

Artificial intelligence system developed to help better select embryos for implantation

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For many people who are struggling to conceive, in-vitro fertilization (IVF) can offer a life-changing solution. But the average success rate for IVF is only about 30 percent. Investigators from Brigham and Women's Hospital and Massachusetts General Hospital are developing an artificial intelligence system with the goal of improving IVF success by helping embryologists objectively select embryos most likely to result in a

healthy birth. Using thousands of embryo image examples and deep-learning artificial intelligence (AI), the team developed a system that was able to differentiate and identify embryos with the highest potential for success significantly better than 15 experienced embryologists from five different fertility centers across the United States. Results of their study are published in *eLife*.

"We believe that these systems will benefit clinical embryologists and patients," said corresponding author Hadi Shafiee, Ph.D., of the Division of Engineering in Medicine at the Brigham. "A major challenge in the field is deciding on the embryos that need to be transferred during IVF. Our system has tremendous potential to improve clinical decision making and access to care."

Currently, the tools available to embryologists are limited and expensive, and most embryologists must rely on their observational skills and expertise. Shafiee and colleagues are developing an assistive tool that can evaluate images captured using microscopes traditionally available at fertility centers.

"There is so much at stake for our patients with each IVF cycle. Embryologists make dozens of critical decisions that impact the success of a patient cycle. With assistance from our AI system, embryologists will be able to select the embryo that will result in a successful pregnancy better than ever before," said co-lead author Charles Bormann, Ph.D., MGH IVF Laboratory director.

The team trained the AI system using images of embryos captured at 113 hours post-insemination. Among 742 embryos, the AI system was 90 percent accurate in choosing the most high-quality embryos. The investigators further assessed the AI system's ability to distinguish among high-quality embryos with the normal number of human chromosomes and compared the system's performance to that of trained

embryologists. The system performed with an accuracy of approximately 75 percent while the embryologists performed with an average accuracy of 67 percent.

The authors note that in its current stage, this system is intended to act only as an assistive tool for embryologists to make judgments during embryo selection.

"Our approach has shown the potential of AI systems to be used in aiding embryologists to select the embryo with the highest implantation potential, especially amongst high-quality [embryos](#)," said Manoj Kumar Kanakasabapathy, one of the co-lead authors.

More information: Charles L Bormann et al. Performance of a deep learning based neural network in the selection of human blastocysts for implantation, *eLife* (2020). [DOI: 10.7554/eLife.55301](https://doi.org/10.7554/eLife.55301)

Provided by Brigham and Women's Hospital

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