**COMPARISON OF FOUR ACTIVATED CLOTTING TIME DEVICES DURING CARDIAC SURGERY**

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Point of care Activated Clotting Time (ACT) testing is the most widely adopted method for monitoring the effect of unfractionated heparin in cardiac surgery. One of the common contributors to post-operative blood transfusions is bleeding immediately after cardiopulmonary bypass (CPB) therefore careful management of anticoagulation during cardiac surgery is paramount. This remains challenging in part due to limitations in systems that are used in its assessment. The objective of this study was to compare the clinical performance of four current ACT systems in cardiac surgery.

The study included 40 cardiac surgery patients undergoing CPB. Samples were taken at five different time points: before (T1), after heparinization for CPB (T2, T3, T4), and after heparin reversal (T5). The reproducibility, correlation, and differences in ACT values were assessed concurrently using four ACT devices: Hemochron Elite, Medtronic HMS, Abbott i-STAT, and Helena Abrazo. Subrange analyses were performed for low ACT values (results from TI, T5) and high ACT values (results from T2, T3, T4).

Within-system analysis showed strong linear correlation between paired measurements from the same system(R=0.968-0.993). However, Hemochron showed decreased reproducibility given highest percent differences between paired measurements of 10.28% and highest overall standard error of 74 sec across the measurement range compared to that of the other three systems (range 39.2-47.3 sec, respectively). For inter-system analysis, using Hemochron as reference (which is standard of care at our center), showed that ACTs were strongly correlated as follows: HMS (R-0.9384), i-STAT (R-0.9109), and Abrazo (R-0.9107). In the high ACT range, according to Bland and Altman analysis, HMS values were higher than Hemochron on average of 77sec (+11.2% bias), whereas lower values versus Hemochron were observed for i-STAT (-49 sec, -7.8% bias) and Abrazo (-82sec, -13.4% bias). Post-protamine ACT results commonly used to indicate adequate heparin reversal were dependent on device type where Hemochron yielded highest post-protamine ACT (+12.56% higher than baseline) compared to -16% for HMS, -10% for iSTAT and 0% for Abrazo.

This study shows that each device had individual reproducibility and biases, which may impact heparin management during and after CPB. Therefore careful validation must be undertaken when comparing or adopting the different technologies as decision limits and clinical interpretation will be affected. If not fully appreciated, this could also have an affect on haemostasis and associated outcomes of patients undergoing CPB.