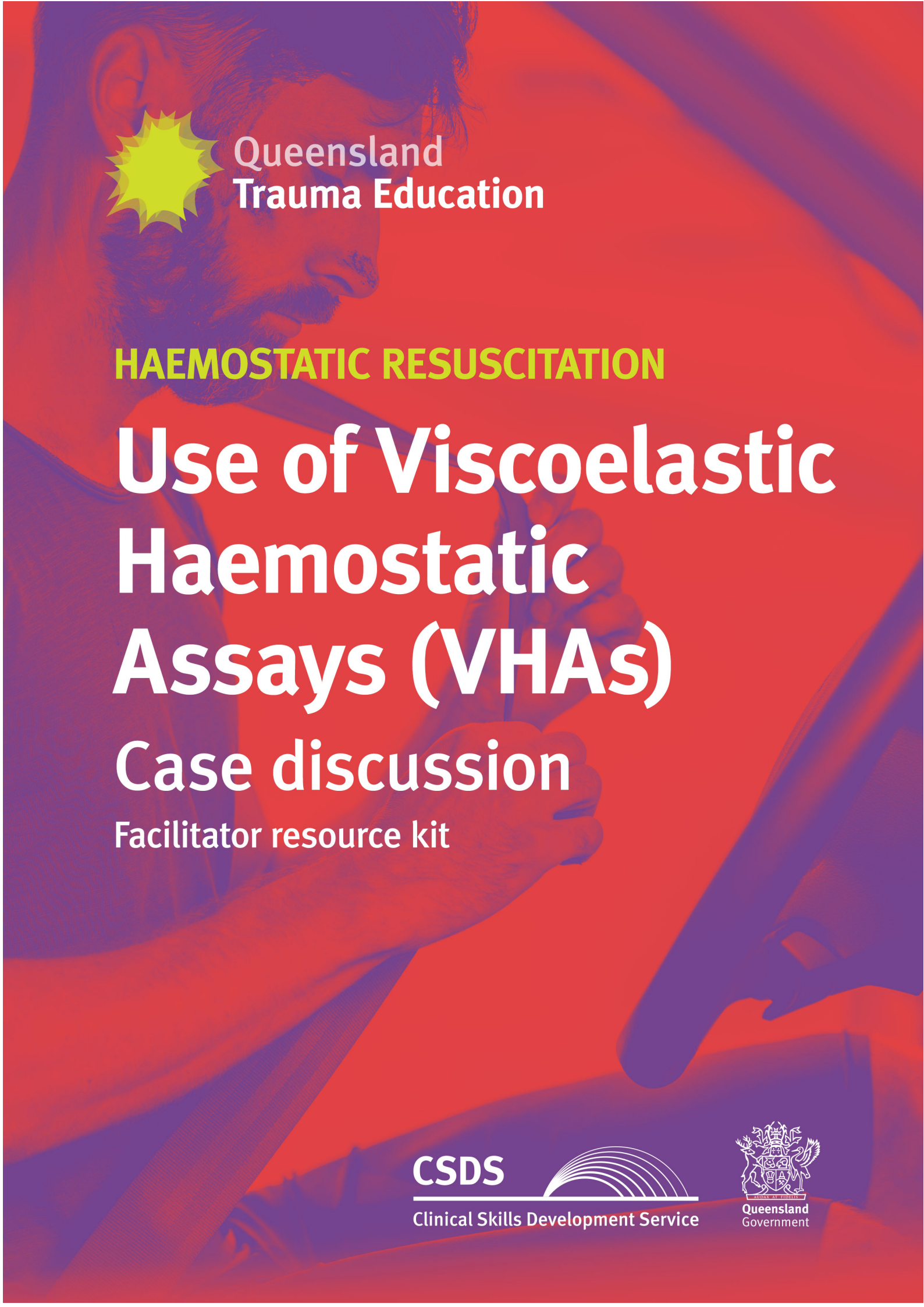

Queensland
Trauma Education

HAEMOSTATIC RESUSCITATION

Use of Viscoelastic Haemostatic Assays (VHAs)

Case discussion

Facilitator resource kit

CSDS
Clinical Skills Development Service

Queensland
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Queensland Trauma Education

The resources developed for Queensland Trauma Education are designed for use in any Queensland Health facility that cares for patients who have been injured as a result of trauma. Each resource can be modified by the facilitator and scaled to the learners needs as well as the environment in which the education is being delivered, from tertiary to rural and remote facilities.

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Education Working Group, Statewide Trauma Clinical Network – Clinical Excellence Queensland

Queensland Trauma Education
Haemostatic Resuscitation - Use of Viscoelastic Haemostatic Assays: Case discussion – Facilitator resource kit
Version 1.0

Published by the State of Queensland (Clinical Skills Development Service), 2022

About this training resource kit

This resource kit provides information for clinical teams caring for major trauma patients about the role, practical application, and interpretation of Viscoelastic Haemostatic Assays (VHAs).

National Safety and Quality Health Service (NSQHS) Standards

Target audience

Medical, nursing and pharmacy clinicians

Duration

30 minutes

Group size

Suited to small group participation.

Learning objectives

By the end of this session the participant will be able to:

- Describe the types of VHA used in trauma resuscitation.
- Understand the process to obtain a VHA test.
- Describe the steps in interpretation of a VHA.

Facilitation guide

Use facilitator resource to guide discussion for local practice and integration of VHA tests within local environment.

Supporting resources

- VHA PowerPoint presentation
- Example ROTEM guideline for assessment and management of coagulation
- TEG (thromboelastography) vs TEM (thromboelastrometry)

Overview of the use of Viscoelastic Haemostatic Assays in trauma resuscitation

Further reading

A practical guide to haemostasis	
Publication	Sang Medicine
Link	https://bit.ly/3bJJwLt

Thromboelastogram	
Organisation	Life in the Fast Lane
Link	https://bit.ly/3etz9MV

Case discussion

Case study

A 27-year-old male is brought to the Emergency Department following a high-speed road traffic collision. He was the restrained driver, wearing a seatbelt with significant damage to his capsule on extrication.

His prehospital vital signs are HR 140, BP 80/50mmHg, O2 saturations 98% on 10LHM and respiratory rate 18. He is GCS 15 with no neurological deficits.

His CXR and PXR is normal, EFAST positive in Morrisons (RUQ).

Question and answer guide

1. In the setting of trauma, what fluid is preferred for resuscitation?

It is recognised that most hypotensive trauma patients are hypovolaemic from haemorrhage. The preferred fluid for resuscitation is therefore blood and blood products.

2. What laboratory tests can be used to identify the effect of haemorrhage following trauma?

Laboratory tests include bedside, conventional and point of care.

1. Bedside tests include urine analysis for haematuria.
2. Conventional tests include full blood examination (FBE) for haemoglobin and coagulation studies (i.e., INR, PT).
3. Point of care tests include blood gas analysis and VHAs. A blood gas can be used to determine the haemoglobin, lactate, and acid base status. VHAs will give other measures of coagulation function, including can be used to direct treatment through the replacement of blood products.

3. What information can a VHA provide?

All VHA tests can identify the following information:

- Clot initiation time
- Fibrin polymerisation
- Clot strength
- Clot lysis

4. What VHAs are used in care of the trauma patient?

Commonly in Queensland two types of VHA tests are used.

1. Thromboelastrography (TEG) involves rotation of the cup.
2. Thromoboelastometry (ROTEM) involves rotation of the pin.

5. How are these measures used in clinical care?

Clot initiation is related to the PT or aPTT- measures time to fibrin formation. Warfarin and Heparin will prolong the measurement as will low fibrinogen (1).

Fibrin polymerisation- this measure is a reflection of the binding of fibrin to platelets and the amount and function of each of these components.

Clot strength- this forms the majority of the VHA trace and is a measure of fibrinogen, platelets, and Factor VIII.

Clot lysis- normal clot function includes the breakdown of the clot. The VHA can indicate when this process is increased, but slightly increased fibrinolysis may not be identified with the VHA trace.

This can be summarised in the care of the patient as: prolongation of clot formation, reduction in clot strength and increased fibrinolysis.

6. Do VHAs identify clotting abnormalities in trauma patients?

Yes. VHAs identify more clotting abnormalities than standard lab tests (clotting studies).

7. How are the results integrated into clinical care?

A normal VHA suggests that the patient does not require blood product replacement for coagulopathy (grade 2B evidence) and can be monitored.

VHAs may reduce transfusion requirements as a more targeted strategy when compared to MTP (1:1:1) (Grade 2B evidence).

TXA may still be required despite VHA result (Grade 1B evidence).

8. How are VHAs incorporated into transfusion protocols?

VHAs are included in local transfusion protocols with specific reference to the machine type (ROTEM/TEG) and products available. Each health system protocol will vary depending on the equipment, availability for test performance and blood products and adjunct available. Clinicians should be familiar with their local guidelines.

Many transfusion guidelines will include both a ratio-based strategy (including 1:1:1) and a VHA guide with parameters and inclusion criteria for each.

An example of local practice difference includes the likelihood of pregnant trauma patients as they often have higher fibrinogen requirements.

9. How are samples for VHA collected?

- VHA are performed on the standard ‘coagulation’ citrate blue tube and must be filled to the correct mark (3.5ml black line).
- Prenotification of the laboratory or local process to turn the VHA machine on is often required in addition to a separate request form from the routine trauma blood tests.
- Importantly the sample should not be sent to the laboratory via a pneumatic tube as this may affect results. Also, the sample should not be placed on ice or cooled prior to analysis.
- A cartridge is inserted into the machine and patient details entered.

- Once the sample has been collected, the tube is inverted 5 times ready to be inserted into the cartridge.
- The assay will run automatically and must continue for at least 5 minutes.
- The results may be printed or available on computer viewer programs.

10. What steps are performed in the interpretation of the VHA results?

A local protocol will exist for the interpretation of VHA results based on local equipment, process and available blood and transfusion products.

In general, following any administration of blood products or adjuncts (e.g., TXA), a repeat VHA should be obtained to review the effect of the intervention.

Each abnormality should be corrected, with a repeat test performed before moving to the next interpretation step.

Step 1: Assessment of fibrinolysis to determine if TXA and/ or fibrinogen required.

Step 2: Assessment of fibrinogen requirements- Fib Conc or cryoprecipitate.

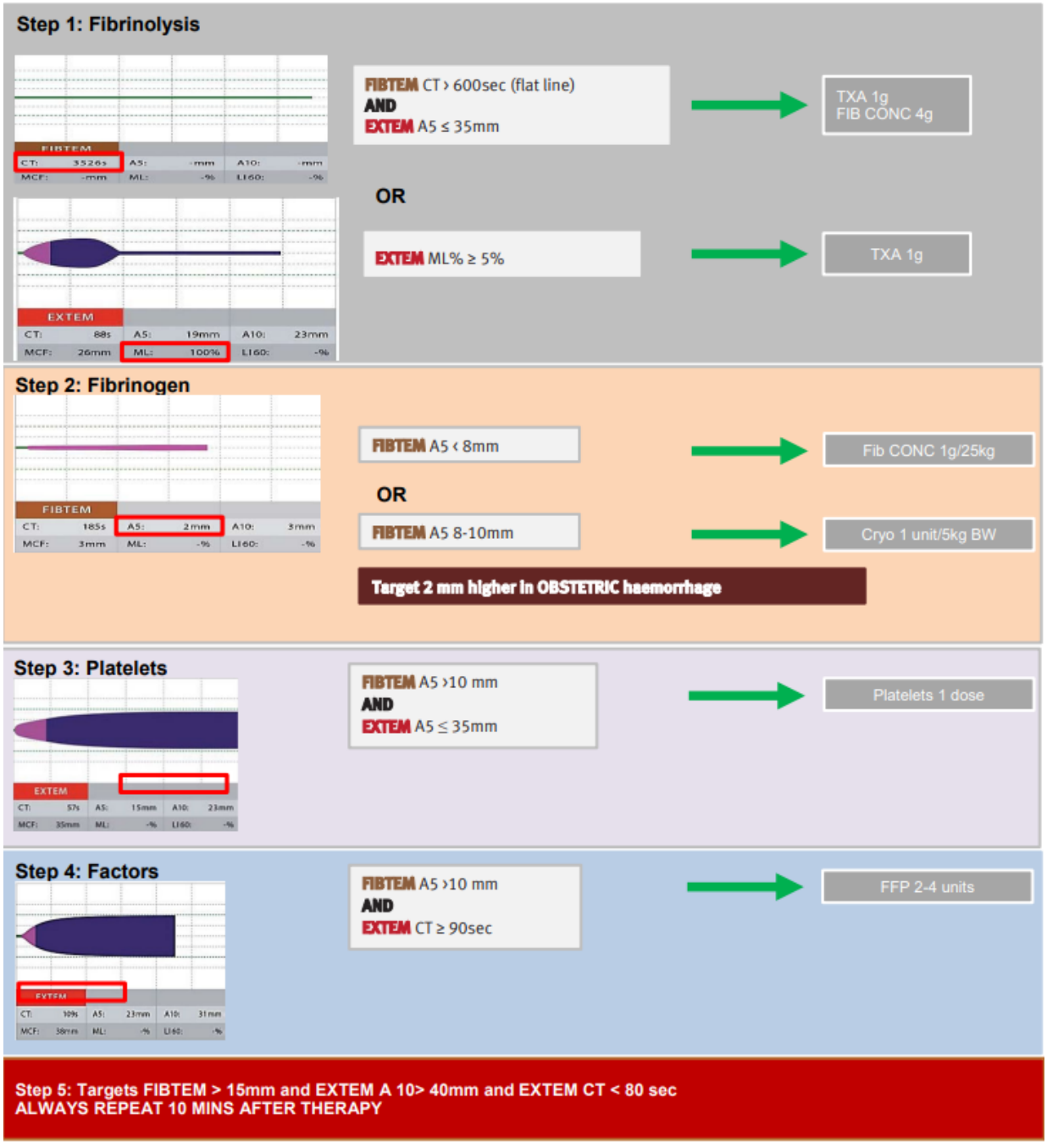
Step 3: Assessment of platelet function and replacement- platelets.

Step 4: Assessment for factor replacement need- FFP.

Supporting resources

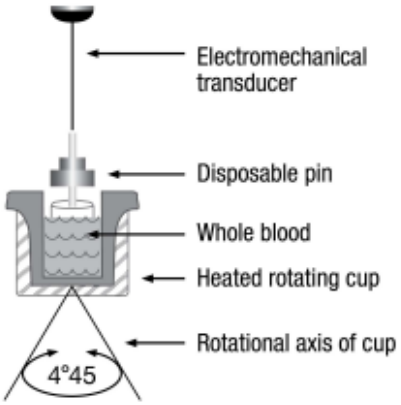
ROTEM guideline

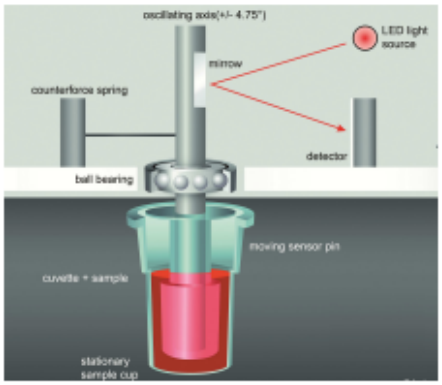
Example ROTEM guideline for assessment and management of coagulation.



TEG (thromboelastography) vs ROTEM (thromboelastrometry)

a) Thromboelastography **b) Thromboelastometry**

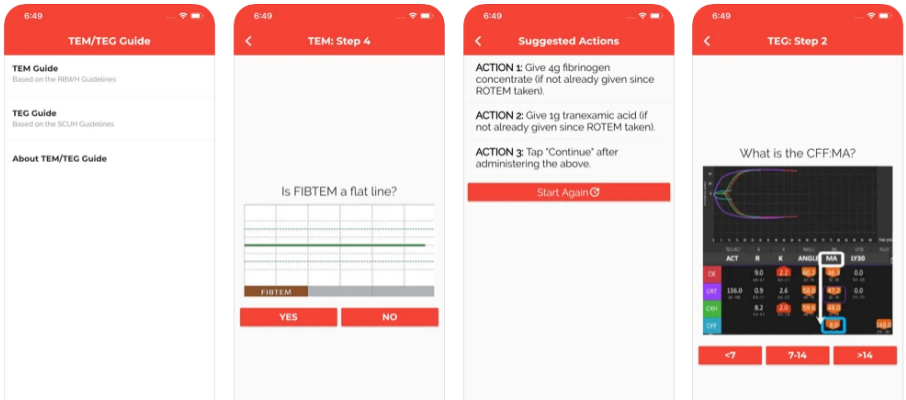




TEM/TEG app

TEM/TEG Guide 17+
A step-wise guide to TEM/TEG
Josh Case
Designed for iPad
★★★★★ 5.0 • 7 Ratings
Free

Screenshots iPad iPhone



Acronyms and abbreviations

Term	Definition
aPTT	Activated partial thromboplastin time
FFP	Fresh Frozen Plasma
INR	International normalized ratio
MTP/MHP	Massive Transfusion/Haemorrhage Protocol
PT	Prothrombin time
ROTEM	Rotational thromboelastometry
TEG	Thromboelastography
TEM	Thromboelastrometry
TXA	Tranexamic Acid

References

1. Curry N, Davenport R, Pavord S, Mallett S, Kitchen D, Klein A, Maybury H, Collins P W. and Laffan M. The use of viscoelastic haemostatic assays in the management of major bleeding. British Journal of Haematology 2018;182 (6), pp. 789-806. 10.1111/bjh.15524 file. Retrieved from https://bit.ly/3dgOjEp.
2. Metro North Hospital and Health Service. 2019. ROTEM - Point of Care Coagulation Testing. Brisbane: Metro North Hospital and Health Service. Retrieved from https://bit.ly/3eeYDNE
3. Case J & Klan M. 2020. TEM/TEG Guide [IOS].

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