



Queensland
Trauma Education

HAEMOSTATIC RESUSCITATION

VHA application in trauma care

Procedural skill

Facilitator resource kit

CSDS



Clinical Skills Development Service



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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.

Developed by

Dr Frances Williamson – Staff Specialist Emergency Physician, Metro North Health

Reviewed by

Tracey McLean, Nurse Educator-Simulation, CSDS

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

Queensland Trauma Education

Haemostatic Resuscitation – VHA Application in Trauma Care:

Procedural skill – Facilitator resource kit

Version 1.0

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About this training resource kit

This resource kit provides clinical staff the opportunity to practise the application and interpretation of a Viscoelastic haemostatic assay (VHA) trace (ROTEM) for the management of the bleeding trauma patient.

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:

- Demonstrate understanding of VHA process and requirements for blood products.
- Apply VHA guidelines to clinical scenarios.

Facilitation guide

1. Use clinical scenario and VHA trace to lead the interpretation of haemostatic resuscitation.
2. The ROTEM images can be replaced by TEG trace if more relevant to clinical environment.

Supporting resources

- ROTEM images
- TEM/TEG app

Overview of VHA application in trauma care

This procedural skill allows clinicians to practise the use of and interpretation of a ROTEM trace in clinical scenarios.

Further reading

ROTEM Point of Care Testing	
Organisation	Metro North Hospital and Health Service
Link	https://bit.ly/3pgEKYZ

Massive Haemorrhage Protocol	
Organisation	Queensland Health
Link	https://bit.ly/3drvDSn

Procedural skill

Resources required

Equipment	<ul style="list-style-type: none">• ROTEM images• TEG/TEM app (can demonstrate using internet link)
Delivery tool	Facilitator to use ROTEM images for discussion (may substitute with TEG if relevant to clinical area)

Case 1

23-year-old man. Fall from 10 meters 40 minutes ago. Brought to ED by ambulance. Vital signs HR 130, BP 90/60mmHg, oxygen saturations 97% 10L HM, respiratory rate 20. Very tender abdomen, EFAST positive for free fluid in LUQ.

Case 2

33-year-old man. Driver of RTC, 100km/hr into barrier. Restrained, self-extricated from vehicle then collapsed on side of the road. Ambulance paramedic identified deep laceration to R leg with femoral fracture, this has been aligned, compression dressing and splint applied. Noted estimated 500mls blood loss on the road, no ongoing haemorrhage. HR initially 140 and BP 100/60mmHg. On arrival to the Emergency department: HR 110, BP 100/85mmHg, oxygen saturations 99% 2L NP O₂, respiratory rate 22.

Case 3

18-year-old female, fall from galloping horse which then rolled on her. She has been brought to the Emergency Department with significant pain to her pelvis. Her pelvic Xray shows an open book fracture, the binder is in an appropriate position and her EFAST is negative.

Case 4

67-year-old man has been retrieved following a high speed RTC. He was hemodynamically unstable on scene and was given 2 units PRBC in addition to TXA prehospital. On arrival to the Emergency Department, he has a HR 130, BP 70/50mmHg and oxygen saturations 95% 15L NRB.

Question and answer guide

Using the attached ROTEM images to discuss management options in each case. For example, in addition to the ROTEM image available for case 1 clinical scenario, the supporting documents outline the results and management strategy indicated.

For each clinical case:

What abnormality in the ROTEM is demonstrated?

What is the required intervention response for each case?

What should occur after each intervention?

The ROTEM should be repeated prior to further analysis.

Clinical state is considered prior to the administration of blood and blood products

Other notes

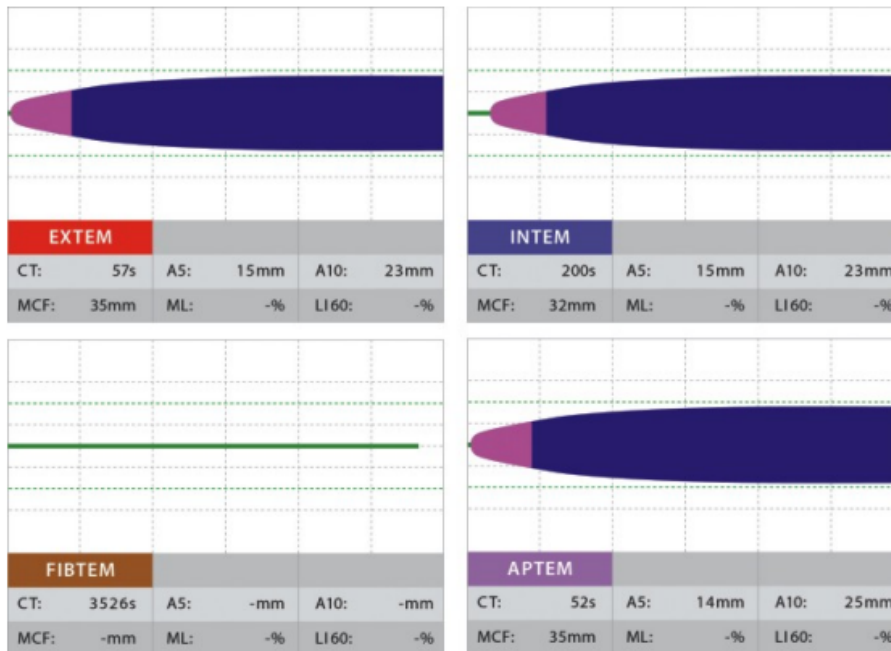
- Discussion may include use of local massive transfusion/haemorrhage protocols.
- Local VHA interpretation guides and protocols to be used in place of the TEM/TEG app if clinically relevant.
- Reference made to prioritisation of haemorrhage control, identification of injury for early definitive care in addition to haemostatic resuscitation process.
- Recognition of challenges in use of VHA strategy and appropriate use of ratio-based resuscitation.

Supporting documents

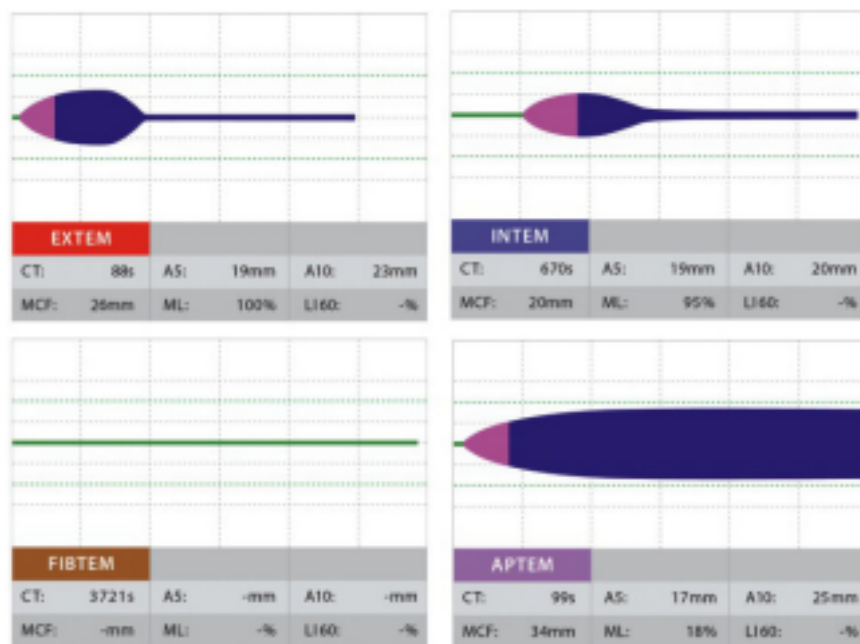
The following answers and ROTEM curves below are provided to facilitate discussion for each case example above:

1. ROTEM 1- strongly prolonged clot formation time (CFT), strongly reduced clot firmness (MCF) in EXTEM and INTEM show a strongly reduced haemostatic capacity. The zero line in FIBTEM (no clotting) shows a strongly reduced fibrinogen level and/or a disturbed fibrin polymerisation. The first line treatment would be a highly dosed administration of fibrinogen concentrate (2-6 g) or cryoprecipitate or a larger amount of FFP (5-15 units). In cases of massive bleeding, it would be considered to concomitantly transfuse platelets.
2. ROTEM 2- combined haemostasis disorder. We see a hyperfibrinolysis (lysis of the clot in EXTEM and INTEM), a prolonged CT in INTEM (heparin effect), a strongly reduced clot firmness in APTEM (indicates a disturbance of clot formation exceeding fibrinolysis) as well as a zero line (no clotting) in FIBTEM (reduced fibrinogen and / or polymerisation disorder). This result is not compatible with clinically normal haemostasis and requires a rapid combined treatment: an antifibrinolytic drug for the treatment of the hyperfibrinolysis, fibrinogen or FFP (large doses) for improvement of the clot formation. In cases of such an insufficient clot formation, a simultaneous platelet administration is also recommended (it would however also be possible to give fibrinogen or FFP first and then check the clot formation).
3. ROTEM 3- fibrinolysis (lysis of the clot in EXTEM, INTEM and FIBTEM) with an at the same time borderline acceptability of MCF (MCF = 47 mm in APTEM). Good fibrin clot in FIBTEM. Therapy would be an antifibrinolytic drug. In cases of persisting bleeding, administration of platelets would be suggested (for correction of the clot formation).
4. ROTEM 4- normal coagulation in the ROTEM®. EXTEM and INTEM show a normal coagulation activation (CT normal), normal clot formation (CFT and MCF normal) as well as a stable clot (no lysis of the clot in EXTEM, INTEM or FIBTEM). The FIBTEM shows a normal fibrin clot. Should the patient bleed clinically, the following causes have to be considered: surgical cause of bleeding, Warfarin® therapy (low sensitivity of EXTEM), Aspirin®, clopidogrel, von Willebrand syndrome (for these drugs respectively pathologies ROTEM® delta and ROTEM® sigma tests show low sensitivity) as well as errors (e.g., sample mix-up).

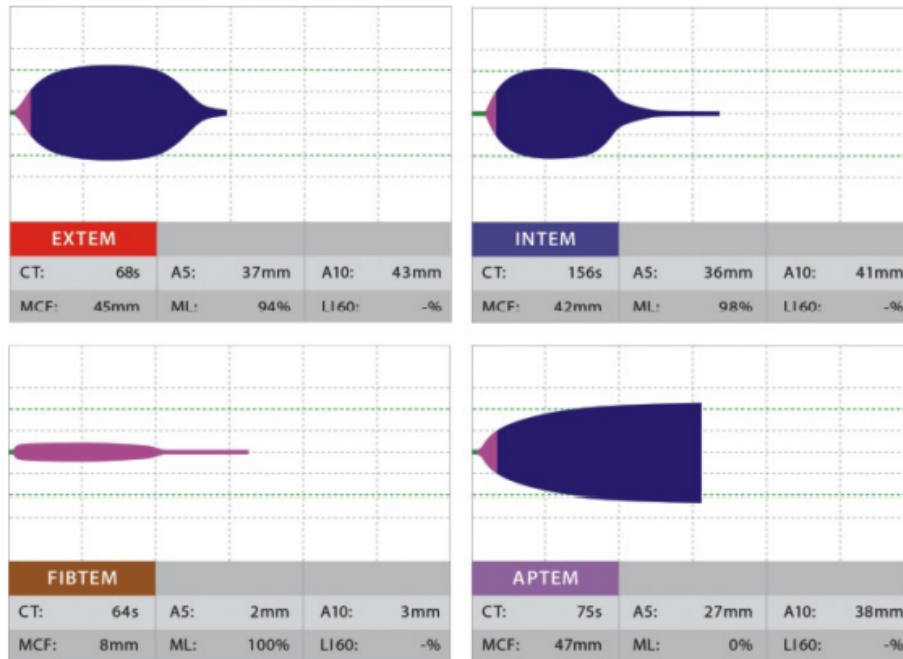
ROTEM 1



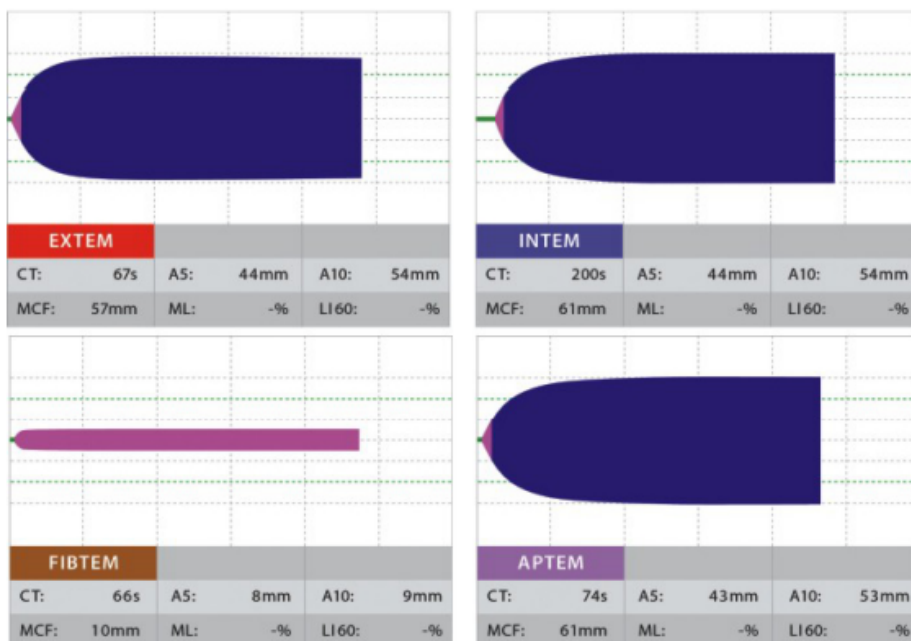
ROTEM 2



ROTEM 3



ROTEM 4

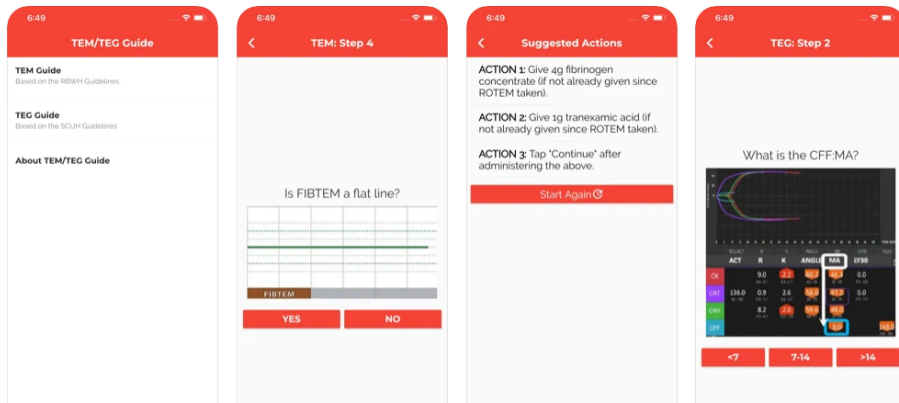


TEM/TEG app

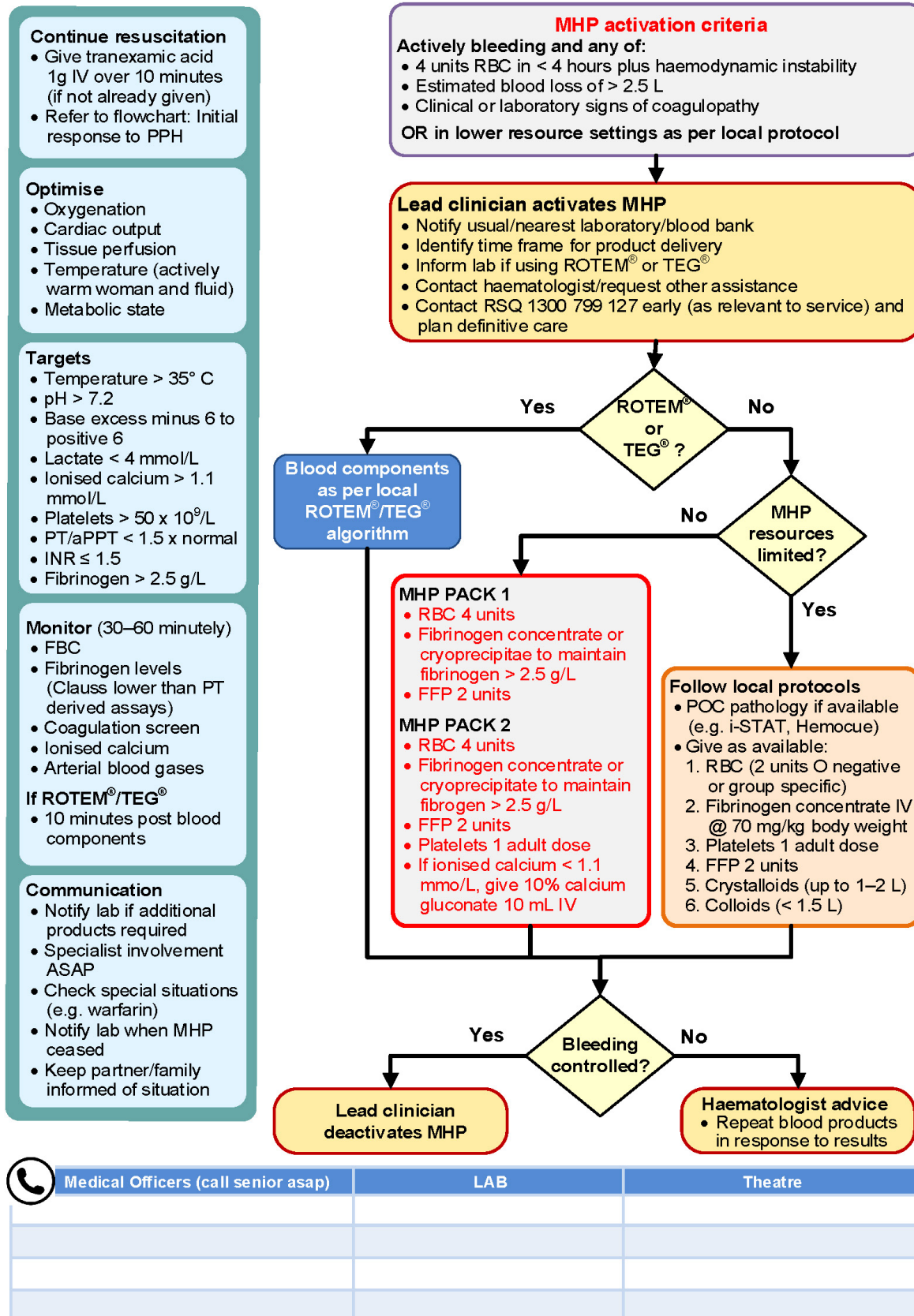


TEM/TEG Guide 17+
A step-wise guide to TEM/TEG
Josh Case
Designed for iPad
★★★★★ 5.0 • 7 Ratings
Free

Screenshots [iPad](#) [iPhone](#)



Massive haemorrhage protocol (MHP)



Queensland Clinical Guidelines: Massive haemorrhage protocol (MHP). Flowchart version: F18.1-2-V4-R23

APPT: activated partial thromboplastin time, ASAP: as soon as possible, FBC: full blood count, FFP: fresh frozen plasma, INR: international normalised ratio, IV: intravenous, MHP: massive haemorrhage protocol, POC: point of care, PPH: postpartum haemorrhage PT: prothrombin time, RBC: red blood cells, ROTEM®/TEG®: types of blood clotting analysers, <: less than, >: greater than



Acronyms and abbreviations

Term	Definition
VHA	Viscoelastic haemostatic assay
TXA	Tranexamic acid
ROTEM	Rotational thromboelastometry
TEG	Thromboelastography
TEM	Thromboelastometry
CFT	Prolonged clot formation time
FFP	Fresh frozen plasma
NP	Nasal prongs

References

1. Calatzis, A., Görlinger, K., Spannagl, M. and Vorweg, M., (2016). *ROTEM® Analysis Targeted Treatment of Acute Haemostatic Disorder*. [online] ttuhsc.edu. Available at: <<https://bit.ly/3wYtsN6>> [Accessed 26 July 2022].

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Visit csds.qld.edu.au/qte

Email CSDS-Admin@health.qld.gov.au

Phone [+61 7 3646 6500](tel:+61736466500)

