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Authors

Woelkers, Megan
Sedighi, Melody
Rangarajan, Harini
et al.

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Early Rise in Urinary TIMP-2 and IGF-BP7 and Prediction of Contrast-Associated Acute Kidney Injury after Invasive Angiography

Megan Woelkers, Melody Sedighi, Harini Rangarajan, Alekhya Pushadapu, Srusti Acharya, Saiharinath Nerella, Elizabeth Tabornal, Lori B. Daniels, MD, MAS, FACC, FAHA
Division of Cardiovascular Medicine, University of California, San Diego



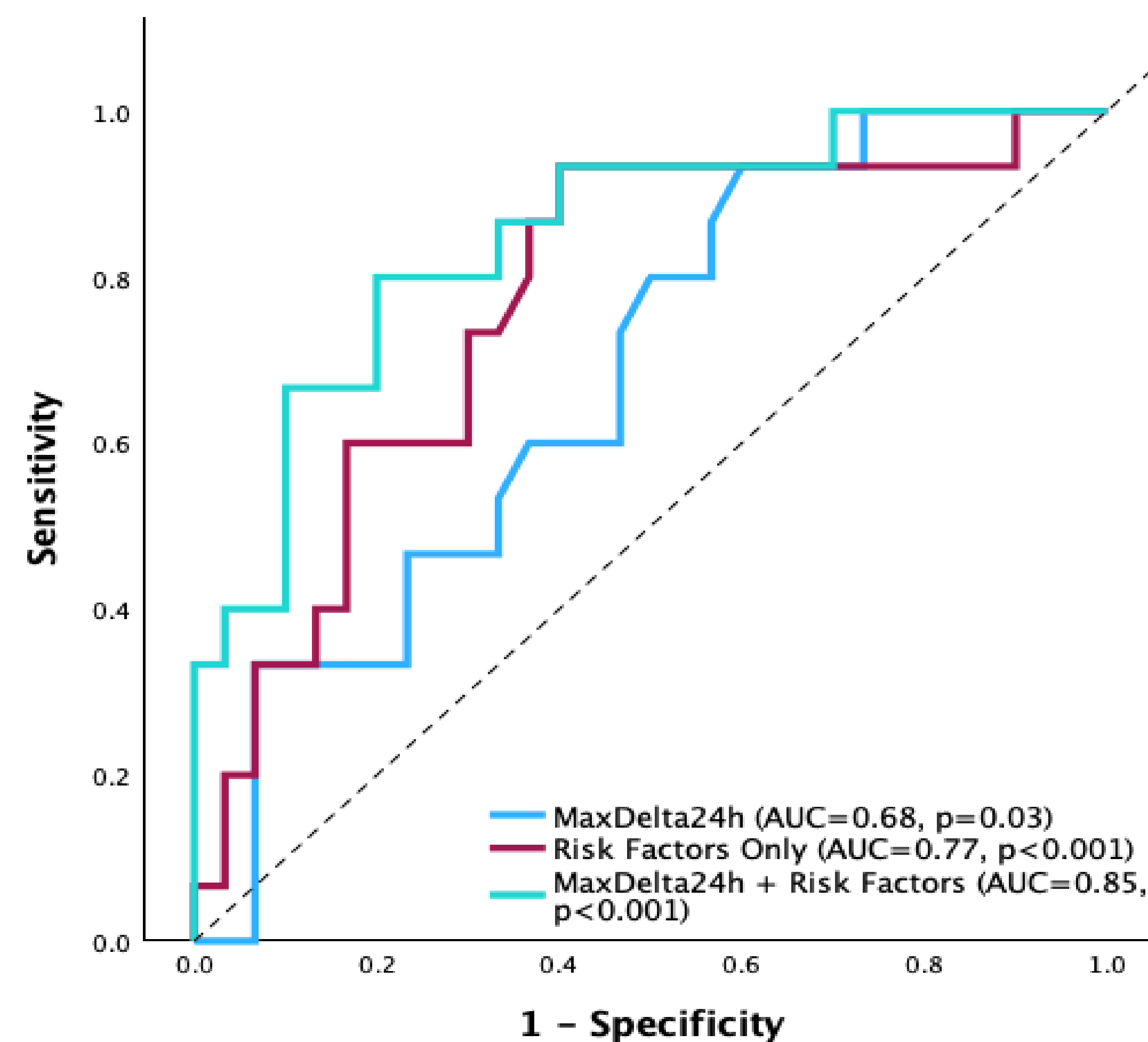
Background

Contrast-associated acute kidney injury (CA-AKI) occurs in approximately 12% of patients following exposure to iodinated contrast media during angiography and is associated with increased morbidity and mortality; reported mortality approaches 20% in some cohorts. Early detection of CA-AKI is essential in mitigating long-term complications and improving outcomes, yet current diagnosis relies largely on serum creatinine (sCr) which typically rises 24–48h after contrast exposure. Tissue inhibitor of metalloproteinases-2 (TIMP-2) and insulin-like growth factor binding protein-7 (IGFBP7) are biomarkers of acute renal stress for early AKI detection. We investigated whether urinary [TIMP-2]*[IGFBP7] predicts CA-AKI within 24h following angiography.

Background

This single-center, prospective study included 45 inpatients (mean age 69 ± 14 yrs, 65% male) with ≥ 1 risk factor for CA-AKI who underwent coronary or peripheral angiography. Risk factors assessed included chronic kidney disease (CKD), diabetes, age > 80 yrs, or congestive heart failure (CHF). Urine samples were collected immediately prior to contrast administration and at 0-2h, 2-6h, 6-12h, and 12-24h post-contrast, with urinary [TIMP-2]*[IGFBP7] “score” measured at each timepoint using NephroCheck (Astute Medical, San Diego, CA). sCr was assessed daily and used to diagnose AKI according to KDIGO criteria. Area under the receiving operator characteristic curve (AUC) evaluated sensitivity and specificity of the score at various timepoints; time-order analyses visualized trends in early scores. IBM SPSS Statistics (v31.0) was used for all analyses.

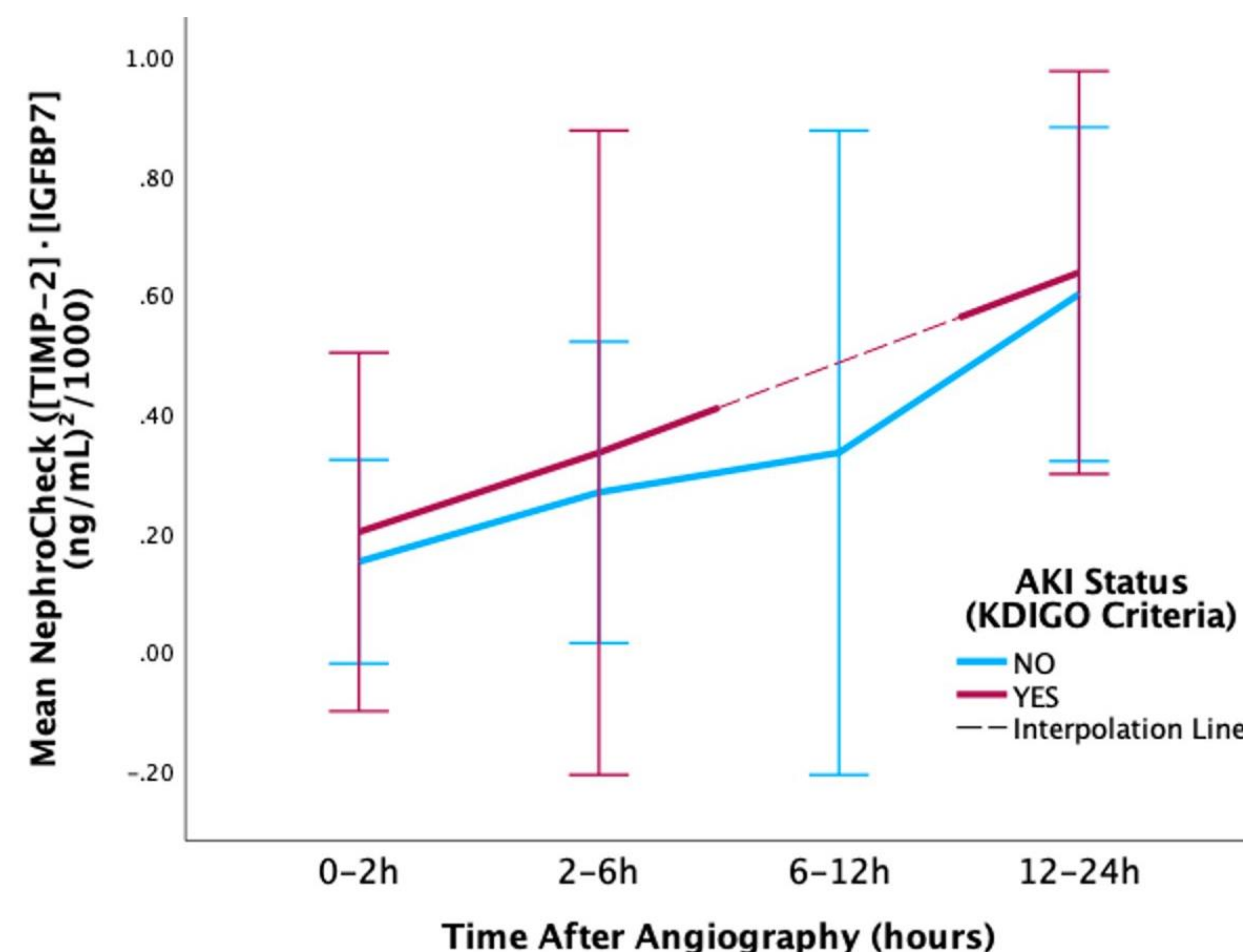
Figure 1. ROC Curve Analysis of MaxDelta24h Prediction of AKI with and without Additional Risk Factors



Results

AUC for [TIMP2]*[IGFBP7] score at baseline, 0-2, 2-6, 6-12, and 12-24 hours were unremarkable (AUC=0.436, $p=0.47$; AUC=0.367, $p=0.38$; AUC=N/D, $p=N/D$; AUC=0.548, $p=0.68$). Change in score from pre-procedure to maximum within 24h post-procedure (MaxDelta24h) was higher in patients who developed AKI ($p<0.001$) and modestly predictive of AKI (AUC=0.68, $p=0.03$). In models with MaxDelta24h adjusting for AKI risk factors as above, AUC increased to 0.849 ($p<0.0001$). Significant predictors of AKI included age ($p=0.02$) and MaxDelta24h ($p=0.02$), whereas CKD ($p=0.30$), diabetes ($p=0.52$), and CHF ($p=0.18$) were N/S. There was a non-significant trend toward higher absolute NephroCheck scores post-angiography in AKI vs no-AKI patients ($p=0.06$).

Figure 2. Temporal Trends of NephroCheck Scores Post-Angiography by AKI Status



Conclusions

Changes in urinary [TIMP2]*[IGFBP7] within 24h after angiography may enable early detection of CA-AKI prior to traditional sCr-based diagnosis. MaxDelta24h demonstrated moderate prediction for AKI, with improved performance when considering clinical risk factors, especially age. Larger studies should investigate change in urinary [TIMP2]*[IGFBP7] as a potential early risk-stratification tool for CA-AKI.

Figure Captions

Figure 1. AUC was optimized with MaxNephro24 and risk factors considered together.

Figure 2. NephroCheck scores increased over time in both groups, with higher levels observed in patients who developed AKI ($p = 0.06$).