

Conference Report

Summary Report on Impact of Machine Learning and Mobile Application in Personalizing Assisted Reproductive Technology



Summary Of
The ESHRE 39th Annual Meeting

ESHRE serves as a platform for reproductive medicine conferences, featuring sessions that emphasize the application of artificial intelligence in customizing assisted reproductive technology

Context

The 39th annual meeting of the European Society of Human Reproduction and Embryology (ESHRE) took place in Copenhagen, Denmark from June 25th to 28th 2023

ESHRE's primary objective is to foster interest in and enhance comprehension of reproductive biology and medicine.



Scope of Discussion

The report provides a glimpse into few case studies of the scientific programs conducted based on the theme of machine learning (ML) and mobile app that aid in personalizing assisted reproductive technology (ART)

Session Themes:

- Enhancing Access to ART and Improving Live Birth Outcomes through ML-Based Personalized Prognostics (Speaker: Hila Raanani, Israel)
- Patients Support Through a Mobile Application Improves ART Outcomes Across Age Groups (Speaker: Mylene Yao, the US)

Artificial intelligence's applicability in healthcare continues to expand, and within the realm of ART, multiple ML techniques have been successfully used to optimize performance and outcomes

Overview

ART

- ART encompasses medical procedures primarily used to address infertility, yet its limited usage, despite being effective and safe, leads to missed opportunities in helping individuals create families
- However, the integration of artificial intelligence (AI) with ART shows promise as an exciting field of research with ongoing advancements

Application of AI/ML in ART

The integration of AI in ART laboratories enhances gamete and embryo quality prediction for in vitro fertilization (IVF)

Automation and AI are revolutionizing IVF by replacing subjective expertise with precise and standardized methods

The use of AI in the IVF lab encompasses tasks ranging from observation to embryo selection, driving advancements in automation through robotics

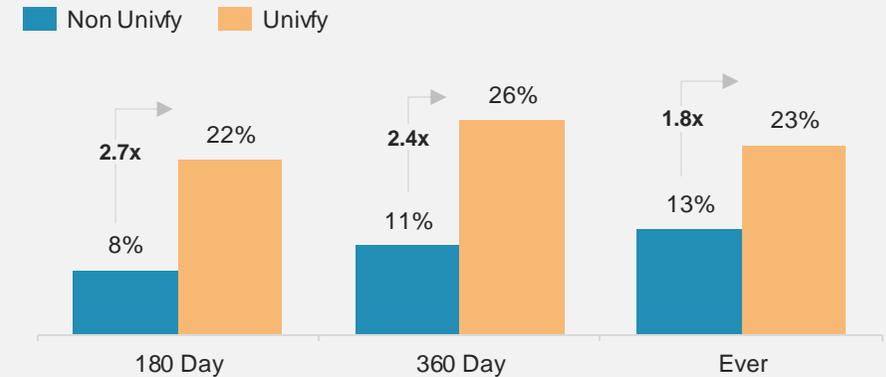
Source: ESHRE 39th Annual Meeting

A study at the ESHRE conference revealed that using a patient-centric, ML-prognostics counseling report resulted in significantly higher ART conversion rates than conventional therapies

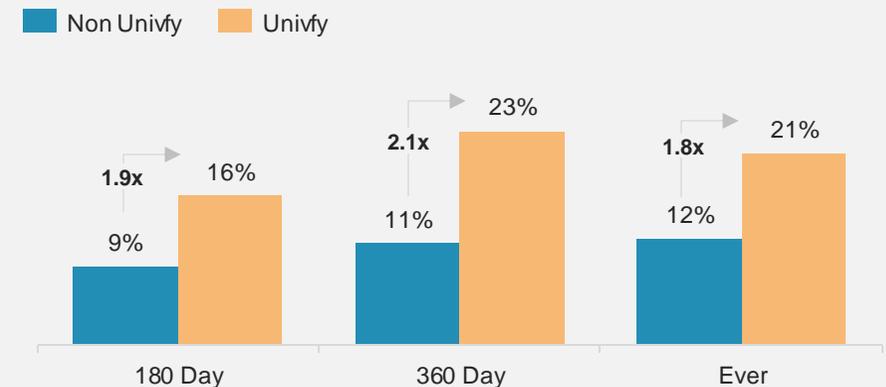
Case Study 1 (1/2) – Enhancing Access to ART and Improving Live Birth Outcomes through ML-Based Personalized Prognostics

- The utilization rate of ART for infertility is alarmingly low, with less than 5% of eligible individuals accessing it, mainly due to limited availability.
- The high cost of IVF and need for multiple attempts to increase pregnancy chances create significant financial burdens, making access to IVF challenging. Despite multiple attempts, the success rate of IVF remains disappointingly low.
- Personalized ART prognosis plays a crucial role in helping patients establish realistic expectations regarding IVF success and assists in financial planning for multiple cycles to increase the likelihood of achieving a LB outcome.
- A [retrospective study](#) analyzed the impact of using a patient-centric, ML-based prognostic counseling report (Univfy® PreIVF Report) on the conversion rate (first ART cycle usage) and LB rate (LBR) in ART
 - Based on the findings of the study, it was observed that the use of ML-prognostic counseling report (Univfy) by fertility specialist was associated with higher ART conversion rate (by 2.7, 2.4, 1.8 folds) and high LB outcomes (by 1.9, 2.1, 1.8 folds)

ART Conversion Rate in Timed Analysis



Estimated Live Birth Rates



Source: ESHRE 39th Annual Meeting

Personalized ML-prognostics counseling report helps patient set the right expectations and plan better financially by providing IVF success probability and number of IVF cycles a patient will likely need

Case Study 1 (2/2) – Enhancing Access to ART and Improving LB Outcomes through ML-Based Personalized Prognostics

Impact of personalized ART prognosis

Number of Cycles	Individual 1	Individual 2	Individual 3
Age of the individuals – 38 years			
Cycle 1	~40%	~15%	~8%
Cycle 2	~64%	~28%	~15%
Cycle 3	~78%	~39%	~2%

WHAT DOES ML-PROGNOSTIC COUNSELING REPORT DO?

- It provides IVF success probability and number of IVF cycles a patient will likely need
- As personalized IVF success probability directly affects the cost of having a baby from IVF, this will help the patients have the right expectations and plan better financially

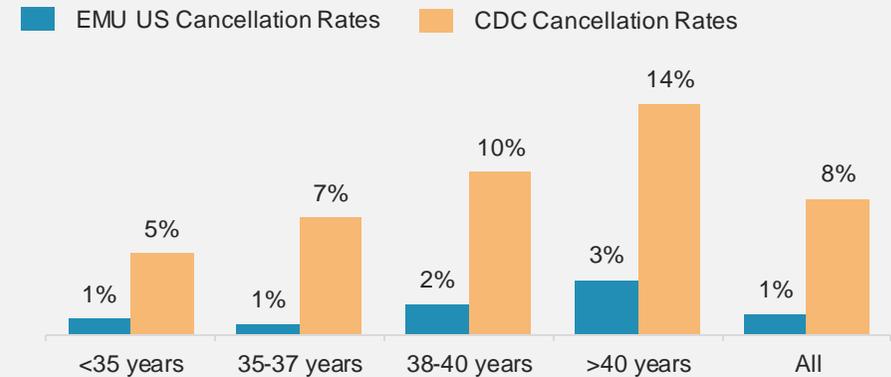
Source: ESHRE 39th Annual Meeting

Another study presented in the conference emphasized the positive influence of integrating mobile apps for patient support in ART, resulting in a significant (~50%) reduction in stimulation cancellation rates

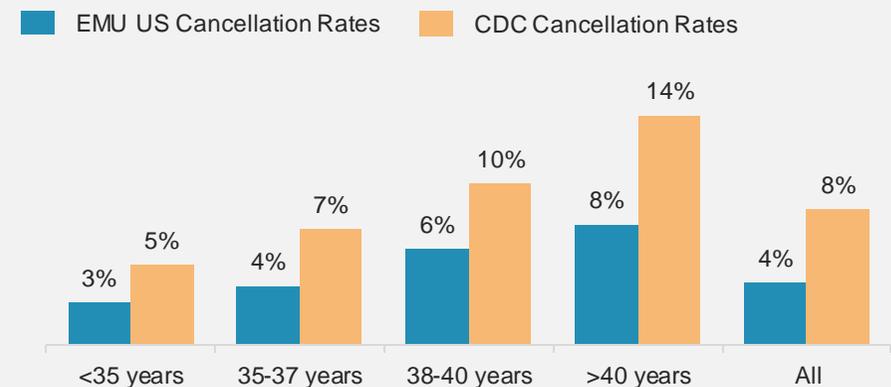
Case Study 2 (1/2) - Patients Support Through a Mobile Application Improves ART Outcomes Across Age Groups

- Growing numbers of adults use digital health tools to diagnose and manage their health conditions especially reproductive health
- Limited research has been conducted on mobile application's ability to impact ART outcomes
- This necessitates requirement for focused research on patient support through mobile applications to improve ART outcomes
- A retrospective study* conducted on fertility clinic patients to analyze ART outcomes by providing patient support using Embie mobile application's database (EMU)
 - Based on the findings of the study, it was observed that using EMU reduced stimulation cancellation rates by ~50% compared to Centre for Disease Control and Prevention (CDC) 2020 report
 - Furthermore, EMU demonstrated higher ongoing pregnancy rates than the average rates by age reported by the CDC
 - Patients also reported feeling "more organized" and "taking an active role in their treatment." Hence, increased patient engagement could lead to increased treatment compliance and outcomes

The US Stimulation Cancellation Rates EMU versus CDC 2020:



Non-US Stimulation Cancellation Rates EMU versus CDC 2020:



Source: ESHRE 39th Annual Meeting

*Study is not yet published

Mobile applications are transforming ART research by facilitating the real-time collection and analysis of big data, leading to improved fertility treatment outcomes

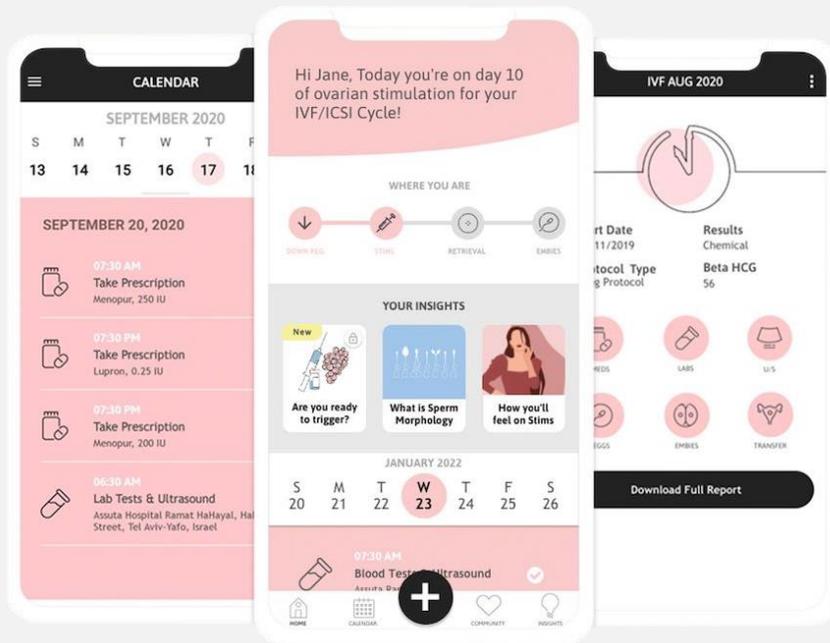
Case Study 2 (2/2) - Patients Support Through a Mobile Application Improves ART Outcomes Across Age Groups

Impact of Embie mobile application

What does the app do?

The app provides treatment, support, and adherence tools at every point during the patient's journey

- **Patient Onboarding**
 - Intake of basic information, medical and fertility history
- **Treatment and Tracking Adherence**
 - Track and compare previous and current treatment cycles
- **Insights**
 - Give personalized information by patient age and diagnosis on a per cycle basis
- **Support**
 - Community support with patients on similar paths



Source: ESHRE 39th Annual Meeting

Overall, mobile applications and **ML** will have a positive impact on the patient experience and fertility outcomes in ART; ongoing research will continue to influence future ART treatments

Summary

Impact of Mobile Application on ART outcomes

- Fertility treatment mobile applications significantly enhance ART outcomes and improve the overall experience for patients
- Increased patient engagement through mobile application leads to increased treatment compliance and improved outcomes

Impact of ML-Based Personalized Prognostics

- Use of a patient-centric, ML-prognostics counseling report results into significantly higher ART conversion rates and LBRs
- It helps patient set the right expectations and plan better financially by providing IVF success probability and number of IVF cycles a patient will likely need

Further research requirement

- Since there is limited existing research on AI/ML's impact on reproductive health, collaboration with additional centers is necessary to evaluate the reproducibility of AI/ML-driven, validated personalized prognostics for IVF



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