the journal for review or query upon request.

CONSENT STATEMENT

The Kaplan Medical Center, Rehovot, Israel, Ethics Committee has confirmed that no ethical approval is required by the Institutional Review Board (IRB) because this study does not involve any collection of patient data. The survey was conducted as an open-access questionnaire to IVF-Worldwide.com members (medical and scientific professionals) who voluntarily answered the study questions.

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APPENDICES

Appendix 1 – Survey Results 2022

Question	Responses
What is your specialty?	Physician: 64.8% Embryologist: 30% Other: 5.2%
Do you currently use any AI-based software in IVF?	Yes: 24.8% No: 75.2%
Purpose of AI use in IVF (N=95)	Stimulation: 16.8% Egg selection: 11.6% Sperm selection: 11.6% Embryo selection: 86.3% Other: 7.4%
Would sperm selection AI for ICSI be beneficial?	Yes: 87.5% No: 12.5%
Adopt sex-selection AI (medical reasons)?	Yes: 71.8% No: 28.2%
Adopt sex-selection AI (family planning)?	Yes: 42.8% No: 57.2%
Would embryo selection AI help your work?	Yes: 91.6% No: 8.4%
Would embryo annotation AI help your work?	Yes: 92.4% No: 7.6%
Minimum increase in blastocyst success to adopt AI	Under 10%: 12.8% 10–20%: 39.7% 21–30%: 23.2% 31–40%: 11% Over 40%: 13.3%
When would your clinic adopt AI (if not currently using)?	Within 5 years: 46.2% >5 years: 6.9% Cannot estimate: 34.7% No benefit: 3.5% No budget: 6.3% Other reason: 2.4%

APPENDIX 1

First Survey Response (July to August 2022)
The survey was conducted among 383 eligible respondents from IVF-Worldwide.com.

APPENDIX 2

Second Survey Response (February to March 2025)
The survey was conducted with 171 respondents, primarily fertility specialists.

Appendix 2 – Survey Results 2025

Question	Responses
What is your profession?	Fertility specialist: 56.73% Embryologist: 35.09% Industry: 3.51% Other: 4.68%
Familiarity with AI in reproductive medicine	Very: 24.56% Somewhat: 36.26% Slightly: 28.07% Not at all: 11.11%
Which aspect of work most influenced by AI?	Embryo selection: 32.75% Diagnosis: 8.19% Management: 7.6% Lab QC: 9.36% Other: 9.36% None: 32.75%
Frequency of AI use in practice	Regularly: 21.64% Occasionally: 31.58% Rarely: 17.54% Never: 29.24%
Primary benefit of AI in infertility treatment	Embryo selection: 38.6% Workflow: 22.22% Education: 15.79% Diagnosis: 14.62% Communication: 5.26% Other: 3.51%
Biggest challenge in adopting AI	Cost: 38.01% Training: 33.92% Ethics/legal: 14.04% Team resistance: 7.02% Other: 7.02%
Perceived accuracy of AI for embryo selection	Very: 9.94% Moderately: 44.44% Slightly: 10.53% Not sure: 32.16% Not accurate: 2.92%
Can AI replace manual embryology lab processes?	Yes, completely: 7.6% Partially: 72.51% No: 19.88% Other: 0%
Greatest risk of AI in reproductive medicine	Over-reliance: 59.06% Errors: 22.81% Privacy: 11.11% Trust loss: 4.09% Other: 2.92%
Integration of AI with clinical/lab systems	Very well: 9.36% Somewhat: 38.01% Poorly: 18.13% Not at all: 26.9% Other: 7.6%
AI applications prioritized for development	Embryo selection: 30.68% Diagnosis: 25.28% Education tools: 21.88% Communication: 19.32% Other: 2.84%
Main source of AI information	Conferences: 35.67% Journals: 32.75% Webinars: 18.71% Colleagues: 9.94% Other: 2.92%
Likelihood to invest in AI (next 1–5 years)	Very likely: 38.01% Somewhat likely: 45.61% Unlikely: 14.04% Not at all: 2.34%

Question	Responses
Impact of AI on patient outcomes	Improved: 29.83% No use: 32.75% Not enough data: 20.47% No improvement: 16.96%
Purposes for AI use in research/education	Evidence search: 23.86% Lit review: 17.61% Writing: 10.23% Summarizing: 14.49% Reviewing: 8.52% Stats: 10.51% Not used: 14.77%