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Reply: Reshaping Patient Outcomes with Machine Learning

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To the Editor:

We thank Drs. Patel and Ahmad for their interest in and comments on our recently published prediction model for short-term cardiac resynchronization therapy (CRT) response.(1)

We agree that an accurate prediction of an outcome is paramount for shared decision-making.(2) We also agree that substantial differences in cardiac electrophysiology between men and women (3) appropriately raised the question of whether CRT candidates would benefit from a sex-specific prediction of CRT response. The development of a binary prediction model requires having data of adequate size, estimated based on the squared root of the mean squared prediction error and mean absolute prediction error of the model. (4) Assessment of the out-of-sample predictive performance of the model should consider three factors: the number of predictors, the total sample size, and the events fraction. We wholeheartedly agree with Drs. Patel and Ahmad that sex disparities in the CRT field are unacceptable and should be eliminated. A relatively small sample of women (as compared to men) in our study is an important limitation that should be taken into consideration.

Notably, our machine learning (ML) prediction model is fully open, with all coefficients reported. In contrast, the model developed by Cai et al.(5) is a “black-box” ML model with yet identical to our model discrimination performance (ROC AUC of 0.76).

Lastly, we thank Drs. Patel and Ahmad for highlighting an important feature of our study – focus on a short-term CRT response, opening up an opportunity for CRT optimization, targeting modifiable predictors of CRT response, and improving CRT delivery.

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