CRITICAL BLEEDING PROTOCOL

POWH/RHW

Principles of Critical Bleeding Management

- Early recognition of blood loss
- Maintenance of tissue perfusion and oxygenation by restoration of blood volume and haemoglobin
- Arrest bleeding with surgical or radiological intervention
- Judicious use of blood component therapy to correct coagulopathy

Criteria for identifying patients at risk massive haemorrhage

- Patients likely to need replacement entire blood volume in 24 hours
- Patients with at least 1 of severe thoracic, abdominal or pelvic injury
- Patients who are receiving or have received transfusion of 4 units of RBC in < 4 hrs
- ***In addition to haemodynamic instability and/or ongoing blood loss***

Damage control during resuscitation

- Early consultant input to arrest haemorrhage and minimize microvascular bleeding & coagulopathy
- Surgical assessment/intervention; tourniquet; packing; compression
- Aggressive fluid resuscitation; active warming measures to try and avoid hypothermia & acidosis

Activation of Critical Bleeding Protocol (CBP)

- Senior medical officer notifies Blood bank directly (**ext 29145**), verifying whether it is **ROTEM** guided or **Non- ROTEM**
- Blood Bank may also identify a patient and ask the team if they want to activate the CBP
- If patient has no current group and hold, group O blood will be issued until pateitnis cross matched.
- Blood component therapy is then administered according to monitoring and and the CBP
- Component therapy may be altered by consultant in charge, particularly if initial values abnormal, clinical conditions (e.g. liver failure) suggest coagulopathic risk or patient received blood products prior to arriving POWH
- Decision to ceae CBP is that of senior medical officer in charge and must be communicated directly to Blood Bank

ROTEM Guided

- ***An 'Authority to Issue Blood Products' (pink form)'*** for all products requested must be sent with staff member collecting products
- PRBC requested based on estimated loss and HB from blood gas machine and formal FBC
- Refer to Cardiac/Vascular ROTEM algorithm OR
- Refer to General surgical/Obstetric Haemorrhage ROTEM Algorithm
- Ensure ROTEM trace is repeated 10 minutes after each intervention and results recored in notes
- Multiplate to be ordered and interpreted according to POWH Multiplate schedule

NON-ROTEM Guided

- ***An 'Authority to Issue Blood Products' (pink form)'*** for all products requested must be sent with staff member collecting products
- If bleeding continues, alternate Pack 1 and Pack 2
- **PACK 1:** 4 units PRBC; 4 units ELP; 3 units apheresis cryoprecipitate
- **PACK 2:** 4 units PRBC; 4 units ELP; 1 bag platelets

Additional suggested if:

- **Platelets** if count < 50 or < 100 with head injury
- **Cryoprecipitate** if fibrinogen < 1.5 g/dL
- **ELP** if PT, APTT prolonged & provided fibrinogen > 1
- **PRBC** if Hb < 80 g/L and ongoing blood loss
- **Calcium chloride** if ionised calcium < 1.1 mmol/L

Monitoring

- FBC, EUC, LFTs, ionised calcium, PT/APTT, Fibrinogen, BG, Group/crossmatch initially
- FBC, EUC, PT/APTT, fibrinogen, BG every 60 mins during resuscitation
- Ionised calcium should also be monitored

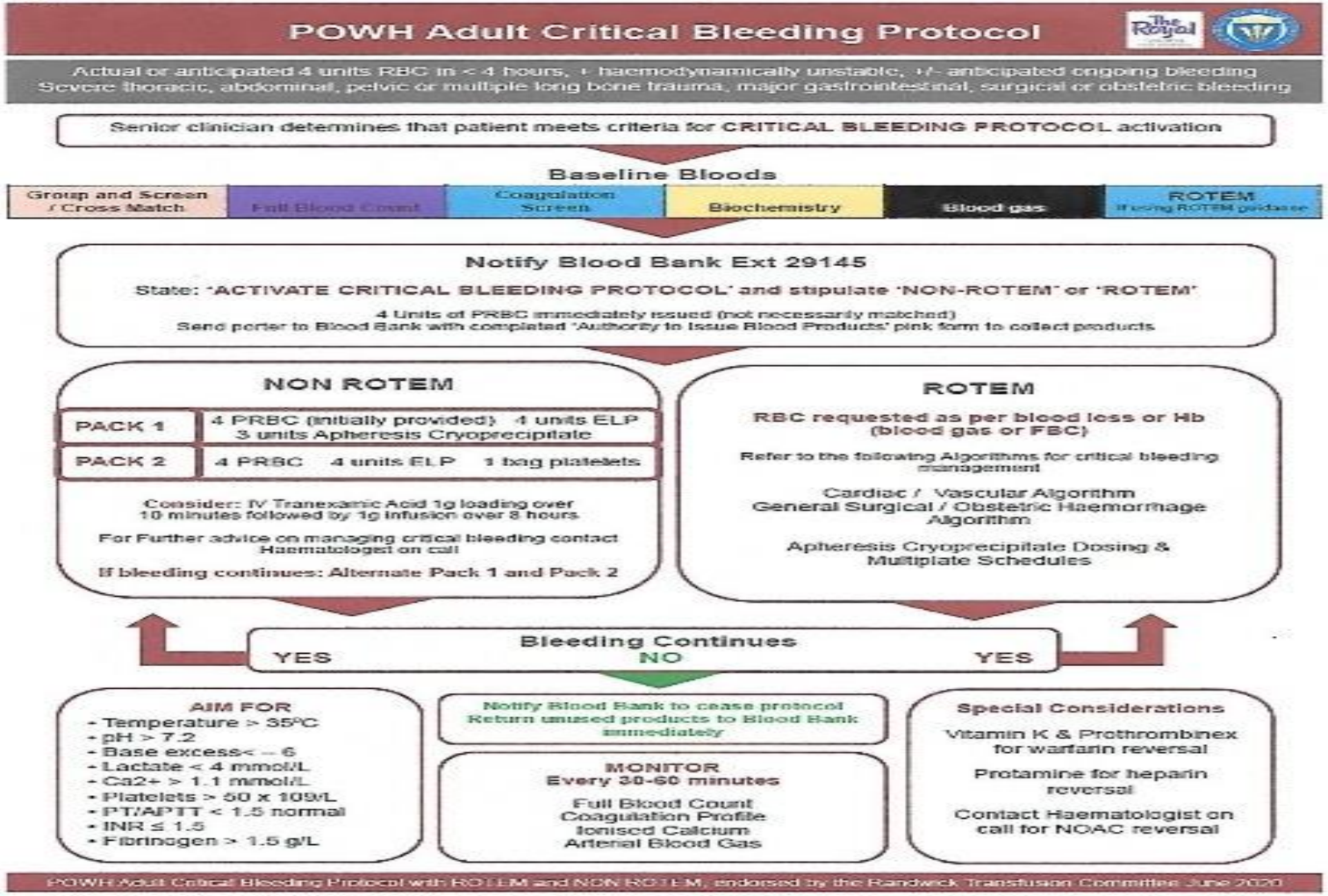
Tranexamic acid

- In trauma patients with significant haemorrhage consider Tranexamic acid – 1g IV loading dose over 10 mins; followed by 1g IV infusion over 8 hrs
- Also safe and effective in postpartum haemorrhage
- 500mg/5ml ampoules available in pharmacy and Afterhours Drug Room.

Recombinant Activated Factor (rFVIIa)

- No randomised trial has demonstrated survival advantage in life-threatening bleeding
- Patient pH should be > 7.2 for procoagulant effect
- Every effort should be made to correct surgical bleeding
- Authorisation required by consultant Haematologist on-call
- Dose: 90 microg/kg rounded to nearest whole vial, given as IV bolus over 2 to 5 mins. A second dose may be required 2 to 4 hours later
- Kept in Blood Bank

Appendix 1: POWH Adult Critical Bleeding Protocol



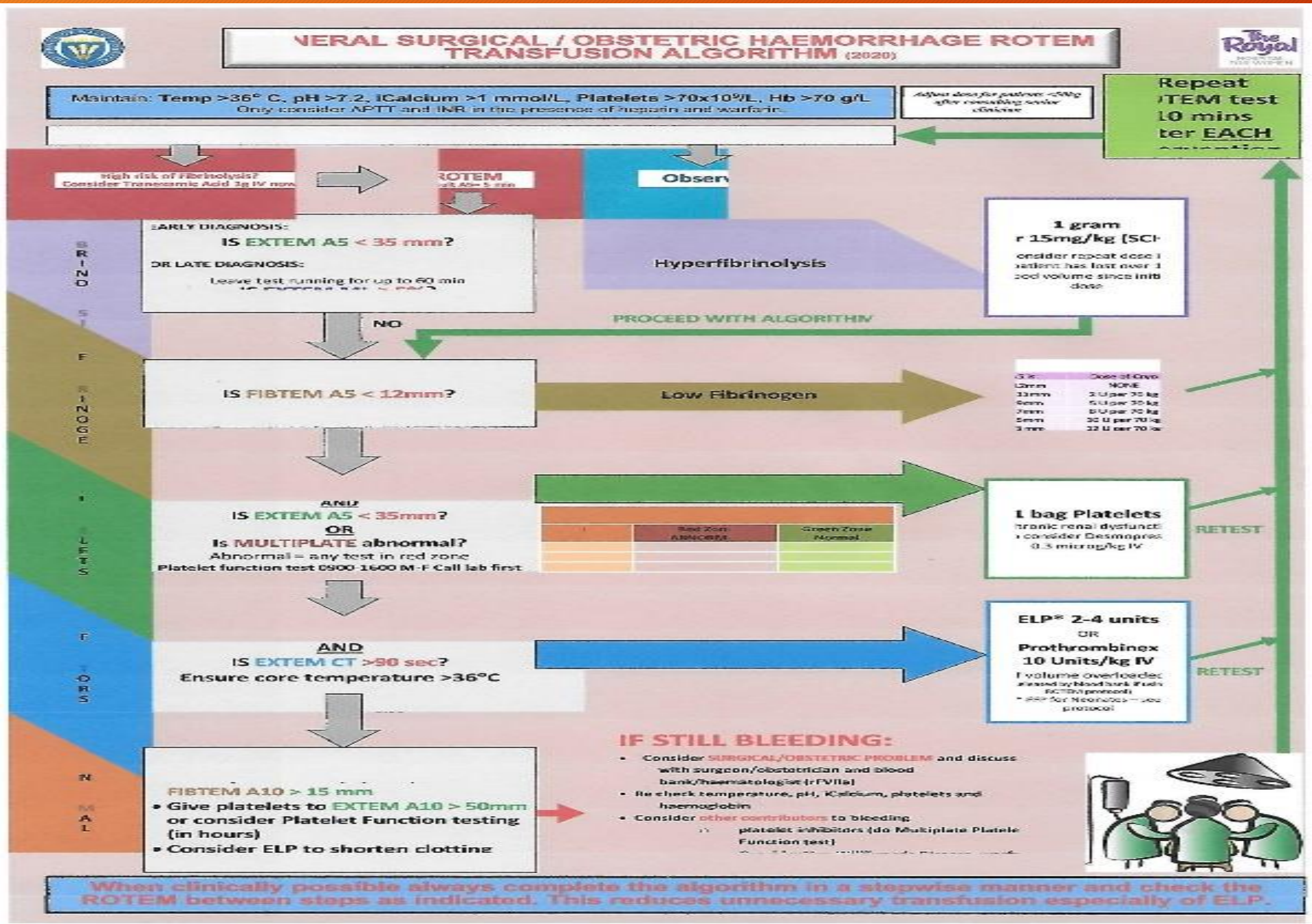
Appendix 2: Anticoagulation Table

Anticoagulation Table [9]

Anticoagulation monitoring and management in critical bleeding

Drug	Conventional coagulation tests		Reversible	Recommendations *Contact haematology for further discussion*				
	Present	Drug level						
Vitamin K antagonist (VKA) Warfarin	INR	INR	Yes	*Prothrombinex-VF (mg/kg)^ (+Vit K)*				
				Initial INR	1.5–2.5	2.6–3.5	3.6–10.0	> 10.0
				Target INR 0.9–1.3	30	35	50	50
				Target INR 1.4–2.0	15	25	30	40
Unfractionated heparin (UFH)	APTT	APTT	Yes	*Protamine* • Maximum dose 50 mg • 1 mg per 100 units of UFH intravenously, at a maximum rate of 5 mg/minute (Where the amount of UFH to be reversed = cumulative dose in preceding 3hrs)				
Low molecular weight heparin (LMWH) Enoxaparin	+/- APTT	antiXa assay	Partial (60–75%)	*Protamine* • Maximum dose 50 mg, maximum rate 5 mg/min • < 8 hours post dose • 1 mg per 100 units enoxaparin intravenously • 8–12 hours post dose • 0.5 mg per 100 units enoxaparin intravenously				
Dabigatran	APTT and TT	Dilute TT	Yes	*Idarucizumab* (stored in Blood Bank) Refer to SESLHDPR/571 Prescribing Protocol • 5 g intravenously (2x2.5g/50mL), by bolus injection or infusion				
Rivaroxaban	PT*	Modified antiXa assay specific for Rivaroxaban	No	Consider pro-haemostatic agents: PCC, FEIBA				
Apixaban	+/- PT*	Modified antiXa assay specific for Apixaban	No	Consider pro-haemostatic agents: PCC, FEIBA				

^If Prothrombinex-VF is not available, use Extended Life Plasma (ELP) 10-15mL/kg for warfarin reversal.
^Vitamin K should be co administered
*PT sensitivity to DOACs will vary according to local laboratory reagents. In some laboratories the PT will be insensitive to DOACs.


VERAL SURGICAL / OBSTETRIC HAEMORRHAGE ROTEM TRANSFUSION ALGORITHM (2020)
Maintain: Temp >36° C, pH >7.2, iCalcium >1 mmol/L, Platelets >70x10⁹/L, Hb >70 g/L
Only consider APTT and INR in the presence of heparin and warfarin
Repeat ROTEM test 30 mins after EACH
High risk of Fibrinolysis? Consider Tranexamic Acid 1g IV now
ROTEM
Observ
EARLY DIAGNOSIS:
IS EXTEM A5 < 35 mm?
OR LATE DIAGNOSIS:
Leave test running for up to 60 min
Hyperfibrinolysis
1 gram
r 15mg/kg [SCI
NO
PROCEED WITH ALGORITHM
IS FIBTEM A5 < 12mm?
Low Fibrinogen
AND/
IS EXTEM A5 < 35mm?
OR
Is MULTIPLATE abnormal?
Abnormal = any test in red zone
Platelet function test 0900-1600 M-F Call lab first
Red Zone Abnormal
Green Zone Normal
1 bag Platelets
RETEST
AND
IS EXTEM CT >90 sec?
Ensure core temperature >36°C
ELP* 2-4 units
OR
Prothrombinex 10 Units/kg IV
RETEST
IF STILL BLEEDING:
Consider SURGICAL/OBSTETRIC PROBLEM and discuss with surgeon/obstetrician and blood bank/haematologist (rFVIIa)
Re check temperature, pH, iCalcium, platelets and haemoglobin
Consider other contributors to bleeding
platelet inhibitors (do Multiplate Platelet Function test)
FIBTEM A10 > 15 mm
Give platelets to EXTEM A10 > 50mm or consider Platelet Function testing (in hours)
Consider ELP to shorten clotting
When clinically possible always complete the algorithm in a stepwise manner and check the ROTEM between steps as indicated. This reduces unnecessary transfusion especially of ELP.

CARDIAC/VASCULAR ROTEM TRANSFUSION ALGORITHM (2020)

Maintain: **Temp** >36° C, **pH** >7.2, **iCalcium** >1 mmol/L, **Platelets** >70x10⁹/L, **Hb** >70 g/L Only consider APTT and INR in the presence of heparin and warfarin

IS THERE CLINICALLY SIGNIFICANT BLEEDING?

YES

High risk of Fibrinolysis? Consider Tranexamic Acid 1g IV, if not already given

ROTEM Result ASAP-Urgent

NO

Observe

Adjust dose of blood products for patients with pre-existing coagulation disorder

Repeat ROTEM test 10 mins after EACH Intervention

HEPARIN

IS INTEM CT > 240 sec? AND IS HEPTEM CT < 205 sec?

YES → Heparin effect if differ by more than 20% → **Protamine IV** 0.5-1 mg/kg → RETEST

NO

ARE INTEM & HEPTEM CT both > 205 sec?

YES → Possible excess protamine (can impair platelet function) → **Re-test in 10 min** → RETEST

NO

IF SEVERE BLEEDING, PROCEED WITH ALGORITHM

FIBRINOGEN

IS FIBTEM A5 < 12mm?

YES → Low Fibrinogen → **Apheresis Cryoprecipitate** → RETEST

A5 FIBTEM	Dose of Cryo
> 12mm	NONE
10-11mm	2 U per 70 kg
8-9mm	5 U per 70 kg
6-7mm	8 U per 70 kg
4-5mm	10 U per 70 kg
0-3 mm	12 U per 70 kg

If bleeding despite adequate fibrinogen and platelets consider TXA

NO

PLATELETS

NORMAL FIBTEM A5 ≥ 12mm ☑ AND IS EXTEM A5 < 35mm? OR Is MULTIPLATE abnormal?

Abnormal = any test in red zone

Platelet function test 0900-1600 M-F Call lab first

YES → Poor Platelet Contribution → **1 Pool Platelets** → RETEST

If chronic renal dysfunction also consider Desmopressin 0.3mcg/kg IV

MULTIPLATE – check 15min post protamine

Hang Gelber x2 blue top tubes to lab – ext. 29073

Test	Red Zone ABNORMAL	Green Zone Normal
ADP	<40	>40
ASPI	<20	>20
TRAP	<77	>77

NO

FACTORS

NORMAL FIBTEM A5 ≥ 12mm ☑ AND IS EXTEM CT > 90 sec? Ensure core temperature >36°C

YES → Low Coagulation Factors → **ELP* 2-4 units** OR **Prothrombinex 25 Units/kg IV** → RETEST

If volume overloaded (Patient to have blood taken using ROTEM protocol)

* FFP for Neonates – see protocol

NO

FIBRINOLYSIS

CLOT LYSIS INDEX IS EXTEM ML ≥ 5 %?

Leave test running for 20 to 40 min

Clot should be stable for 1 hour, not tapering away

YES → Hyperfibrinolysis → **Additional Tranexamic acid 1 g IV** → RETEST

Adjust subsequent dose for renal dysfunction

NO

NORMAL

STILL BLEEDING? Make stronger clot:

- Give Cryo to FIBTEM A10 > 15mm
- Give platelets to EXTEM A10 > 5 mm or consider Platelet Function testing (in hours)
- Consider ELP to shorten clotting time to EXTEM CT < 80 sec

IF STILL BLEEDING:

- Consider SURGICAL PROBLEM and discuss with surgeon and blood bank/haematologist (rFVIIa)
- Re check temperature, pH, iCalcium, platelets and haemoglobin
- Consider other contributors to bleeding
  - platelet inhibitors (do Multiplate Platelet Function test)
  - Consider Von Willibrands Disease, warfarin (INR), dexane etc.

When clinically possible always complete the algorithm in a stepwise manner and check the ROTEM between steps as indicated. This reduces unnecessary transfusion especially of ELP.