PRE-OP

Consider:
1. Likely length of CPB-run
2. Platelet inhibition % (ADP/ASA)
3. Volume tolerance (LVEF < 30%)
4. Re-do surgery or dissection?
5. Recent antiplatlelet medication?
6. Baseline clotting abnormalities, especially hypofibrinoginaemia

Platelet Mapping:
Compares 4 graphs:
1. Fibrin effect (Activator-F)
2. ADP
3. AA
4. Citrated Kaolin TEG

Points to remember:
- Inhibition <35% is unlikely to increase bleeding risk
- Using % inhibition alone can be misleading if baseline TEG is abnormal
- Compare MA AA, MA ADP and MA-Fibrin together to fully assess degree of platelet dysfunction

REMEMBER:
1. An abnormal TEG in a patient who is not bleeding does not mandate therapy.
2. TEG interpretation is limited in:
   - DOAC therapy
   - vWF disorders
   - Hypothermia
   - Overlooks hypocalcaemia

REWARMING

Consider:
1. Length of CPB-run
2. Volume given on CPB (especially crystalloid)
3. Platelet inhibition % (ADP/ASA)
4. Volume tolerance (LVEF <30%)
5. Patient weight (<50kg?)

R-Time > 10

- Consider 4 units FFP (OR 10ml/kg if low body weight) once off CPB

MA < 52

Consider ordering 1 unit pooled platelets taking into account:

- Pre-op platelet inhibition
- Antiplatelets in last 7 days
- CPB duration > 90mins
- CABG graft latency

POST-PROTAMINE

Compare:
Heparinase TEG + Kaolin (plain) TEG
>10% difference suggests ongoing heparin effect

Give 50mg protamine

R-Time > 10 and bleeding

- Give 4 units FFP (10ml/kg if low body weight)

CFF < 17 *(or a-angle <59)* **and bleeding**

- Give cryoprecipitate 1-2 units
- Consider fibrinogen concentrate 2-4g (If unable to tolerate volume or RV impairment)

MA < 52 and bleeding
- Give 1 unit pooled platelets

Fibrinolysis > 3% (Ly30)
- Give further 1g TXA

ONGOING BLEEDING

(AFTER "1ST ROUND")

Compare:
Heparinase TEG + Kaolin (plain) TEG
>10% difference suggests ongoing heparin effect

Give 50mg protamine

R-Time > 10 and bleeding

- Give 4 units FFP (10ml/kg if low body weight)

- Consider prothrombin complex concentrate (PCC) 1000-2000 units as may now be unable to tolerate volume

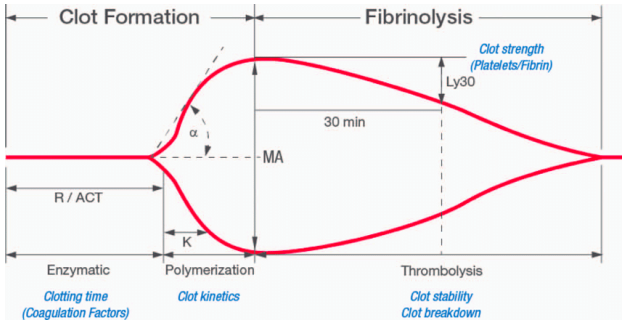
CFF < 17 *(or a-angle <59)* **and bleeding**

- Give fibrinogen concentrate 2-4g
- Consider further cryoprecipitate 1-2units if ongoing volume loss

MA < 52 and bleeding
- Give 1-2 units pooled platelets

Fibrinolysis > 3% (Ly30)
- Give further 1g TXA

TEG INTERPRETATION



R-Time

Broadly corresponds to “clotting factor” activity

Normal value < 8 mins. Consider treating >10

Alpha-angle

Describes the “kinetics” of clot proliferation.

Normal value: Angle > 59 degrees

Maximum amplitude (MA)

Describes the “maximal clot” size and is determined by platelet and fibrinogen interaction. Normal value: MA >55

Lysis Time (Ly30)

Describes clot lysis at 30 minutes. >3% is significant

Platelet Mapping

AA - % inhibition to aspirin

ADP - % inhibition to clopidogrel / prasugrel

BLEEDING IN CARDIAC SURGERY PROTOCOL

Cardiac surgery is the largest user of blood and blood products within all surgical specialities. All cases are managed by a consultant cardiothoracic anaesthetist with access to near-patient TEG, platelet mapping and arterial blood gas analysis in theatre. Cardiac surgical patients may have pre-existing or newly acquired cardiac dysfunction predisposing them to transfusion associated circulatory overload (TACO). In these patients factor concentrate (PCC or FCC) may be requested ahead of or alongside blood products to reduce this risk. High risk cases likely to require massive transfusion include re-do procedures, aortic root replacement, aortic dissection repair, cases involving deep hypothermic cardiac arrest (DHCA) and prolonged cardiopulmonary bypass times.

Antithrombin III concentrate

Used in patients in whom ACT > 400sec has **not** been achieved following heparin administration as an alternative to a large volume FFP transfusion which has been proven to be less efficacious. More likely if on pre-op heparin infusion or liver impairment.

Usual dose = 1000 units

Prothrombin Complex Concentrate (PCC)

Used in patients who have an ongoing clotting factor deficiency (TEG R-Time >12) who can no longer tolerate large volume transfusion.

“4x factor” concentrate (Octoplex) is stocked at Derriford containing Protein C+S, Factor II, VII, IX and X

1x vial contains 500units and is reconstituted into 50mls with sterile water (provided)

Dose = 1000 - 2000 units (2-4x vials)

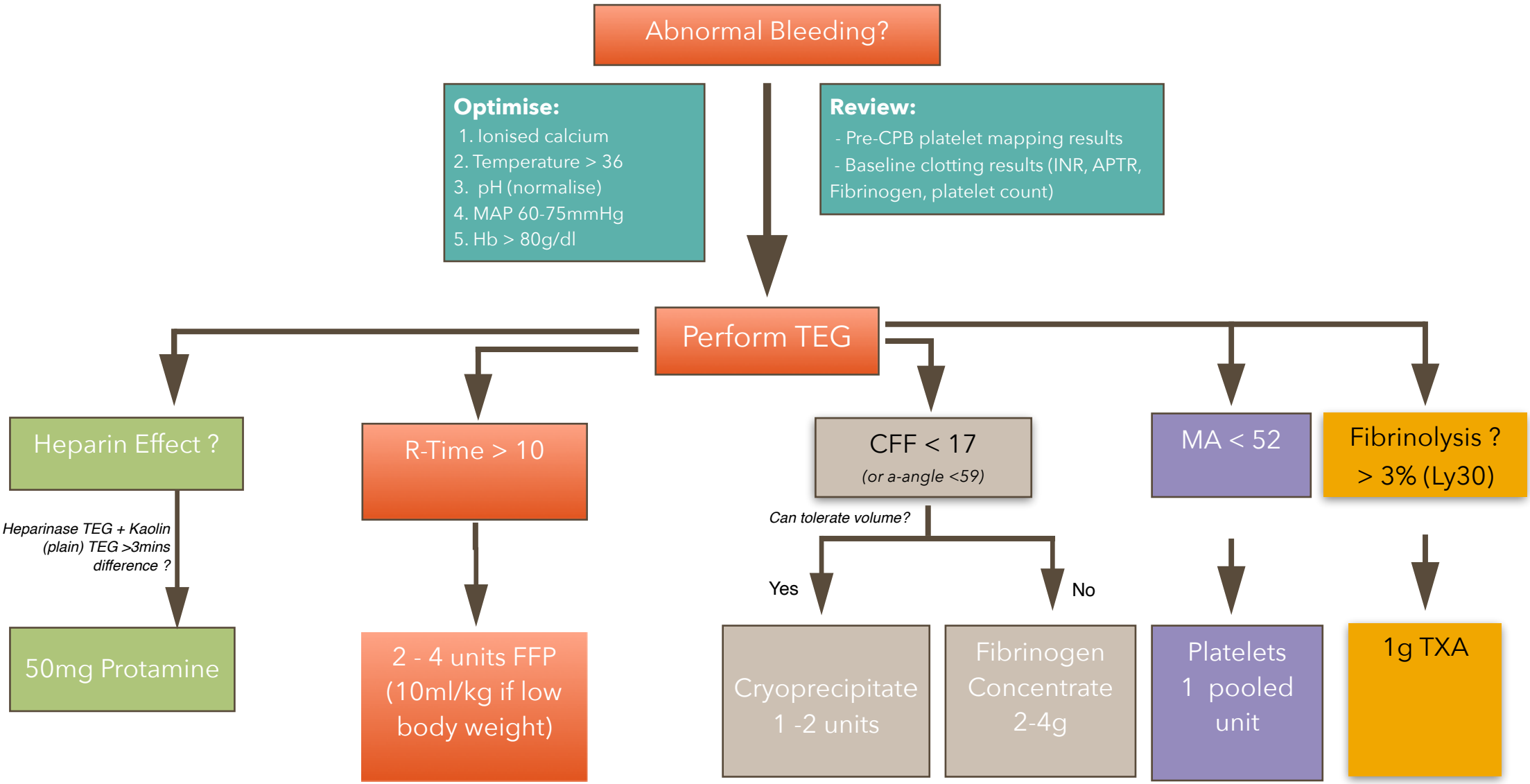
Fibrinogen Concentrate (Fibryga)

Used in patients with acquired hypofibrinogenaemia (TEG-FF < 18) as an alternative or adjunct to cryoprecipitate.

1x vial contains 1g of fibrinogen concentrate and is reconstituted in 50mls of sterile water. (Once reconstituted must be used within 24 hrs)

Usual dose = 2 - 4g *(70mg/kg if fibrinogen level unknown)*

BLEEDING IN CARDIAC SURGERY PROTOCOL



Factor concentrate considerations:

Ongoing haemorrhage will usually necessitate volume replacement in the form of FFP, platelets and cryoprecipitate (as above)
Bleeding due to coagulopathy may require correction of factor deficiencies without the need for volume replacement.
Patients with pre-existing LV impairment, low body weight or post-CPB RV (or LV) impairment may benefit from factor replacement to avoid transfusion associated circulatory overload. In this group PCC or fibrinogen concentrate can be used as a low-volume alternative to correct coagulopathy. FC dose = 2-4g, PCC dose = 1000-2000units
Remember:

The treatments above should be administered in parallel.
Formal FBC and clotting profile should be sent alongside discussion with the on call haematologist if bleeding is ongoing after the second “round” of blood products.