

## Supplemental Digital Content 2: Sensitivity Analysis – Missing Data Handled by Multiple Imputation

We performed a sensitivity analysis to determine discrimination capacity for a model handling missing data by multiple imputation for analyzing our primary outcome, postoperative AKI. All imputations were performed using STATA/MP Version 14 (StataCorp) using the “mi impute chained” command (MICE). Following are the exact steps used to perform our multiple imputation:

1. All variables to be imputed were registered. These included: body mass index, all patient-level disease-specific comorbidities, emergent surgery, and ASA status.
2. All remaining covariates were then registered as “regular” variables within STATA including our outcome variable, postoperative AKI.
3. The “mi impute chained” command was then used; the following chained commands were used to specify the type of variable to be imputed: mlogit (categorical), logit (binary), ologit (ordinal), and regress (continuous).
4. Following the “mi impute chained” command, a specified number of imputation datasets must be documented. By a common convention of using a number of imputed datasets greater than or equal to the percentage of missing data,<sup>3</sup> we performed 25 imputations for our dataset containing 22% of patients with missing data.
5. A mixed effects logistic regression model was then performed on the imputed dataset, in which all covariates in Table 1 were fixed effects with the exception of institution, which was included as a random effect. Estimates were saved, to create a AKI probability score for each patient, used to assess the model’s overall predictive capability.
6. Beta coefficients and 95% confidence intervals along with the p-values from the imputed dataset were provided (Supplemental Digital Content 11A). The intraclass correlation coefficient was reported for the random effect. The model’s predictive capability was reported as the c-statistic.
7. Monte Carlo Error estimates (MCE) were also reviewed to ensure that the proper number of imputation datasets was selected. MCE assumptions for the coefficients:
  - a. The MCE should be  $\leq 10\%$  of the standard error
  - b. The MCE T-statistic should be  $\leq 0.1$
  - c. The MCE of the p-value should be  $\leq 0.01$

As the dataset satisfied all MCE assumptions, it was determined MICE modeling used the appropriate number of imputations. Following MICE, we report no statistically significant difference in c-statistics from the non-imputed dataset [0.76, 95% CI 0.75-0.76] versus the imputed dataset [0.75, 95% CI 0.75-0.76].