

Predicting acute kidney injury in a Georgia quality improvement program trauma cohort



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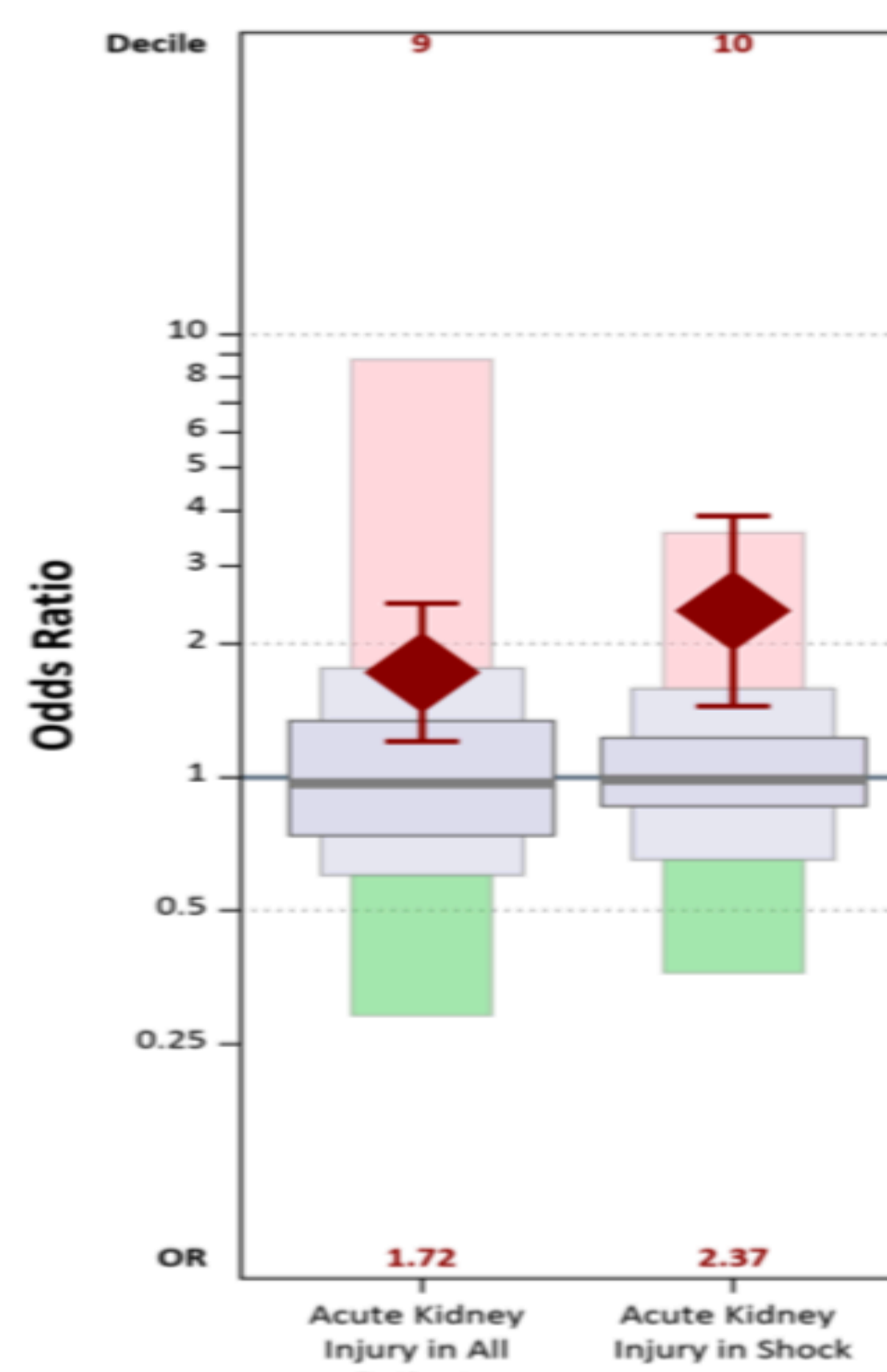


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Background

- GQIP is a collaboration of Georgia ACS TQIP hospitals
- GQIP AKI rates were higher than national benchmarks (figure I)
- We aimed to develop an early AKI prediction model for trauma

Figure I GA 2020 TQIP Report



Results

Table I Patient/Pre-Hospital Variables

Variable	AKI (n=95)	No AKI (n=152)	Total (n=247)	P-value
Age (years)	54.2 ± 20.3	47.4 ± 19.7	50.2 ± 20.2	0.011
< 50	41 (43.2%)	83 (54.6%)	124 (50.2%)	
≥ 50	54 (56.8%)	69 (45.4%)	123 (49.8%)	0.081
Gender				
Male	74 (77.9%)	116 (76.8%)	190 (77.2%)	0.845
Female	21 (22.1%)	35 (23.2%)	56 (22.8%)	
Race				
Black	56 (59.0%)	80 (52.6%)	136 (55.1%)	0.692
White	34 (35.8%)	66 (43.4%)	100 (40.5%)	
Other	5 (5.2%)	6 (3.9%)	11 (4.4%)	
Hypertension				
Yes	41 (43.2%)	37 (24.3%)	78 (31.6%)	0.002
No	54 (56.8%)	115 (75.7%)	169 (68.4%)	
Heart Failure				
Yes	6 (6.3%)	3 (2.0%)	9 (3.6%)	0.093
No	88 (93.6%)	149 (98.0%)	238 (96.4%)	
Chronic Kidney Dx				
Yes	6 (6.4%)	7 (4.6%)	13 (5.3%)	0.55
No	88 (93.6%)	144 (95.4%)	232 (94.7%)	
Diabetes Mellitus				
Yes	22 (23.2%)	27 (17.8%)	49 (19.8%)	0.302
No	73 (76.8%)	125 (82.2%)	198 (80.2%)	
Smoker				
Yes	19 (20.0%)	47 (30.9%)	66 (26.7%)	0.061
No	76 (80.0%)	105 (69.1%)	181 (73.3%)	
Injury Type				
Blunt	82 (86.3%)	120 (79.0%)	202 (81.8%)	0.147
Penetrating	13 (13.7%)	32 (21.0%)	45 (18.2%)	
Injury Severity Score				
(0-20)	23 (13-34)	10 (6-18)	14 (9-26)	<0.0001
(20-40)	41 (43.2%)	120 (79.0%)	161 (65.2%)	
(> 40)	41 (43.2%)	25 (16.5%)	66 (26.7%)	<0.0001
Long Bone Fracture				
Yes	31 (32.6%)	36 (24.0%)	67 (27.4%)	0.354
No	64 (67.4%)	114 (76.0%)	178 (72.6%)	
CPR Pre-Hospital				
Yes	3 (3.2%)	1 (0.7%)	4 (1.6%)	0.170
No	92 (96.8%)	151 (99.3%)	243 (98.4%)	

Figure III ROC Curves for Training and Validation Sets
AUC Training Model: 0.857
AUC Validation Model: 0.858

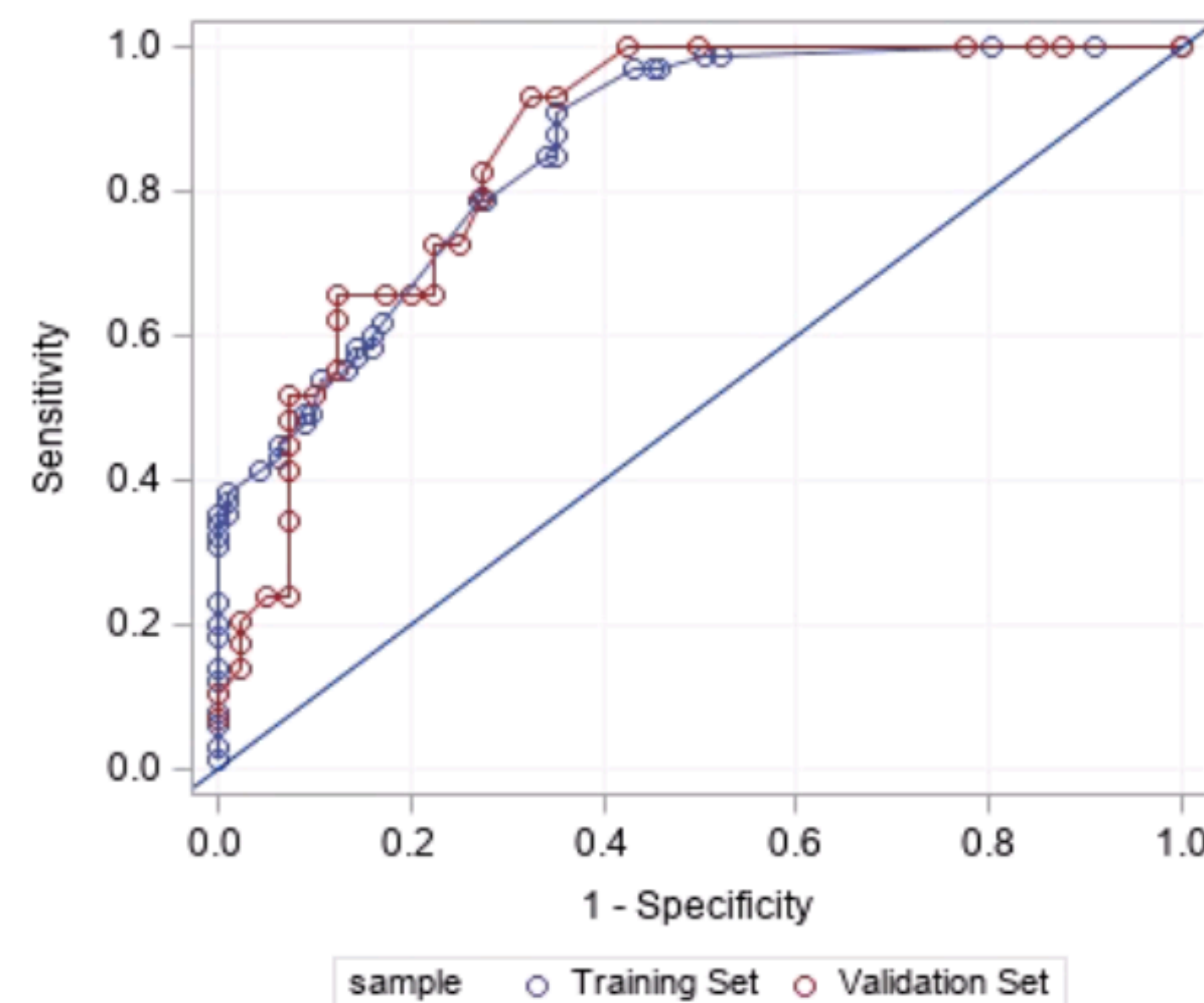


Figure II Variables with Sig. Univariate ORs for Early AKI

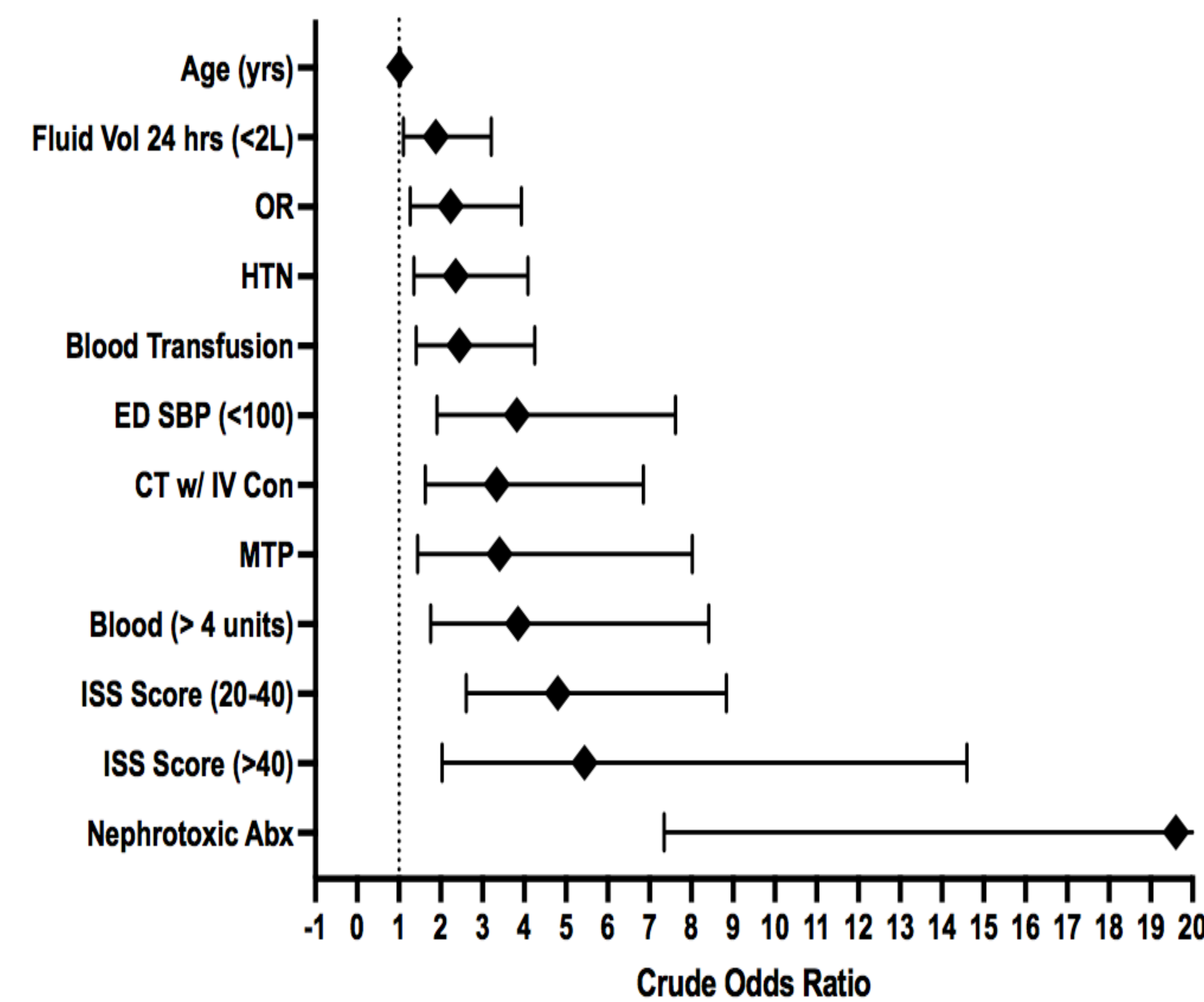
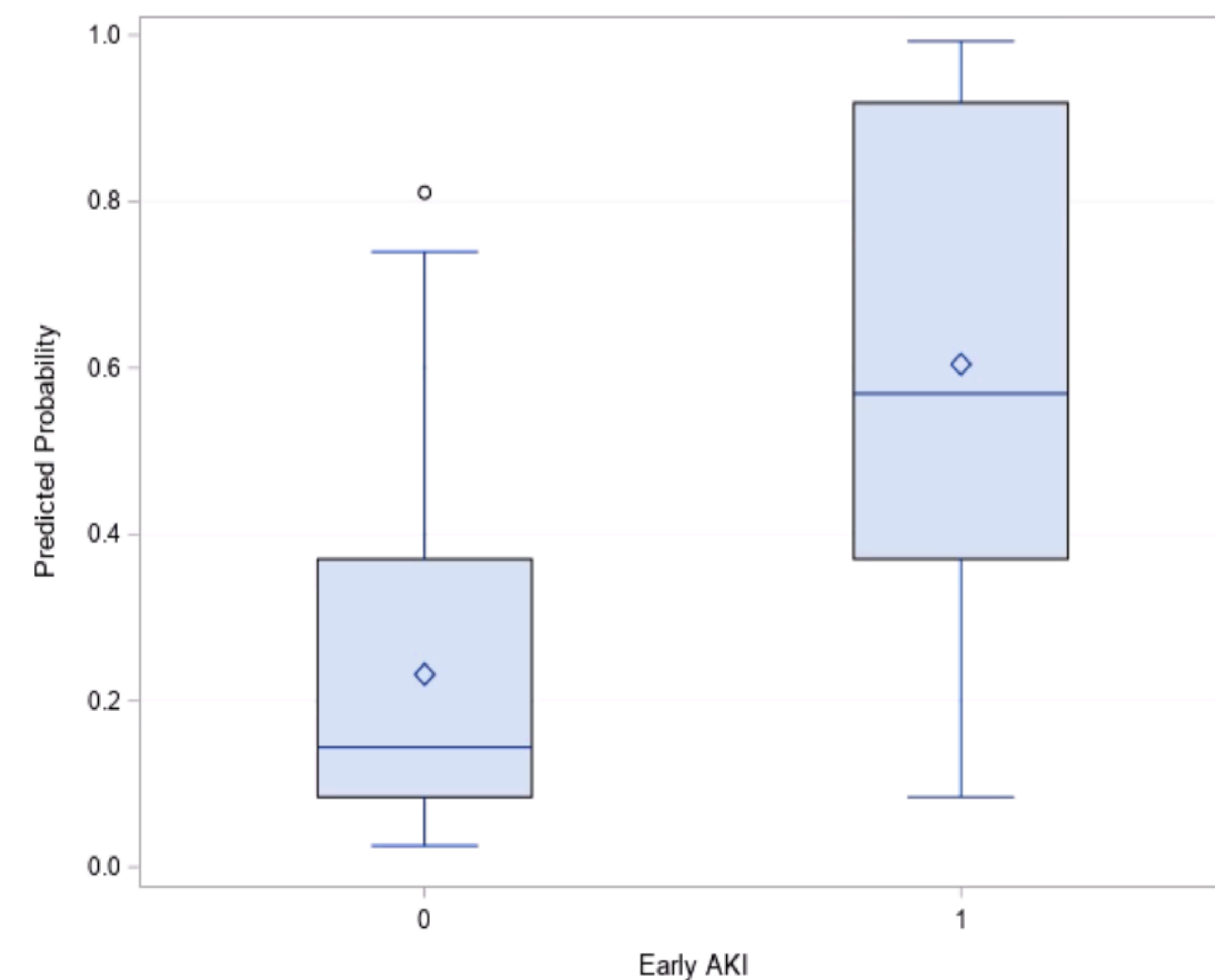


Figure IV Vbox plot of Early AKI and Predicted Probability



• Using 20% Predicted Probability:
Model Sensitivity- 96.9%
Model Specificity- 56.8%
Misclassification Rate-28.4%

Table II Training Set Multivariable Log Regression Model on Early AKI

Variable	Crude OR (95% CI)	Multivariable OR (95% CI)
Age (< 50)	REF	REF
Age (≥ 50)	1.88 (1.01, 3.51)	2.95 (1.07, 8.14)
Hypertension Yes	2.60 (1.34, 5.05)	2.03 (0.76, 5.42)
Hypertension No	REF	REF
Injury Severity Score (0-20)	REF	REF
Injury Severity Score (20-40)	4.47 (2.16, 9.22)	4.84 (1.93, 12.14)
Injury Severity Score (> 40)	7.86 (2.29, 27.02)	6.4 (1.33, 30.8)
ED Systolic BP (≤100)	3.82 (1.91, 7.62)	2.91 (0.99, 8.56)
ED Systolic BP (>100)	REF	REF
CT w/ IV Contrast Yes	3.34 (1.63, 6.85)	3.36 (1.09, 10.3)
CT w/ IV Contrast No	REF	REF
Nephrotoxic Abx Yes	18.4 (5.24, 64.7)	24.79 (5.74, 107.06)
Nephrotoxic Abx No	REF	REF

Conclusion

- Final model predictors included Age, HTN, ISS Score, ED SBP, CT w/ IV Con, & Nephrotoxic Abx
- Training Set AUC-85.7%
- Validation Set AUC-85.8%
- Final model shows reasonable prediction as a screening tool

Future

- Analysis excluding Nephrotoxic Abx
- Collect new data to validate the predictive model
- Build a tiered AKI protective bundle
- Implement AKI risk prediction tool into EMR and utilize AKI protective bundle for high risk patients

Methods

- Retrospective cohort study of adult trauma admissions in 2016 & 2017 from 10 GA trauma centers
- Primary endpoint: AKI within 14 days of presentation
- Data split:
 - 70% Training Set
 - 30% Validation Set
- Predictive multivariable logistic regression was trained and validated