

Embryo transfer simulation improves pregnancy rates and decreases time to proficiency in Reproductive Endocrinology and Infertility fellow embryo transfers

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Objective: To design and evaluate an ET simulator to train Reproductive Endocrinology and Infertility (REI) fellows' techniques of ET.

Design: Simulation model development and retrospective cohort analysis.

Setting: Not applicable.

Patient(s): Patients undergoing IVF.

Intervention(s): Simulation model evaluation and implementation of ET simulation training.

Main Outcome Measure(s): Pregnancy rates.

Result(s): The REI fellow and faculty evaluation responses ($n = 19/21$ [90%]) of the model demonstrated realistic characteristics, with evaluators concluding the model was suitable for training in almost all evaluated areas. A total of 12 REI fellows who performed ET were analyzed: 6 before ET trainer and 6 after ET trainer. Pregnancy rates were 31% in the initial 10 ETs per fellow before simulator vs. 46% after simulator. One of six pre-ET trainer fellows (17%) had pregnancy rates $\geq 40\%$ in their first 10 ETs; whereas four of six post-ET trainer fellows had pregnancy rates $\geq 40\%$ in their first 10 ETs. The average number of ETs to obtain $>40\%$ pregnancy efficiency was 27 ETs before trainer vs. 15 ETs after trainer. Pregnancy rates were similar in the two groups after 20 ETs, and collective terminal pregnancy rates were $>50\%$ after 40 ETs.

Conclusion(s): Embryo transfer simulation improved REI fellow pregnancy rates in their first 10 transfers and led to a more rapid ET proficiency. These data suggest potential value in adopting ET simulation, even in programs with a robust history of live ET in fellowship training. (Fertil Steril® 2017; ■■:■■–■■. ©2017 by American Society for Reproductive Medicine.)

Key Words: Embryo transfer, fellowship education, medical simulation training, model development, pregnancy rates

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Simulation training has been used to train professionals in difficult aspects of their jobs for many decades. The airline industry and military have long used flight simulators in training their pilots. Simulation offers the opportunity to train in numerous situations and is often used to address high-risk or high-stakes procedures. Similarly, nearly all medical specialties use some aspect of simulation to teach

medical students, residents, and fellows important procedures, with proven effectiveness (1–4). Simulation training is increasingly being used in the training of medical professionals in their specialty or subspecialty field and has been developed for even the most experienced surgeon to “warm up” before surgical procedures (5).

During Reproductive Endocrinology and Infertility (REI) fellowship, development of two important technical skills is essential for independent practice: transvaginal oocyte retrieval and ET. Previous studies have demonstrated the importance of training in the success of the ET (6, 7). In addition, significant variance has been shown to occur between individual providers (8–11), confirming the importance of standardized training for physicians. Despite the importance of effective training in these procedures, not all fellowship programs provide experience in live ET, instead using IUI and mock transfers as surrogates for teaching these techniques.

Viewing ET as the more difficult and important of the two skills, we focused on constructing a simulation model for this specific procedure. Our objectives were, first, to design and construct a prototype simulation model that would adequately and realistically replicate the skills needed to perform an ET procedure. Second, we evaluated pregnancy outcomes after IVF in fellows conducting ET both before and after simulation trainer implementation. We hypothesized use of ET simulation would lead to improved fellow pregnancy rates and shorten the time to procedure proficiency compared with presimulation training.

MATERIALS AND METHODS

Model Development

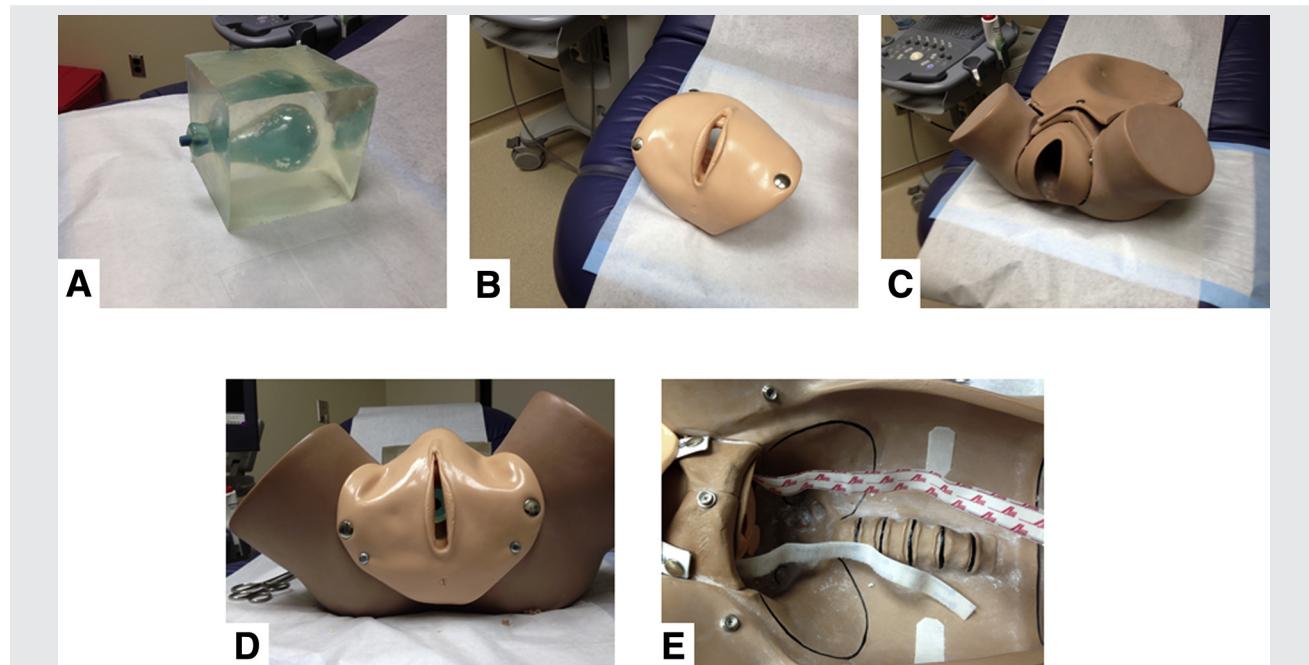
Model development occurred from July 2013 through April 2014. A simulation uterine model was obtained from CEA Healthcare. This model was created using molds that allow for the provider to perform an ultrasound, evaluate the uterine cavity, and visualize the actual insertion of the catheter during the procedure. It includes both the soft tissue of the abdomen and a separate uterus (Fig. 1A). Care was taken to recreate the dimensions and characteristics expected in a woman who would be undergoing the procedure.

Model construction is demonstrated in Figures 1A–E and 2A–D. The uterine model was placed into an empty pelvic simulation model and attached to the vaginal canal using hook and loop straps. A pliable female perineum was attached to the pelvic model to simulate the normal female external anatomy. This additionally allowed for placement of a speculum for visualization of the cervical os of the uterine model.

To achieve the uterine lining sonographic characteristics, the uterine cavity was filled with 10 mL of ultrasound gel. Transabdominal ultrasound was performed using a 2.5–5.0-mHz probe. Catheter visualization was best achieved with use of a 23-cm Wallace Sure View (Smiths Medical) trial catheter.

After construction of the model, evaluation of the simulator was performed by IVF nurses, embryologists, REI fellows, and attending physicians, all of whom were familiar

FIGURE 1



Model development demonstrating (A) uterine model in gel mold, (B) female perineum, and (C) female simulation pelvis. (D) The perineum was attached to the pelvic model to allow for speculum placement. (E) Hook and loop fasteners were placed to secure the uterine mold in the pelvis.
Heitmann. Embryo transfer simulation. *Fertil Steril* 2017.

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