ARTIFICIAL INTELLIGENCE TO LEVEL THE NUMBER OF VAGINAL OOCYTE RETRIEVALS PER DAY AT A SINGLE CLINIC

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Background
Changing socio-demographic trends have greatly increased the demand for in-vitro fertilization. Many clinics, especially those within high population metropolitan areas, have seen dramatic increases in patient throughput which can significantly strain staff resources and increase the costs to the clinic. A tool to balance the number of retrievals each day would help a clinic avoid over-capacity days and ultimately facilitate increased patient throughput without additional staffing costs.

Objective
To retrospectively analyze the effect of using artificial intelligence (AI) to level the number of vaginal oocyte retrievals performed per day at a single IVF clinic.

Materials and Methods
Historical electronic medical record (EMR) data were collected for IVF retrievals at one clinic in the US from February to June 2024, for a total of 1556 cycles from 1398 patients. At this clinic, the first operating room (OR) had a daily capacity of 14 retrievals, after which a second OR had to be utilized for overflow. For each patient in the study, follicle sizes and E2 levels were input into a previously-developed AI algorithm[1] to predict mature oocytes (MII) if triggering on their actual day of trigger, the day after, or two days after. Using these predictions, a level loading algorithm was implemented to identify patients who could safely be pushed to avoid triggering more than 14 patients per day. Going through each day sequentially, if the number of patients selected for trigger exceeded 14, we allowed for pushing patients up to two additional days, as long as (1) predicted MIIs were not declining, (2) E2 did not exceed 5000 ng/mL, and (3) patients were not on day 15 or later.

Results
Prior to implementation of level loading, the number of retrievals exceeded the limit on 37 days (31.6%) over the four-month period. After level loading, this was reduced to only 12 days (10.3%), representing a reduction in over capacity days by 67.6%. To achieve this, 84.2% of patients had their trigger date unchanged, while 14.3% of patients were pushed one additional day and 1.5% of patients were pushed two additional days. Patients who were pushed had an average E2 of 2038 ± 965 ng/mL on the original trigger day and an average predicted E2 of 2620 ± 1189 ng/mL on the new trigger day.

Conclusions

We developed an algorithm to identify patients whose trigger day could safely be modified to avoid significant fluctuations in oocyte retrievals at a clinic. Our retrospective analysis suggests that implementation of this algorithm would have greatly reduced the number of days where an additional OR would have been opened, which could improve operational efficiency and reduce excess staff hours. Future work should investigate prospective use of this tool, which would additionally allow clinicians the ability to safely pull patients to an earlier trigger day and consider other factors such as protocol, progesterone levels, or scheduling preferences.

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References
(1) Fanton, M. et al. *Fertility and Sterility.* 2022.