



# Does Troponin Predict Cardiovascular Issues After Kidney Transplant?

Edward Wang, Zhengxiang Zhou, Helen He, Florence Wang

## Abstract

This study explores the potential prediction power of pre-operative Troponin to post-operative Major Adverse Cardiac Events (MACE) among chronic kidney disease (CKD) patients. A prediction analysis using logistic regression models shows that Troponin has little prediction power to post-operative MACE.

## Introduction

- Data comes from St. Paul's Hospital Kidney Transplant program from 2013 – 2023.
- Each observation tagged with unique patient ID contains demographic information, information about prior disease & traits, and results of a blood test taken prior to the transplant.
- Troponin is measured in Troponin L (ug/L) and Troponin T (ug/L).

Troponin is a protein found in heart muscles that is released into the bloodstream during heart injury, serving as a crucial biomarker for detecting heart damage.

## Method

- Separate analysis was done on patients measured with Troponin L or T.
- Each group (L or T) is analysed using 3 separate logistic regression models fitted using forward selection.
- Data Split: 80% training, 20% testing

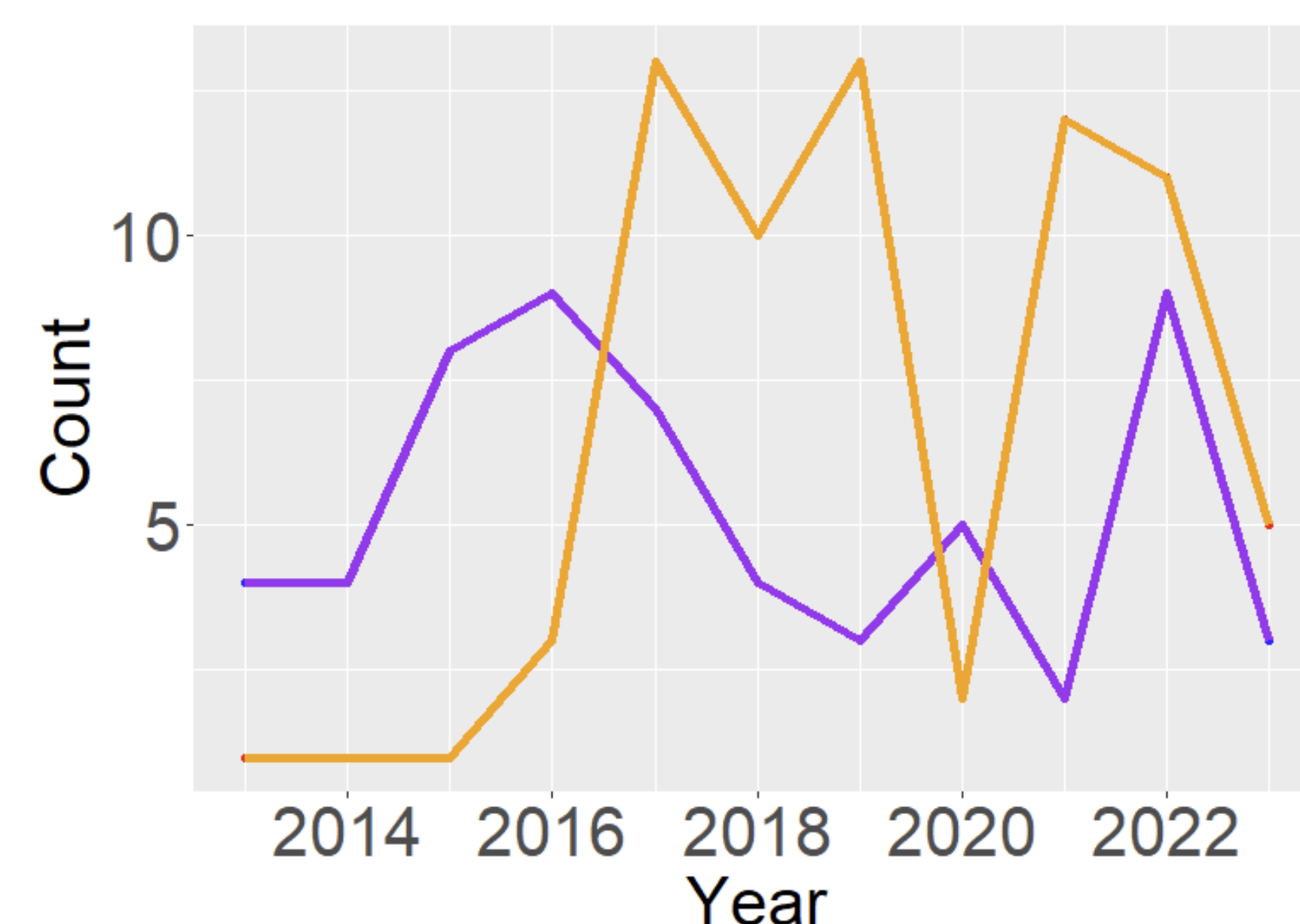


Fig 1: Point & line plot of patients assigned to T (Y) & L over years: plot shows that patients are assigned at random & 2 measures should target the same population.

## Results

### For Troponin T Group

Table 1: Variables in best overall model for Troponin T Group

Best model Variables	Coefficients
Age (Years)	0.3137
Peripheral artery disease (Y/N)	Y: -36.1168
Carotid Artery Disease (Y/N)	40.1538
Aortic stenosis (1, 2, 3)	1: 2.1821, 3: 22.0940
mitral regurgitation (1, 2, 3)	1: 0.4318, 2: 57.7015
Tricuspid regurgitation (1, 2, 3)	1: 0.5538, 2: 19.1337

Note: none of the coefficient above is found significant, which is because that the model is fitted using a small training set (56)

- Best model involving Troponin T only includes Troponin T itself.

Fig 2: AUC Plot of Best Model Involving Troponin T.

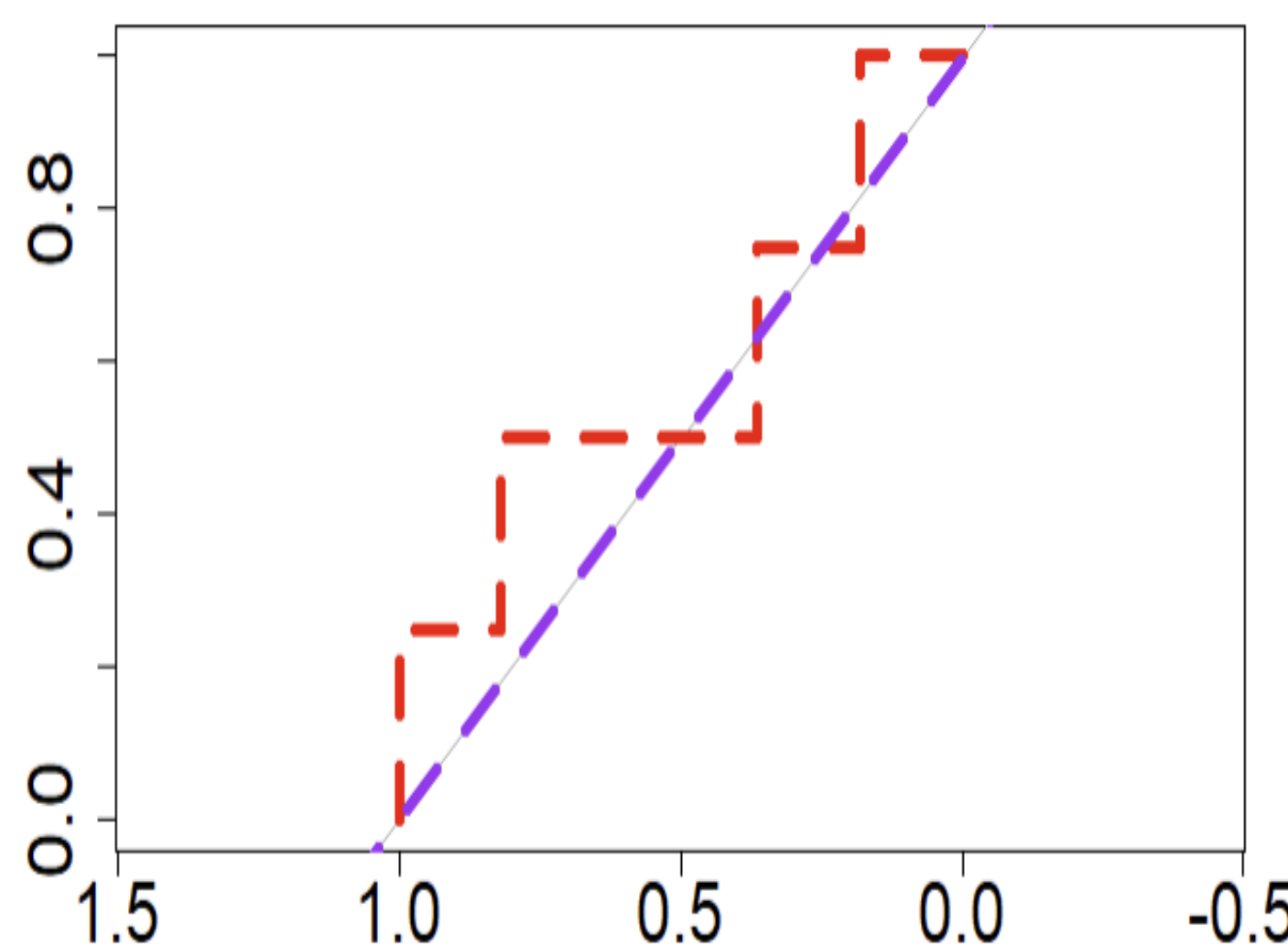


Table 2 & 3: Confusion Matrix for Best T & Baseline Model

	No	Yes
0	11	4
1	0	0

Interpretation: Both the plot & table above shows that the best Troponin model (with only Troponin T itself & AUC: 0.58) is no different in prediction compared to the baseline model.

Fig 3: AUC Plot of Best Model with No Restrictions on Troponin

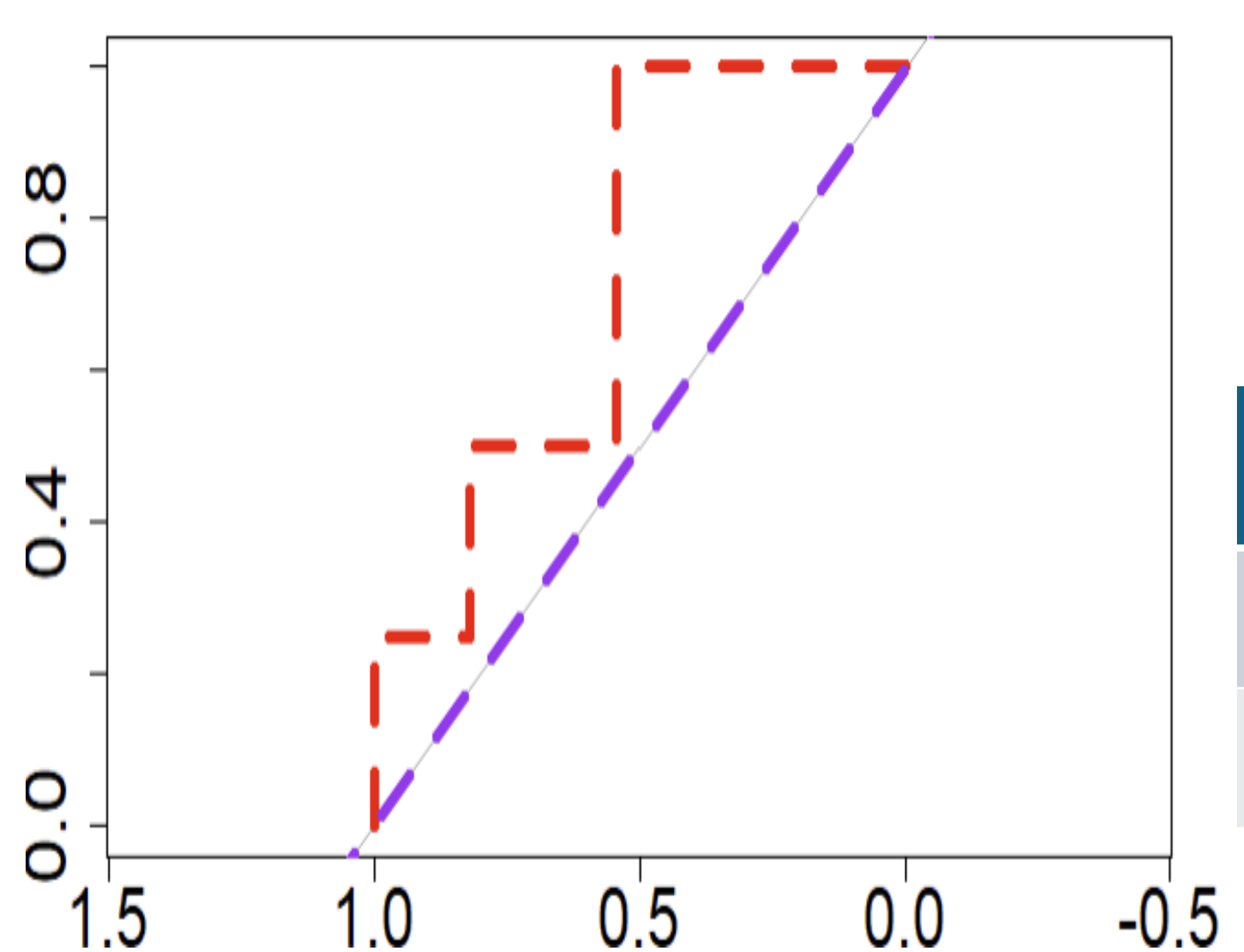


Table 4: Confusion Matrix for Best Model with no restriction

	No	Yes
0	11	3
1	0	1

Interpretation: the plot and table above shows that the best model with no restriction on variables perform better than the baseline model in having higher AUC (0.73) prediction accuracy.

### For Troponin L Group

Table 5 & 6: Confusion Matrix for Best L & Baseline Model

	No	Yes
0	12	0
1	0	0

Table 7: Confusion Matrix for Best Model with no restriction

	No	Yes
0	10	0
1	2	0

Interpretation: tables above shows that both fitted models are the same/worse than the intercept-only model because Troponin L group has much fewer data (58) than the T group (71)

## Conclusion

- Troponin is not a strong predictor to post-operative MACE among CKD patients.
- Age and heart related disease such as Peripheral artery disease and mitral regurgitation are potentially strong predictors to MACE according to result of Troponin T group.
- Troponin L group fails to draw any conclusion due to a lack of observations.
- **Recommendations & Limitations:**
  - Use more diverse dataset (not just from one hospital in a single region).
  - Collect more observations on Troponin L group for valid comparison to the T group.
  - Include at least 1 more blood test per patient after the transplant for better capturing blood data.

## Acknowledgements

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