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A decision support tool for optimized personalized medicine for *in vitro* fertilization

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Superovulation is a drug-induced method to enable multiple ovulation per menstrual cycle and key component towards a successful IVF cycle. Although there are the general guidelines for dosage, the dose is not optimized for each patient, and complications, such as overstimulation, can occur. To overcome the shortcomings of this general system, a mathematical procedure and a decision support tool is developed which can provide a customized model of this stage regarding the size distribution of follicles obtained per cycle as a function of the chemical interactions of the drugs used and the conditions imposed on the patient during the cycle.

Uncertainty and risk are modeled and included in optimal drug dosage decisions. This paper describes the theory, model, the optimal control procedure, and the decision support tool for improving outcomes of IVF treatment for all the four protocols used in real practice. The validation of the procedure is performed using clinical data from more than 100 patients previously undergone IVF cycles. Customized patient-specific model parameters are obtained by using initial two-day data for each patient and validated. The models are then used for predicting the customized optimal drug dosage for each patient. Two clinical trials were conducted in India. The results from the trials show that the dosage predicted by using the model is 40% less than the suggestion made by the IVF clinicians. The testing and monitoring requirements for patients using optimized drug dosage is reduced by 72%.

Biography

Dr. Urmila Diwekar is the President of Stochastic Research Technologies LLC and the president of the Vishwamitra Research, a non-profit research institute that she founded to pursue multidisciplinary research and development. From 2002-2004, she was a Professor at the University of Illinois at Chicago. From 1991-2002 she was on the faculty of the Carnegie Mellon University. She is the author of more than 190 peer-reviewed research papers, 8 book chapters, 7 books, 3 software packages, and has given over 400 presentations and seminars, and has chaired numerous sessions in national and international meetings. She has been the principal advisor to 45 Ph.D. and M.S. students, and has advised 8 post-doctoral fellows and researchers. She is fellow of AIMBE and AIChE.

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