



**TO:** Medical Staff, House Staff, Patient Care Centers,  
Outpatient Clinics and UC Med Labs Clients

**FROM:** Krzysztof Mikrut, B.S. MT (ASCP)  
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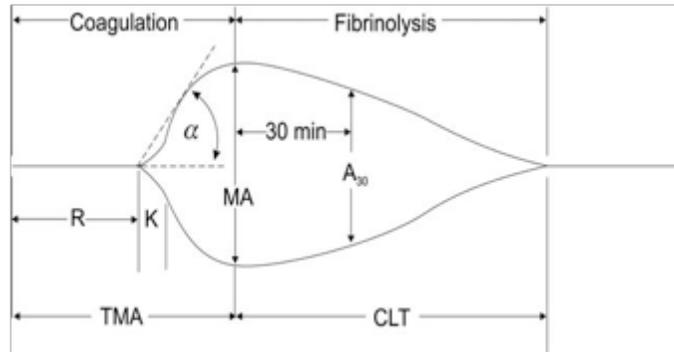
Jonathan L. Miller, M.D., Ph.D.  
Medical Director, Coagulation Laboratory

**DATE:** December 19, 2016

**RE:** TEG Implementation at University of Chicago Medicine

Effective Wednesday December 21, 2016 the initial phase of Thromboelastography (TEG) testing availability will commence at University of Chicago Medicine. In this first phase, testing will be performed with the TEG 5000 instrument on specimens received at the Coagulation Laboratory during first shift (7:30 AM through 3:00 PM) Monday through Friday. During calendar year 2017 availability is planned to be broadened, eventually to a 24/7 basis, as testing employing the new generation of TEG 6S instruments goes live, with such testing also being performed by the Blood Bank/Transfusion Medicine Service. Please contact the Technical Director of the Coagulation Laboratory, Mr. Krzysztof Mikrut, or the Medical Director of the Coagulation Laboratory, Dr. Jonathan Miller, at 2-1315, with any questions concerning this implementation.

The TEG system will be employed to assess the kinetics and extent of viscoelastic changes in citrated whole blood as the sample clots and subsequently may undergo lysis. The resulting hemostasis profile is a measure of the time it takes for the first fibrin strands to be formed, the kinetics of clot formation, maximal elastic amplitude of the formed clot, and dissolution of clot. Parameters that will be reported from this testing include (see below) R, K,  $\alpha$ , MA, and LY30. Secondary derivative parameters also generated by the instrument (e.g., TMA and CLT) will not be reported.



## TEG tracing parameters

**R or R-Time** (Reaction Time): The time in minutes from the start of a sample run until the first significant levels of detectable clot formation (amplitude of 2 mm in the TEG tracing). This represents the enzymatic portion of coagulation. This is the point at which most traditional coagulation assays reach their end points.

**K or K-Time:** A measure of the speed or clot *kinetics* to reach a certain level of clot strength (time in minutes to reach an amplitude of 20 mm).

**Angle ( $\alpha$ )** measures the rapidity of fibrinogen conversion to fibrin resulting from thrombin production, and is heavily influenced by the fibrinogen level. It is defined as the angle in degrees above the horizontal that is formed by a straight line passing through 2 specific points on the upper envelope of the patient's tracing: those corresponding to the R and to the K time points.

**MA** (Maximum Amplitude). Measurement of maximum strength or stiffness (maximum shear modulus) of the developed clot in mm. Clot strength is the result of two components – the modest contribution of fibrin to clot strength and the much more significant contribution of the platelets.

**LY30:** measures the observed amount of clot dissolution (in %), defined as percent reduction from the maximum amplitude

achieved (MA in mm) to the amplitude (in mm) observed 30 minutes later, thus providing an index of fibrinolysis.

## **TEG PACKAGES**

Three different TEG test packages are orderable in EPIC:

***TEG1 Standard***-If No Heparin or Massive Bleed. The package includes results with TEG Kaolin. Indications: for non-operative bleeding/clotting, for operative bleeding/clotting in patients not on heparin or receiving massive transfusion, or for pre-operative baseline.

***TEG2 Heparin***-ECMO, Cardiopulmonary Bypass, etc. The package includes results with both TEG Kaolin and TEG Heparinase. Indications: for patients receiving heparin therapy (cardiopulmonary bypass, ECMO, other complicated patients on heparin drips).

***TEG3 Complex***-Trauma, MTP etc. The package includes results with TEG Kaolin, Rapid TEG, and TEG Functional Fibrinogen. Indications: for bleeding patients requiring transfusion of > 4 RBC units/hour.

### **Type of Collection Container and Amount of Specimen Required:**

Whole blood collected in two light blue top vacutainer containing 3.2% sodium citrate anticoagulant. The tubes must be filled to capacity  $\pm$  10%.

### **Specimen Collection:**

For samples drawn by venipuncture (with 21G or larger bore needle) discard the first 3mL of blood using another blue top tube. Gently invert the sample tube at least five times to ensure complete mixing of the contents.

Whole blood samples that are obtained from an indwelling catheter should be collected after sufficient discard (approximately 5 mL) has been drawn to clear the line. Ensure indwelling catheter is free of clots. Alternatively, use an approved VAMP system for blood recycling. Transfer blood to the blood collection tube immediately after collection. Gently invert the sample tube at least five times to ensure complete mixing of the contents.

### **Specimen Labeling**

Label tubes properly (ideally with a Sunquest labels)

**Required Information/Data** (Please input in corresponding screens in EPIC ordering process):

Drugs affecting hemostasis

Transfusions in last 12 hours

### **Specimen Transportation:**

Samples must be packed appropriately and sent to the Coagulation lab via the pneumatic tube system (tube station 904). *Sample testing must be performed within 2 hours of blood collection.*

### **Locally Determined Adult Reference Intervals**

Normal Ranges for Citrated Kaolin (CK ) whole blood samples:

R: 4.0 – 8.0 minutes

K: 1.0 – 2.1 minutes

Angle: 60.0 – 73.0 degrees

MA: 57.0 – 74.0 mm

LY30: 0.0-5.0 %

### Normal Ranges for Citrated Heparinase Kaolin (CKH):

R: 4.0 – 8.4 minutes

K: 1.0 – 2.4 minutes

Angle: 57.0 – 72.0 degrees

MA: 55.0 – 72.0 mm

LY30: 0.0-5.0 %

### Normal Ranges for Citrated Rapid TEG

R: 0.2 – 0.9 minutes

K: 0.6 – 1.8 minutes

Angle: 70.0 – 82.0 degrees

MA: 57.0 – 72.0 mm

### Normal Ranges for Citrated Functional Fibrinogen

MA: 13.0 – 32.0 mm

Fibrinogen Level: 250.0 – 600.0 mg/dL

### **Remote TEG Curve Viewing**

It is our understanding that in the upcoming months of calendar year 2017, institutional IT services will complete building the infrastructure required to support remote TEG curve viewing within the Medical Center. This functionality is anticipated to be particularly useful during operative procedures, where viewing of the developing clot signature may help guide blood component therapy. In the first phase of TEG introduction, however, such viewing is not yet possible, and only the actual parameters (R, MA, etc) will be reportable through EPIC. Additionally, TEG results will be reviewed by a Pathologist, with interpretations provided as appropriate by the next business day. In instances where more immediate interpretation may be needed, please call the coagulation lab at 2-1315.