# IN-HOUSE DEVELOPED AI FOR EMBRYO SELECTION INCREASES ONGOING PREGNANCY RATE

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## Background

Morphokinetics are being used to develop AI algorithms for embryo selection. The differences in morphokinetic timings are used as selection criteria for embryo transfer in addition to morphology along with traditional embryo selection. These AI systems are reproducible and non-invasive with the addition of timelapse incubation in the IVF laboratory. CareMaps is an in-house developed AI algorithm that uses the morphokinetic timings post insemination of second polar body extrusion, pronuclear appearance, pronuclear fading, cellular division at the 2, 3, 4, 5, 6, 7, 8 cell stages, start of compaction, morula formation, start of blastulation, expanded blastocysts with inner cell mass and trophectoderm grading. Based on these morphokinetic timings, each embryo is given a CareMaps score 1 (lowest) - 10 (highest). Embryo selection for transfer is based on the CareMaps score of the individual embryo.

## Objective

To assess the effect of an in-house developed AI for embryo selection on cycle outcomes.

## Materials and Methods

163 elective single frozen embryo transfers (eset FET) utilized the CareMaps score as the sole source of embryo selection criteria when multiple embryos were frozen and available for transfer. All cycles included embryos vitrified at the blastocyst stage on day 5/6 with embryo grades of A or B for both the inner cell mass and trophectoderm. Pregnancy and ongoing pregnancy outcomes were compared with 128 non-CareMaps eset FET cycles that were performed during the same time period with the same embryo criteria. In these cycles, CareMaps scores were not available to aid in embryo selection and morphology and day of vitrification were used as the selection tools. Cycle outcomes for all FET cycles, for PGT Euploid only transfers, and for non PGT tested cycles were grouped for comparison.

## Results

Initial pregnancy rate (65%, 61%) and gestational sac formation (56%, 51%) showed no significant difference between the CareMaps selected and non-CareMaps selected eset FETs, but did show a positive trend upwards. Transfers utilizing CareMaps selection had a significantly ($p< 0.1$) higher ongoing pregnancy rate (52%) compared to the traditional selection FETs (44%). When comparing the PGTA Euploid FET subset of each group, we see similar initial pregnancy (66%, 64%) and sac (57%, 51%) rates, however there is a significant ($p<0.1$) increase in ongoing pregnancy rate with a positive fca in the CareMaps FET group (53%, 40%). The same trend appears in the data when non-PGTA transfers are parceled out in each group comparing initial pregnancy rates (63%, 59%), sac formation (62%, 51%) and ongoing pregnancy (54%, 40%) rates.

## Conclusions

AI assisted embryo selection using the CareMaps algorithm is having a significant positive impact on ongoing eset FET rates compared to eset FET cycles that did not utilize CareMaps for embryo selection. Cycle numbers were too small to see any impact of the individual CareMaps scores (1-10) on transfer outcomes at this time, and we will continue to assess as cycle numbers increase.

## Financial Support

Not Applicable

## References

Campbell A, Smith R, Petersen B, Moore L, Khan A, Barrie A. O-125 Application of artificial intelligence using big data to devise and train a machine learning model on over 63,000 human embryos to automate time-lapse embryo annotation. Human Reproduction. 2022 Jul 1;37(Supplement_1): deac105-025.

| | n | positive hcg | sac formation | fca/ongoing pregnancy |
|---|---|---|---|---|
| All cycles with CM | 163 | 65 | 56 | 52 |
| All cycles without CM | 128 | 61 | 51 | 44 |
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| No PGTA with CM | 26 | 63 | 62 | 54 |
| No PGTA without CM | 35 | 59 | 51 | 40 |
| | | | | |
| PGTA with CM | 137 | 66 | 57 | 53 |
| PGTA without CM | 93 | 64 | 51 | 40 |