TECHNICAL PROCEDURE

SOP Number: S_HA_CD_SOP0050

SOP Name: Viewing Thromboelastography (TEG) Results

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COPY	1 of 12
LOCATION OF COPIES	1. CITU 2. ITU2/3 (Lab Room) 3. GHDU 4. Theatre 4 5. Cardiothoracic Theatres 7/8 6. Theatre 12 (anaesthetic room) 7. Theatre 16 (anaesthetic room) 8. Theatre 17 9. Theatre 18 10. CDS Recovery 11. CDS Main Theatre 12. Resus (A/E)

Document review and amendment history held on Q-Pulse

STNHSFT is committed to creating a fully inclusive and accessible service. By making equality and diversity an integral part of the business, it will enable us to enhance the services we deliver and better meet the needs of patients and staff.

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Introduction

Principle and Purpose of examination

TEG is a real time analyser of whole blood that can quickly provide patient results to allow for faster treatments and decision-making. The concept of individualised goal-directed therapy allows clinicians to treat each patient more appropriately. From testing whole blood, TEG measures the viscoelastic properties in a functional way. TEG is a diagnostic tool that provides clinicians with the most complete information to determine the right blood product or drug, at the right time, to manage a patient's risk for haemorrhage or thrombosis.

Clinical relevance

TEG has been shown to help differentiate between surgical bleeding and a pathological coagulopathy; this information can support the need for further exploration of surgical sites to ensure surgical haemostasis. TEG can express function and pinpoint dysfunction in the haemostatic process. By doing so, it can reference the types and amounts of blood products to stop bleeding. It can also be used to monitor anti-platelet drugs and anticoagulants to help reduce thromboembolic complications.

The co-located TEG service is provided by the Coagulation department at James Cook university hospital where the testing is performed. There are several live, remove viewing stations within the hospital. These are listed below:

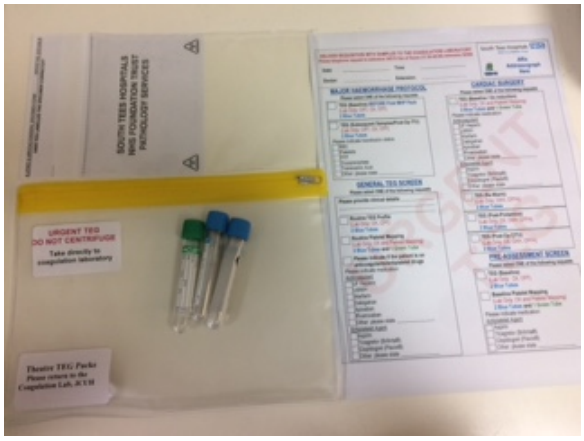
- Coagulation Laboratory
- CITU
- ITU2/3 (Lab Room)
- GHDU
- Theatre 4
- Cardiothoracic Theatres 7/8
- Theatre 12 (anaesthetic room)
- Theatre 16 (anaesthetic room)
- Theatre 17
- Theatre 18
- CDS Recovery
- CDS Main Theatre
- Resus (A/E)

Pre-made TEG packs are delivered to the following locations either once or twice a week:

- CITU
- ITU2/3 (Lab Room)
- GHDU
- Cardiothoracic Theatres 7/8
- Main Theatre Recovery
- TEG Packs included in each Major Haemorrhage Pack

The TEG pack consists of three specimen blood bottles, one TEG request form, one specimen bag (which needs to be sealed once filled bottles are placed within it) all within a plastic TEG wallet. Please use these wallets as both the portering and laboratory staff recognise them and know where to bring them for immediate testing. These packs also contain a visual prompt reminding laboratory staff that these samples MUST NOT be centrifuged.

The TEG requests (within the TEG) pack) MUST reach the Laboratory within 30 of venepuncture.



State Registered biomedical and clinical scientists (BMS) may perform routine analyses and validate/report results.

Pre-registration BMS may perform these procedures but only under the direct supervision of a State Registered BMS.

Form Requirements

Ensure the provided TEG request form is filled in appropriately with date and time, requesting clinician and telephone extension. TEG request forms contain four categories. Fill in the appropriate group whether you are using the TEG in the major haemorrhage protocol, a general TEG screen, for cardiac surgery or as a pre assessment screen. Please ensure all drugs and products given are indicated.

Specimen Requirements

Whole blood collected into 2x vacutainers containing tri-sodium citrate.
Used for all TEG tests
Whole blood collected into 1x vacutainers containing Lithium Heparin.
Used for Platelet Mapping only

Samples should ideally be tested within 30 minutes of venepuncture.

Sample must be labelled with at least 3 points of identification which must include surname, forename, date of birth and/or hospital number.

Transportation Requirements

The TEG requests (within the TEG) pack) MUST reach the Laboratory within 30 of venepuncture.

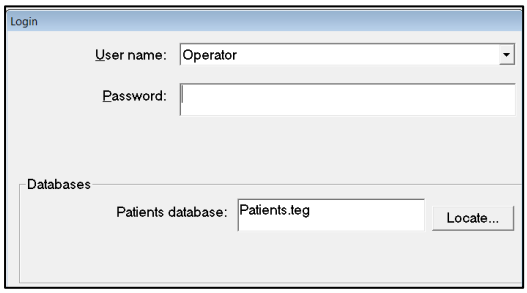
Health and Safety and COSHH, Risk Assessment

Reference: S_HA_CD_COS0022 and S_HA_CD_COS0023

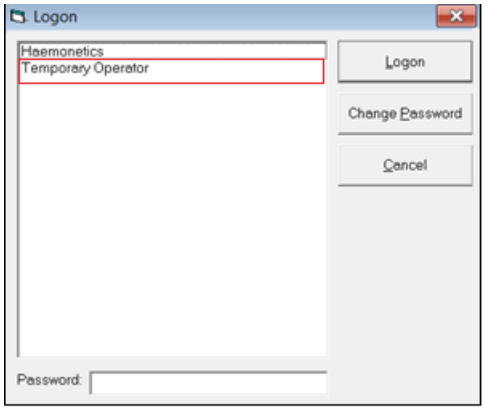
Computer and Software Login

- Login to the computer as per normal procedure.
- Select (or double click) the 

icon on the desktop or find the icon in the start menu – this opens the TEG® software and the following login screen will appear.



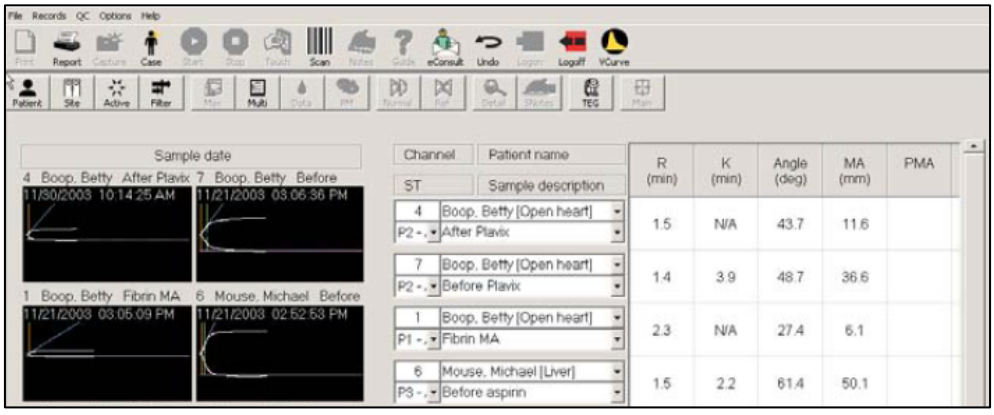
- Select **Operator** from the drop-down menu – there is no password so leave this field blank – select **OK**.
- This loads the TEG® software and automatically brings up a box in the top left hand corner containing a list of operators.



- Select the Cancel option.

Viewing Traces

- Once sample testing has commenced, remote viewing locations and the laboratory can view and overlay traces.
- The main screen should appear as follows:



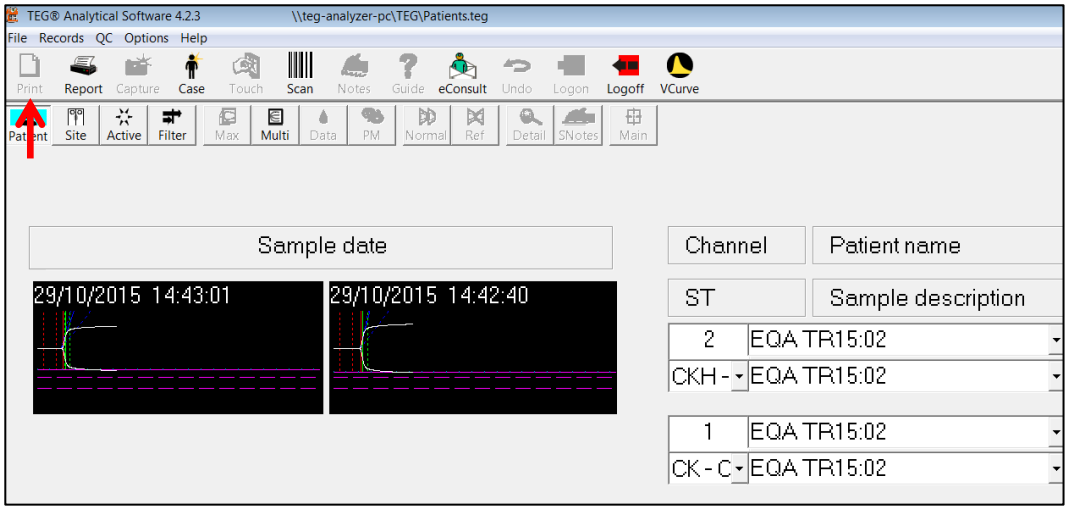
- Traces are present on the left hand side of the screen and, if active, will continue to develop and provide both visual and numerical information.

- The Channel, Patient Name and test information is in the centre of the screen (sample description should include patient name, hospital number and procedure point to allow for easy comparison of traces). **Active traces will also appear green in the central part of the screen, under "Channel/Patient Name section.**

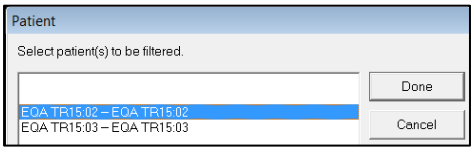
- The TEG numerical parameters represented by the traces are present on the right hand side of the screen.

Viewing Traces to a Specific Patient

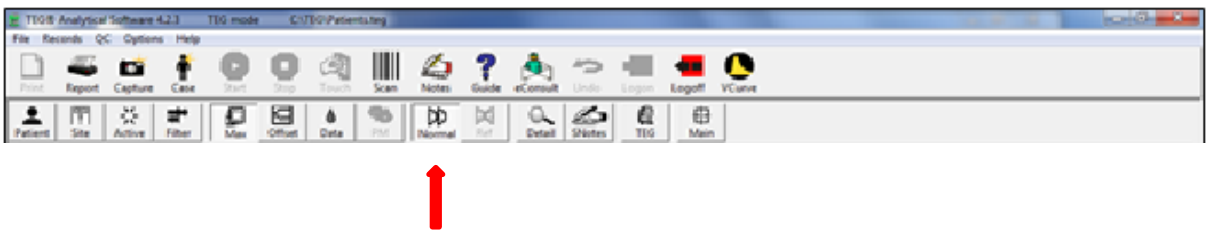
- To view traces specific to one patient select the Patient icon in the top left corner:

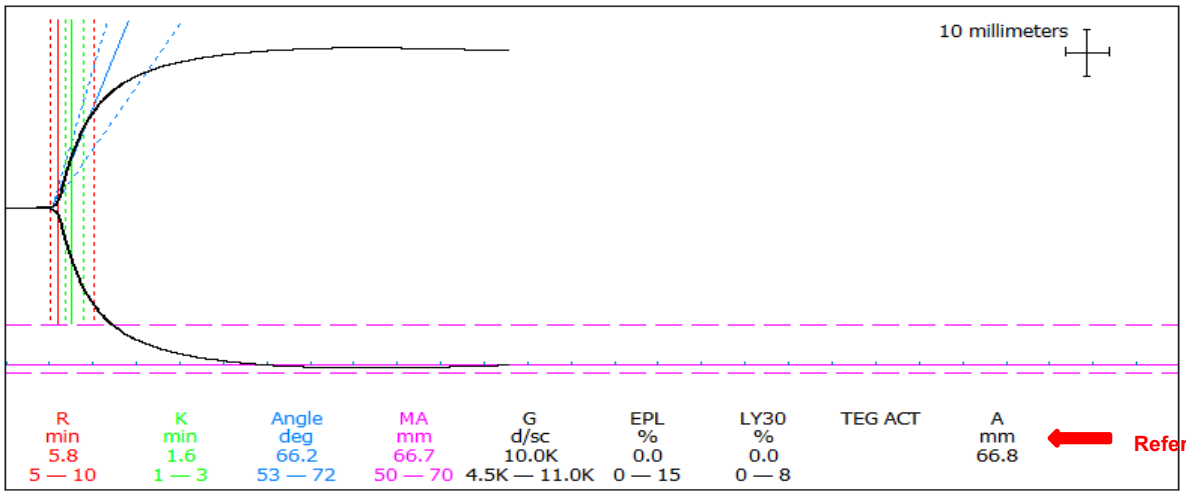


The following screen will appear:



- Highlight the patient required and select the **Done** button. Only graphs corresponding to this patient will upload onto the main screen.
- To view a trace, double click on the trace and a larger version of it will appear on the screen, complete with numerical values and normal reference ranges.
- To overlay a normal trace select the Normal icon (below) and an overlay trace will appear in
- purple as seen below:



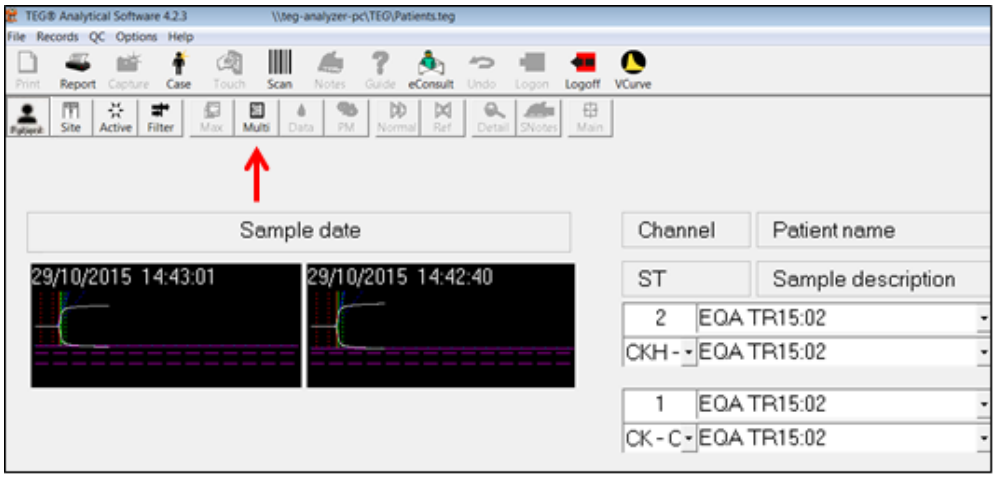


- The overlay trace can be used in conjunction with the reference ranges to aid with diagnosis.
- To return to the main screen, double click on the trace background or select the Main the top right corner.

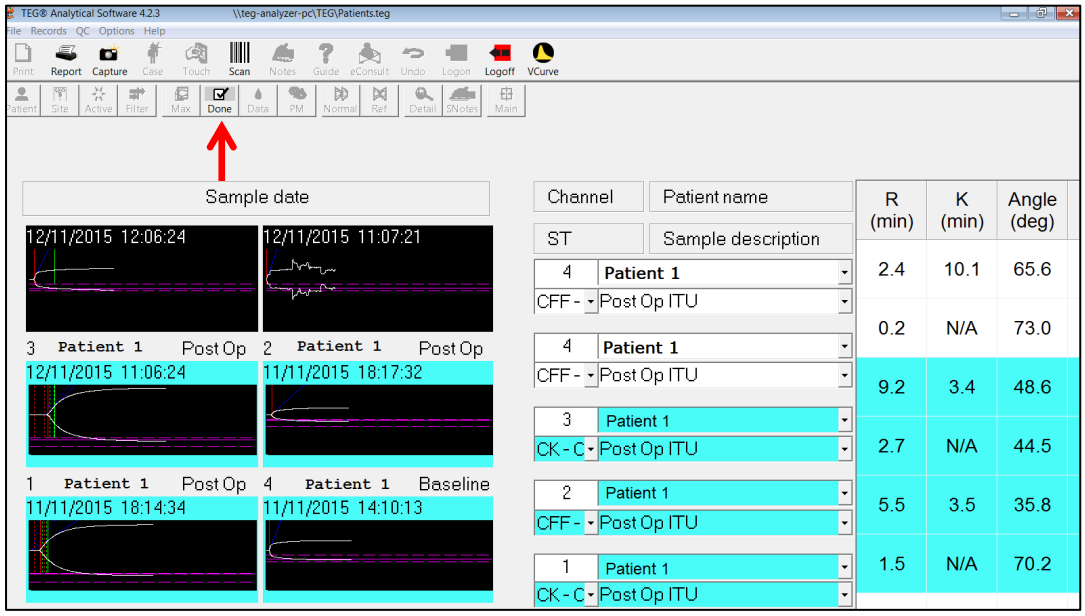
NB: Reference ranges can vary per test.

Viewing Multiple Traces

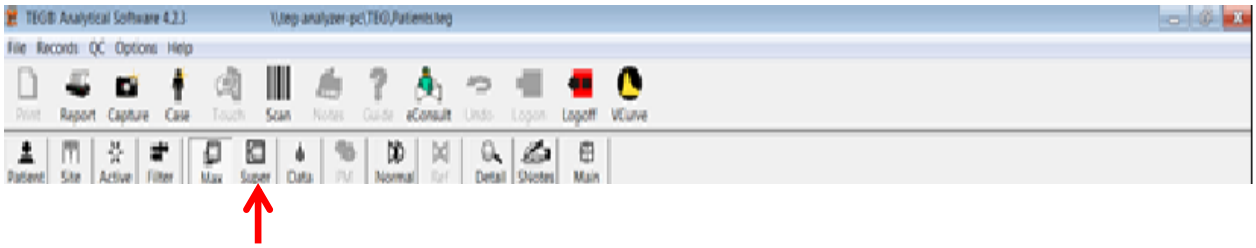
- To view multiple traces select the Multi icon (once selected, this button will change to Done (see below):



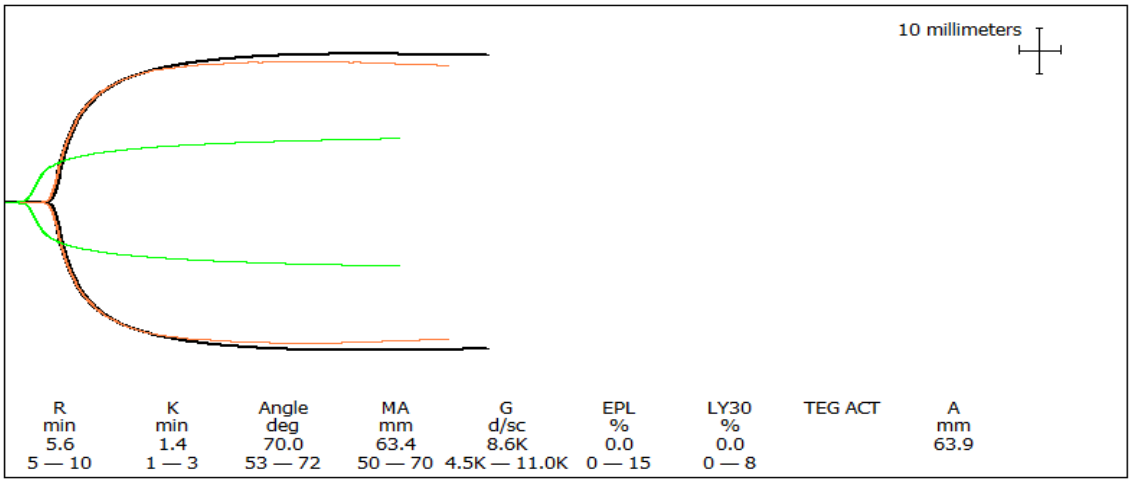
- Select the traces you wish to overlay by clicking either the trace on the left hand side of the screen or the Channel, Patient Name and test information in the centre of the screen. Once selected, the traces will appear highlighted blue as indicated below.
- Once the required traces are chosen select the Done icon:



- The selected traces will appear together on the screen as indicated below.
- To superimpose the traces select the Super icon:



The traces will appear superimposed to allow for a direct comparison:



- To toggle between the traces use the Page-Up and Page-Down buttons on the keyboard.
  - The description of the highlighted trace will appear in the top right hand corner of the trace (for example, in the trace above the citrated kaolin test is highlighted).
  - The colour of the trace corresponds to the type of trace (i.e. in this case, white = citrated kaolin)

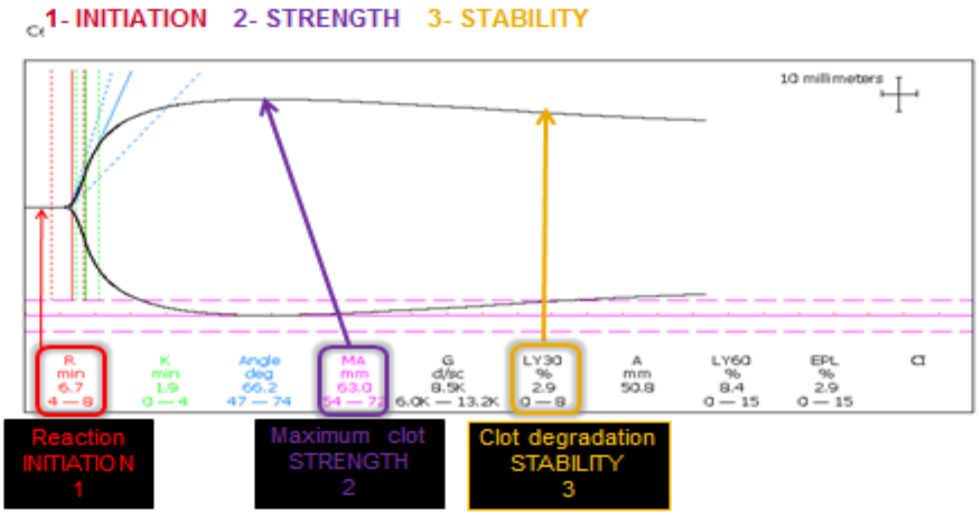
- Traces most commonly overlaid are the CK (citrated kaolin) and CFF (citrated functional fibrinogen) as this not only enables a check of clot initiation, strength and stability, but also provides information on the platelet and fibrinogen contribution to the clot.

- Direct comparisons can be made between traces taken at various intervals of operative care by overlaying, for example, the CK trace taken pre-op, with the CK trace taken during a bleeding episode and post-products; this will show real-time changes in clot initiation, strength and stability.

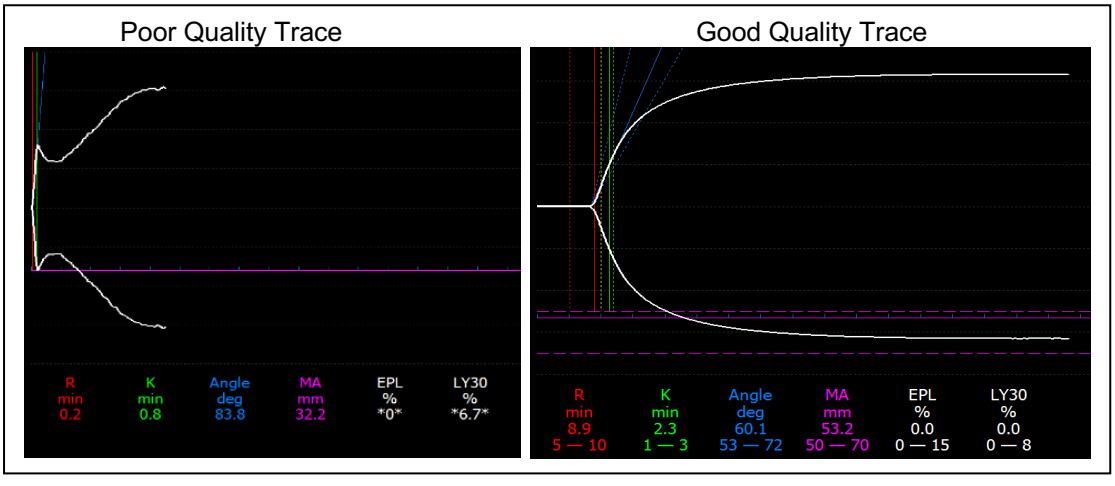
If further advice is required please contact the Coagulation Laboratory:
Extension 54315 (09:00 – 17:30)
Extension 52630 (17:30 – 09:00)
Daniella M Winterburn Lead Clinical Scientist in Coagulation daniella.winterburn@.nhs.net
Rachel Webb Senior Biomedical Scientist in Coagulation rachel.webb5@nhs.net

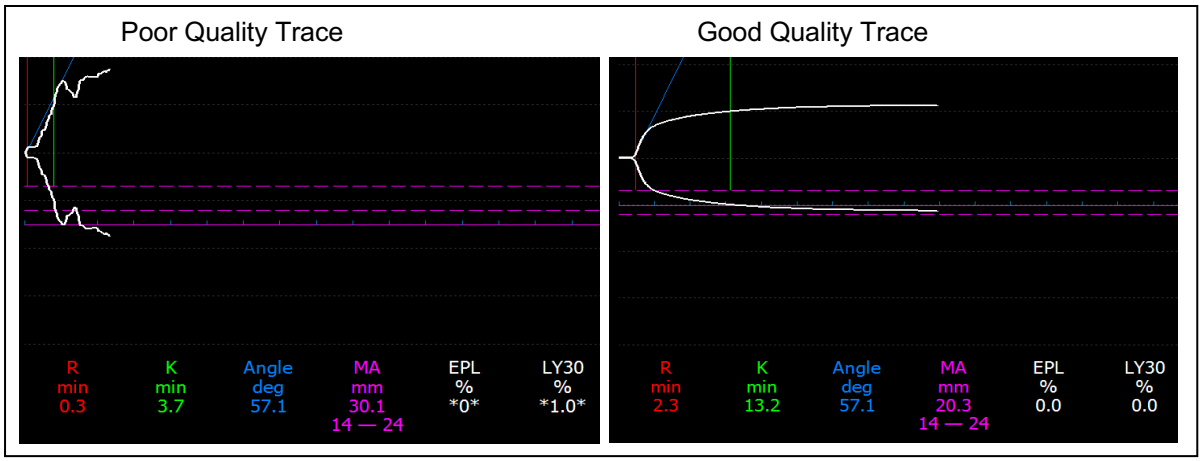
For clinical advice please contact Dr A Wood, Dr J Maddox, or the on-call Haematologist if neither are available.

Basic Trace Interpretation

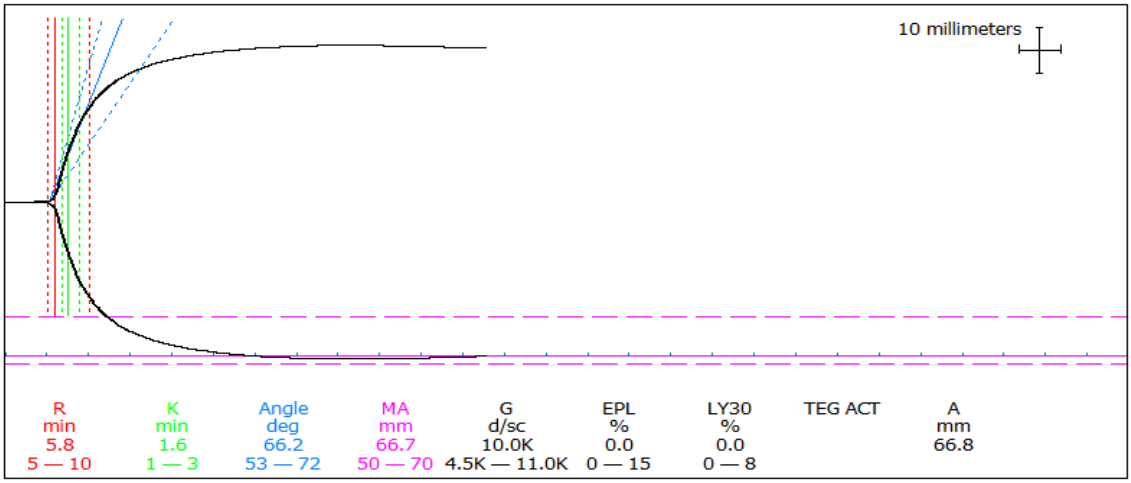


Below are a couple of examples of poor quality traces:
If the trace appears to be of poor quality it will be re-run by the laboratory staff; the poor quality trace will be deleted in due course but should not be used for the purpose of trace interpretation.





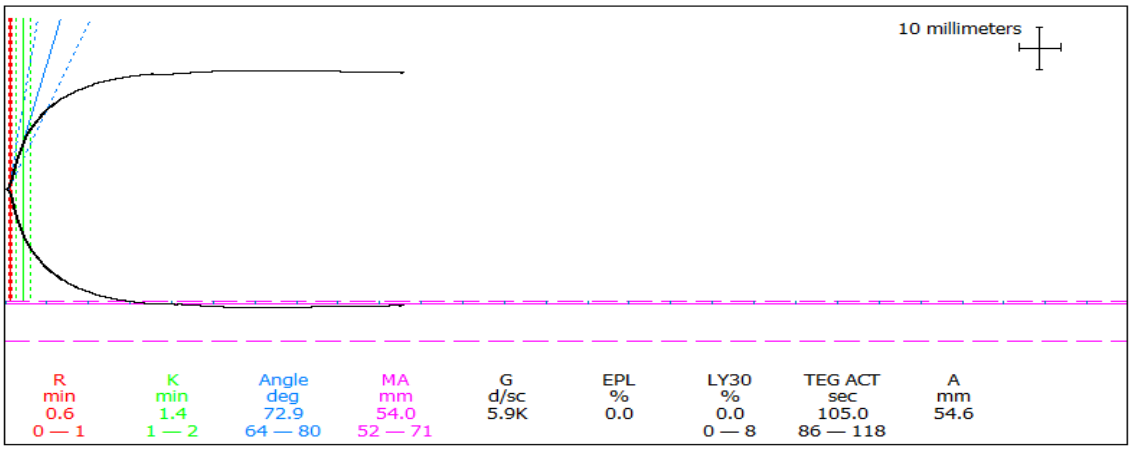
Citrated Kaolin (CK)



This is the standard TEG profile expressing initiation, amplification, propagation and dissolution phases of clot development and breakdown

- R-Time: This represents the clot initiation
- K-Time. This represents the rate of clot development
- MA: This represents the clot strength
- LY30: This represents the clot stability

Citrated Rapid TEG (CRT)

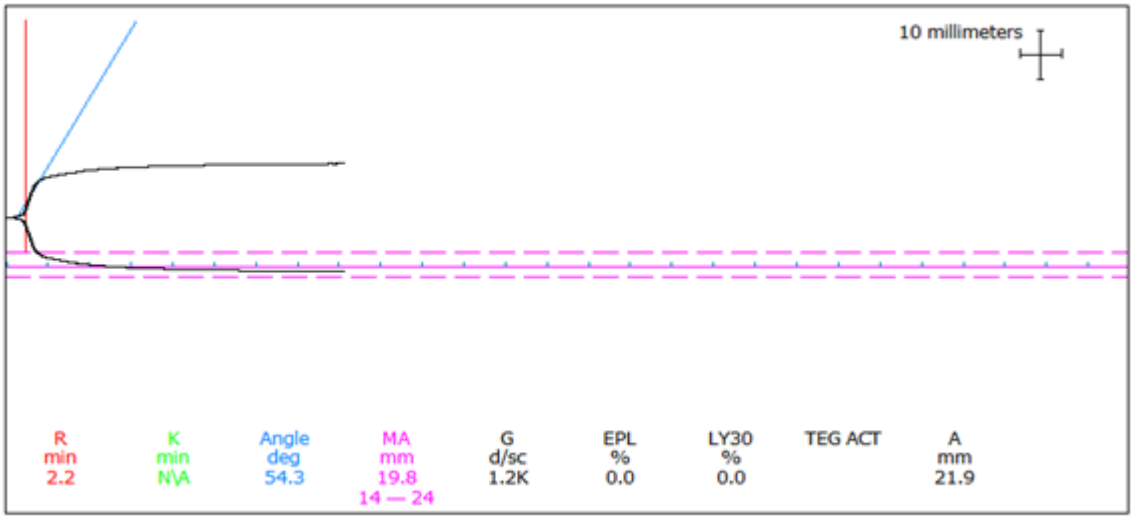


The Rapid TEG® essentially provides a quicker assessment of the clot development and clot breakdown. It provides a more immediate MA value and can be used in conjunction with the R-Time of the CK curve and the MA of the CFF to provide a quick initial assessment of clot initiation, strength and stability.

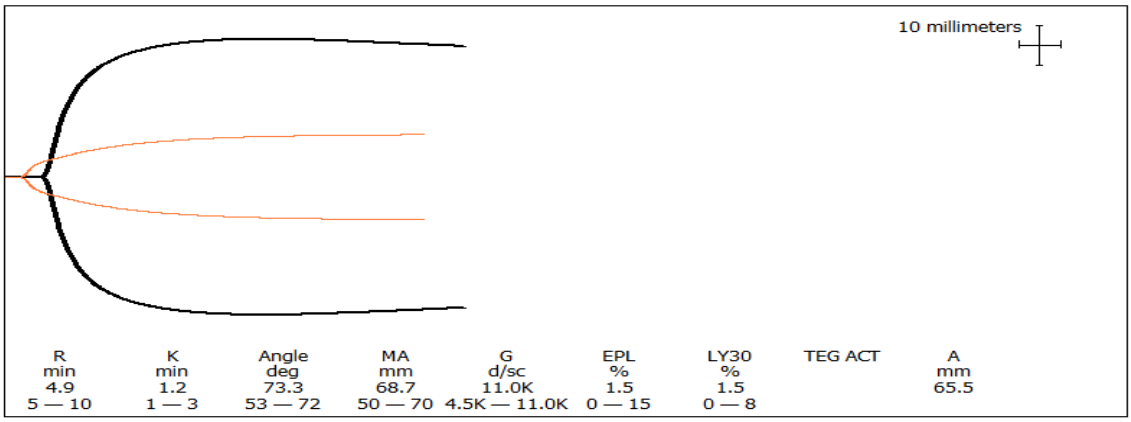
Citrated Functional Fibrinogen (CFF)

This provides the clot integrity based on fibrinogen contribution.

- The MA is the key value:
  - ↑ MA = increased fibrinogen contribution to the clot
  - ↓ MA = decreased fibrinogen contribution to the clot



Platelet/Fibrinogen Clot Contribution



- To establish the platelet/fibrinogen contribution to the clot, the CK and CFF traces must be overlaid. This will provide a MAp value in the top left hand corner of the trace.
- Ensure the CK curve is selected first (to toggle between the selected traces select Page Up or Page-Down on the keyboard – the selected trace will be labelled in the top right hand corner) as the MA value from the CK trace is required.
- Clot contribution is typically 70-80% platelets and 20-30% fibrinogen (as a guide).

South Tees Hospitals NHS Foundation Trust TEG Guided Haemostatic Algorithm

Profile/Test	TEG Variables	Normal Range	Patient Value	Coagulopathy	Haemostatic Therapy
Citrated Kaolin TEG (CK)	R	5-10 minutes	11-15 minutes >15 minutes	Coagulation Factors ↓ or Heparinised sample Coagulation Factors ↓↓ or Heparinised sample	Consider FFP FFP Required
Citrated Kaolin TEG (CK)	MA	50-70mm	44-49 mm <44	Platelets ↓* Platelets ↓↓*	Consider Platelets* Platelets Required* * if normal CFF MA, otherwise may be due to low fibrinogen or both.
Citrated Kaolin TEG (CK) and Citrated Rapid TEG (CRT)	LY30	0-8%	>3% >8% >3% AND MA ↑	Primary Fibrinolysis Primary Fibrinolysis Reactive Hyperfibrinolysis	Consider Tranexamic acid (unless increased MA) Tranexamic acid required (unless increased MA) Tranexamic acid contraindicated. Treat underlying cause
Functional Fibrinogen (CFF)	MA	14-24mm	<14mm	Fibrinogen ↓	Consider Cryoprecipitate
Citrated Rapid TEG (CRT)	MA	52-71mm	<51mm	Platelets ↓*	Consider platelets if normal CFF MA, otherwise may be due to low fibrinogen or both.
Citrated Kaolin TEG (CK)/ Citrated Kaolin Heparinase (CKH)	R	N/A	>3 minute difference	Heparinisation	Protamine Sulphate (consider sample error e.g. heparin contamination)

Note this is a guide, a useful tool to aid in decision making but is not a rule book to follow
Clinical context and other results need to be taken into account