Poster 22

Comparison of Point of Care Activated Clotting Time Systems in different Clinical Settings in a Large Academic Medical Center

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Background: Point-of-Care (POC) activated clotting time (ACT) measurements are used to monitor heparin anticoagulation therapy during interventional procedures and guide management of patient hemostasis. Several ACT testing systems are commercially available using different methodologies, though no gold standard method exists. The aim of this study was to conduct comparative analyses of ACT results using three different ACT POC test systems including iSTAT (Abbott), HMSPlus (Medtronic), and ACTPlus (Medtronic) systems over the ACT range detected in different clinical procedures at our institution.

Methods: Forty-one venous whole blood samples collected from line draws from 25 adult (≥ 18 years) patients undergoing cardiopulmonary bypass, vascular surgery or cardiac catheterization procedures were tested in duplicate in both prewarm and non-prewarm modes with kaolin and celite activators as described below in Table 1. Intra-method imprecision analyses were evaluated using the difference in duplicate measurements for each ACT test method. Linear-mixed ANOVA was used to analyze the differences between method means. The HMSPlus ACT device is used in cardiopulmonary bypass procedures at our institution and was designated the reference method for further analyses. Linear regression analysis and absolute difference ± standard deviation (SD) in ACT values between each test method compared to the reference method were performed to assess correlation and bias, respectively.

Results: Range in ACT values for this study population was 100-835 sec using the HMSPlus. Each POC ACT device exhibited acceptable imprecision at low (< 300 sec) ACT values with enlarged imprecision at high (≥ 300 sec) ACT values. ACT mean values from the different methods were not statistically significant (p = 0.60). Linear regression analyses indicated that all of the ACT testing systems had good correlation ($r^2 \geq 0.94$) in ACT values compared to the HMSPlus. Proportional biases in ACT values were observed with ACTPlus and iSTAT-prewarm-celite ACT devices compared to the HMSPlus. Conversely, small constant bias in ACT values was found for iSTAT-non-prewarm-celite and iSTAT-prewarm-kaolin devices compared to the HMSPlus, though imprecision in the differences were large in the high ACT range (≥ 300 sec).

Conclusions: ACT values overall correlate well between POC ACT testing systems. Inter-method differences in high range ACT values are largely attributed to imprecision. Bias and imprecision profiles vary depending on low versus high ACT range and the optimal device for rapid determination of ACT may depend on the ACT target range for the clinical procedure.

Device	Mode	Activator	Method Duplicate 1 - Duplicate 2 ACT Mean (± SD, sec)		Linear Regression Test Method = m(HMSPlus) + b	Correlation with HMSPlus ACT Values (r^2)	Test Method - HMSPlus ACT Mean (± SD) Difference (sec)	
			100-299 sec	≥ 300 sec			100-299 sec	≥ 300 sec
HMSPlus	Prewarm	Kaolin	-0.3 (± 6.6)	20 (± 26)	N/A	N/A	N/A	N/A
ACTPlus	Prewarm	Kaolin	1.4 (± 9.9)	21 (± 37)	ACTPlus = 1.03(HMSPlus) - 15.35	0.98	-10 (± 19)	35 (± 45)
iSTAT	Prewarm	Celite	-2.4 (± 4.7)	5.8 (± 27)	iSTAT = 0.96(HMSPlus) - 5.24	0.96	-14 (± 16)	-27 (± 57)
iSTAT	Non-prewarm	Celite	3.5 (± 5.1)	-13 (± 44)	iSTAT = 0.99(HMSPlus) + 7.72	0.95	4.2 (± 17)	2.0 (± 69)
iSTAT	Prewarm	Kaolin	0.2 (± 6.8)	-26 (± 22)	iSTAT = 1.01(HMSPlus) - 6.96	0.94	-5.0 (± 18)	-5.0 (± 79)
m- slope								
b - intercept								