

Accuracy of a modified 4Ts score in predicting heparin-induced thrombocytopenia in critically ill patients: a pilot study

Brandon D. Powell, PharmD¹, Feng-Chang Lin, PhD², Katherine F. Beach, PharmD, BCPS, BCCCP³, Raj S. Kasthuri, MD^{4,5}, Kalynn A. Northam, PharmD, BCCCP¹

¹⁻⁵See affiliations listed below



BACKGROUND

- Thrombocytopenia is common among critically ill patients with a prevalence of ~30%¹
- Incidence of heparin-induced thrombocytopenia (HIT) is low (1%) in critically ill patients²
- Professional guidelines recommend calculating a HIT pre-test probability score prior to performing laboratory testing³⁻⁵
 - 4Ts score is widely utilized; however, the accuracy has been questioned in critically ill patients⁶⁻⁸
 - HIT Expert Probability (HEP) score is used to a lesser extent in clinical practice given its complexity⁹
- Investigators developed a new pre-test probability scoring tool to overcome the limitations of the 4Ts and HEP scores in critically ill patients¹⁰

PURPOSE

- This pilot study aimed to compare the accuracy of three pre-test probability scoring tools, the 4Ts score, HEP score, and a modified intensive care unit (ICU)-4Ts score, in critically ill patients undergoing testing for HIT

METHODS

- Design:** single-center retrospective cohort pilot study
- Inclusion:** adult patients admitted to an ICU who underwent testing for HIT from 11/1/2016 to 4/30/2020
- Exclusion:** patients without a 4Ts score documented in the electronic medical record by medical team at time of HIT testing
- Modified Tool:** The ICU-4Ts score was developed by the research team utilizing previous literature and a survey of ICU providers and pharmacists
- Data:** The 4Ts score was recorded, and the HEP and ICU-4Ts scores were calculated retrospectively by a trained, blinded investigator
- Outcomes:** Receiver operating characteristics (ROC) area under the curve (AUC), sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were compared between the three scores

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RESULTS

Table 1: ICU-4Ts Scoring Tool

All platelet count values known:	
2 points	Platelet count fall > 50% and platelet nadir $\geq 20 \times 10^9/L$
1 point	Platelet count fall 30%–50% or platelet nadir $\geq 20 \times 10^9/L$
0 points	Platelet count fall < 30% or platelet nadir < $20 \times 10^9/L$
Platelet counts unknown due to transfer:	
1 point	≤ 10 days OSH & platelet nadir $\geq 20 \times 10^9/L$
0 points	> 10 days OSH & platelet nadir < $20 \times 10^9/L$
Timing:	
2 points	Timeline is 5–10 days Timeline is ≤ 2 days with prior heparin exposure within 30 days (e.g. CVAD, dialysis, recent hospitalization)
1 point	Timeline is > 10 days Timeline is 5–10 days, but unclear if exposed to heparin at OSH Exposed to heparin at OSH, but timeline is unclear
0 points	Timeline is ≤ 4 days without recent heparin exposure within 30 days (e.g. CVAD, dialysis, recent hospitalization)
-1 point	Thrombocytopenia (< $150 \times 10^9/L$) present on admission without recent heparin exposure within 30 days (e.g. CVAD, dialysis, recent hospitalization)
Thrombosis:	
2 points	New thrombosis (confirmed) or skin necrosis at heparin injection sites or acute systemic reaction after intravenous heparin bolus
1 point	Progressive or recurrent thrombosis or non-necrotizing (erythematous) skin lesions or suspected thrombosis (not proven)
0 points	None

Table 2: Probability Categories by Total Score

	Low	High
4Ts Score	0 – 3	4 – 8
HEP Score	(-16) – 1	2 – 19
ICU-4Ts Score	(-2) – 1	2 – 8

Figure 1: ROC Curve for Scoring Tools

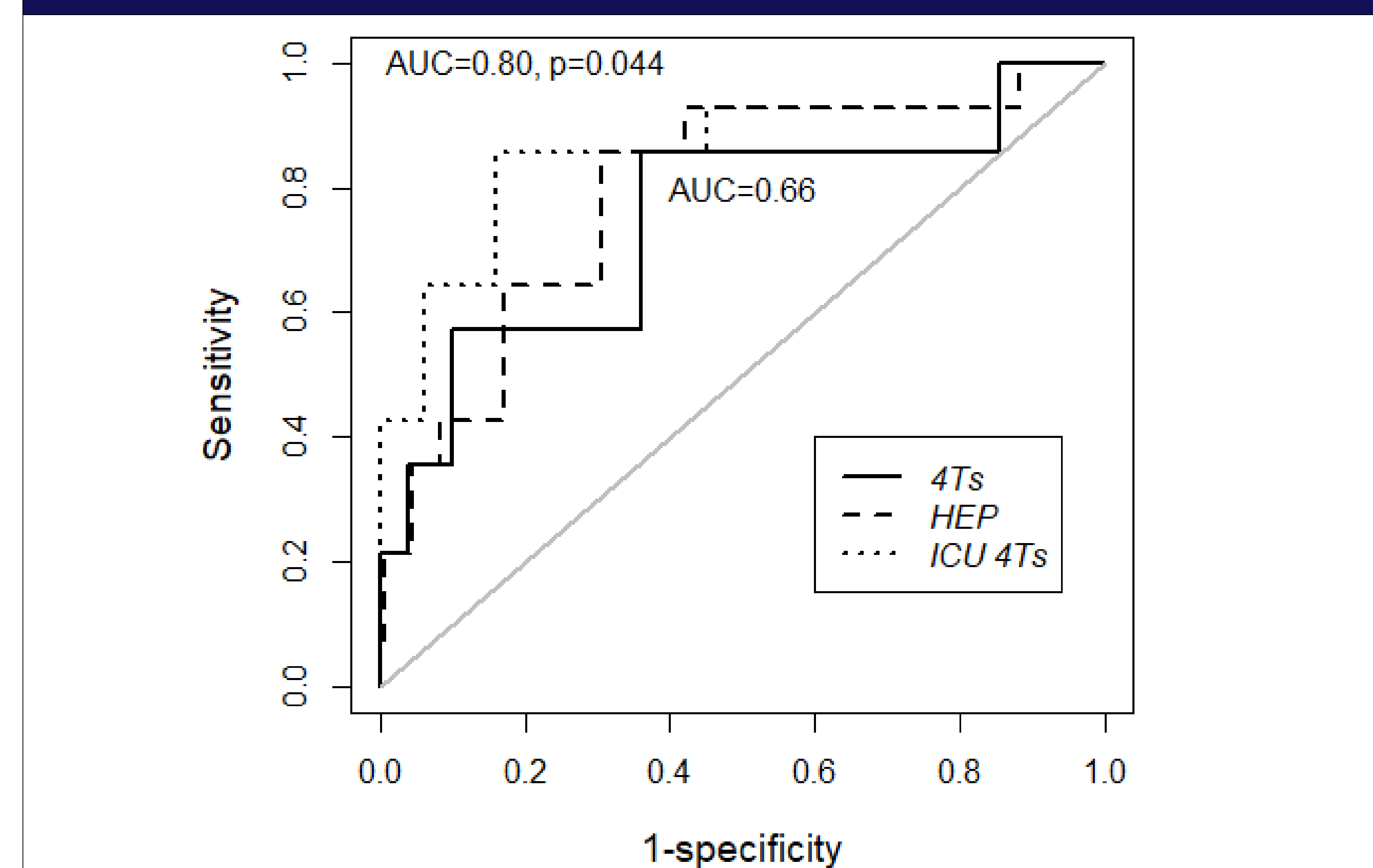
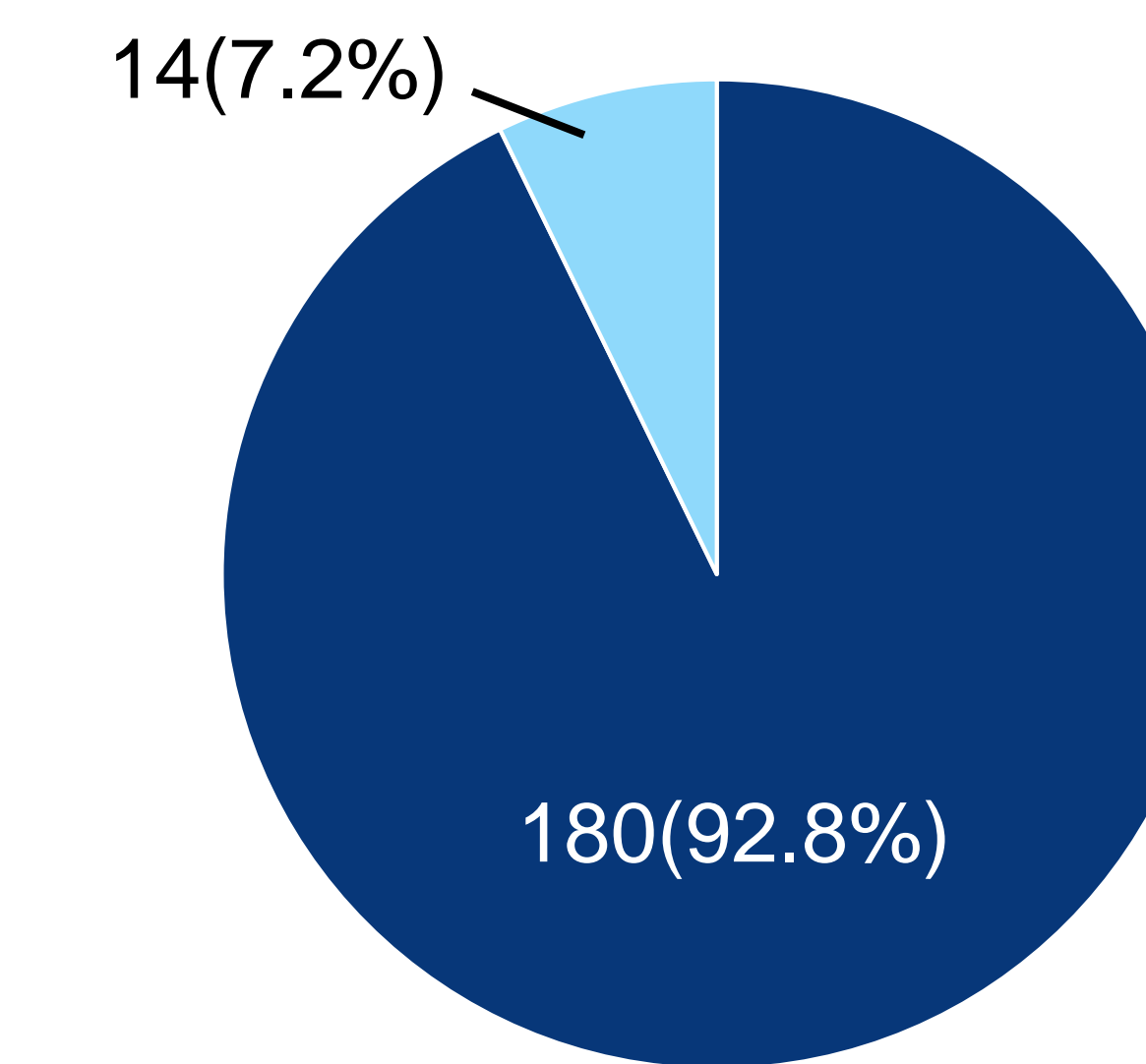


Table 3: Baseline Characteristics

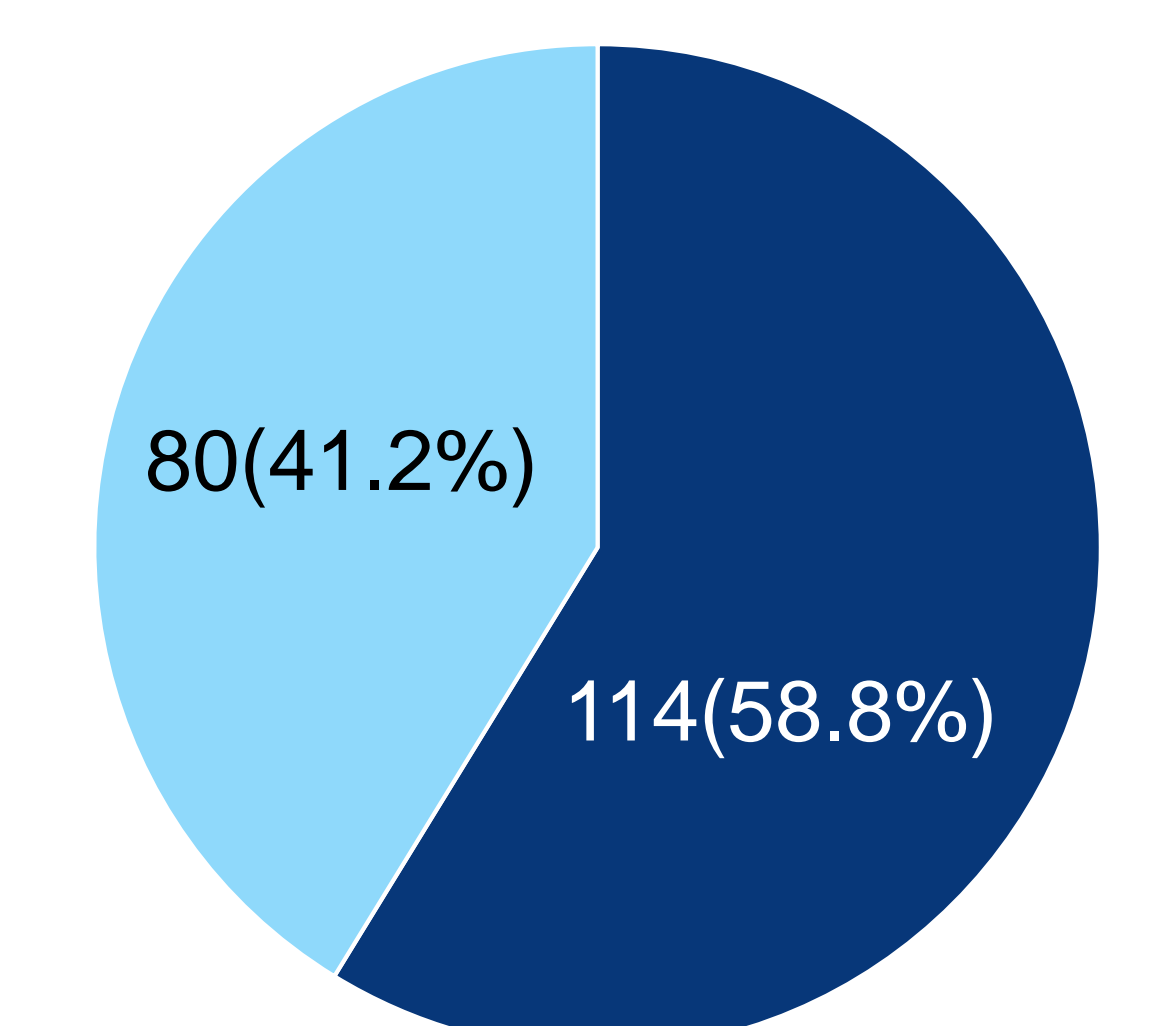
Characteristic	Full Cohort (n=194)	HIT Positive (n=14)	HIT Negative (n=180)
Mean age, years \pm SD	60.2 \pm 15.1	65.3 \pm 12.4	59.8 \pm 15.3
Male sex, n (%)	100 (51.5)	7 (50)	93 (51.7)
Outside hospital transfer, n (%)	100 (51.5)	9 (64.2)	91 (50.6)
Admission type, n (%)			
Medical	114 (58.8)	4 (28.6)	110 (61.1)
Surgical	80 (41.2)	10 (71.4)	70 (38.9)
Intensive care unit, n (%)			
Burn surgery	13 (6.7)	1 (7.1)	12 (6.7)
Cardiac	27 (13.9)	4 (28.9)	23 (12.8)
Medical	78 (40.2)	1 (7.1)	77 (42.8)
Neurosciences	13 (6.7)	1 (7.1)	12 (6.7)
Surgical/trauma	29 (14.9)	3 (21.4)	26 (14.4)
Cardiothoracic surgery	34 (17.5)	4 (28.6)	30 (16.7)

HIT Results



■ HIT Negative ■ HIT Positive

Admission Type



■ Medical ■ Surgical

Table 4: Scoring Tool Performance Metrics

	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)
4Ts Score	0.857 (0.572 - 0.982)	0.350 (0.281 - 0.424)	0.093 (0.049 - 0.157)	0.969 (0.893 - 0.996)
HEP Score	0.929 (0.661 - 0.998)	0.344 (0.275 - 0.419)	0.099 (0.054 - 0.164)	0.984 (0.915 - 1.00)
ICU-4Ts Score	0.929 (0.661 - 0.998)	0.356 (0.286 - 0.430)	0.101 (0.055 - 0.166)	0.985 (0.917 - 1.00)

CONCLUSIONS

- The modified ICU-4Ts score better predicted the diagnosis of HIT and reduced the complexity of the HEP score
- Future prospective validation studies are needed to confirm the utility of this scoring tool

Author affiliations:

- ¹Department of Pharmacy, University of North Carolina Medical Center, Chapel Hill, NC
- ²Translational and Clinical Sciences Institute, University of North Carolina, Chapel Hill, NC
- ³Department of Pharmacy, Wake Forest Baptist Medical Center, Winston-Salem, NC
- ⁴Division of Hematology, University of North Carolina, Chapel Hill, NC
- ⁵Blood Research Center, University of North Carolina, Chapel Hill, NC

Disclosures:

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