"This is what medicine should be like in 2020"

AIVF deploys technology and innovation to boost reproductive science

Reproductive innovation firm AIVF aims to improve and streamline the costly, time-consuming process of IVF by integrating Artificial Intelligence (AI), machine learning and digital innovation. AIVF's CEO Daniella Gilboa, CCO Amir Lewkowicz and VP of Product Ido Hershkovitz tell *HEQ* how technological innovation affects IFV practitioners and patients.

What inspired the creation of AIVF?

DG: I've been an embryologist for many years. I think it's the most novel profession there is – IVF has been around for 42 years – but it hasn't developed or changed much as a field in that time: everything is still done manually, based on human expertise and human knowledge. We were inspired by two things: first, data started to flow into IVF labs and clinics in the forms of electronic medical records and videos of embryos; while at the same time technology evolved to a degree that, with machine learning and deep learning, computers are now capable of discovering many things that humans cannot.

How can Artificial Intelligence improve the process of embryo selection?

DG: The treatment process is very expensive – about $20,000 per treatment cycle – and a patient needs to go through five cycles on average until a baby is born, so that translates into about $100,000 for one child. IVF is great, but most people cannot afford it; so the entire process is very traumatic, it's expensive and it's stressful. Many people who cannot afford IVF are forced to come to the realisation that they may never be able to have children, and this is really heartbreaking.

AIVF was founded with the hope of helping families to achieve their dream of having a child. We think that decisions driven by technology and data can lead to better medicine, both for the physicians and mostly for the patient – and with 2.4 million cycles per year, the global IVF market is worth around $15bn: it poses a major opportunity for the AI healthcare revolution.

AL: While IVF has made a lot of advances, it is still a very labour intensive manual process to choose the embryo: the embryologist has to take the embryos out of the incubator, examine them under the microscope and then decide which embryo to implant in the uterus. It takes time; and it's very subjective: it's based on each person's experience. Currently the average success rate for choosing the correct embryo hovers around 25% to 30%, depending on the patient's age.

The benefit of having computers which can base decisions on historical data and outcomes using powerful algorithms is that they make the process more standardised; computers take the subjectivity out of the process. We want to apply this technology to all aspects of the IVF treatment, and all stakeholders as well

There are about 2.4 million IVF cycles worldwide annually. The US has around 280,000 cycles, which is relatively low in proportion to the population size: treatment cycles are expensive and IVF is rarely covered by health insurance. Only 15 states in the US have mandated insurance coverage for IVF; and they all have different parameters – one state will only cover one treatment cycle, another may cover two cycles – and this means that around 70% of women who receive IVF treatment in the US pay for it out of pocket, with around 50% going into debt. In Europe, which has a comparatively similar population size to the US, there are around 750,000 treatments; IVF is less costly here and there are more options for subsidised treatment. One of our goals is to increase both the overall success and the efficiency of the process, in order to lower costs and to enable more people to have a baby.

IH: Currently, the experience of the embryologist is what matters most in embryo selection – but computers can pinpoint issues which the human eye cannot see. We are trying to launch new technologies, to computerise current lab processes in order to meet the high demand for treatment.

How do you source the data on which your algorithms are built?

DG: We use data and AI technology, coupled with extensive domain expertise from IVF clinics in Europe and the US, as a means of transforming the IVF journey for all its stakeholders. We were founded by several of the world's foremost IVF experts: because we are all deeply involved in the field of IVF, the first thing we did is collaborate with clinics to gather data and research. We have partnered with a number of leading clinics worldwide; and we now hold the largest dataset of timelapse videos of human embryos developing, all of which will assist us in solving the complex challenge of embryo selection. We are currently completing the research phase and working towards deploying an improved version of the product within various clinics.

What benefits does AIVF offer for patients?

IH: Because demand for IVF is so high, if the process can be computerised then labs and clinics will be better equipped to cope this high

demand. Patients will benefit in turn: they will see faster and more effective results because the process is based on an AI algorithm, which is significantly more precise than manual processes. IVF patients are often under a lot of emotional stress. By keeping the patient appraised of what is happening in the lab, the progress of the treatment and the status of her embryos, this could really lower the pressure and stress; and this in turn has positive benefits for the treatment.

DG: Patients sometimes find that the entire IVF process is a bit obscure: they don't understand what's going on in the lab, everything is translated through the physician and nothing is really transparent. Through AIVF they will be able to see videos of the embryos and understand the decision making, so they can really be engaged and be a part of the process. This is what medicine should be like in 2020.

AL: If we can decrease the number of cycles that a patient needs to successfully conceive from the current average of five, they can have a baby sooner and incur less cost: it makes IVF more accessible to more people.

What are the benefits for clinicians?

DG: Patients often demand to know everything – the statistics, the probability, the success rate – and usually the physician cannot answer questions like that, because they don't have the exact numbers: there is a lack of data-driven decisions, so everything is based on either gut feeling or wide ranging statistics which may not be relevant to the specific patient. In this way the interaction between physicians and patients is not as professional as it should be – the physician will describe embryos as 'nice' or 'cute', and it's not very scientific. By having a tool to support decision making, patient interaction would be much more scientific and much more exact. The patient would understand the chances, she wouldn't feel like she's not getting the entire picture.

AL: In many clinics around the world physicians are also partners or owners of the business. Aside from the medical benefits, AIVF can increase the efficiency and success rate of a clinic. IVF is a very competitive field, the patient has a lot of power choosing a clinic; and increasing a clinic's success rate efficiency through technology will in turn help the business to grow.

How do you see AIVF developing in the future?

IH: We aim to provide the next generation of IVF treatment; we are launching new technologies all the time, both to automate additional facets of lab work and to ensure treatment is better and more efficient for the patient. The goal is to make the time between the patient beginning treatment and becoming pregnant as short as possible; and we can help labs to achieve this by shoring up their efficiency.

DG: We want to change the entire process, implementing our system in more labs in order to be less reliant on a single person's expertise. We wouldn't want to take the human expertise out altogether, but to operate as a joint venture between the physician and the technology. We want to make the IVF process much more efficient and more accurate: time to pregnancy will be quicker, with much less stress and much less unknown; and the patient can be more engaged in the process and understand what's going on.

AIVF
Ai assisted technology for IVF treatments

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