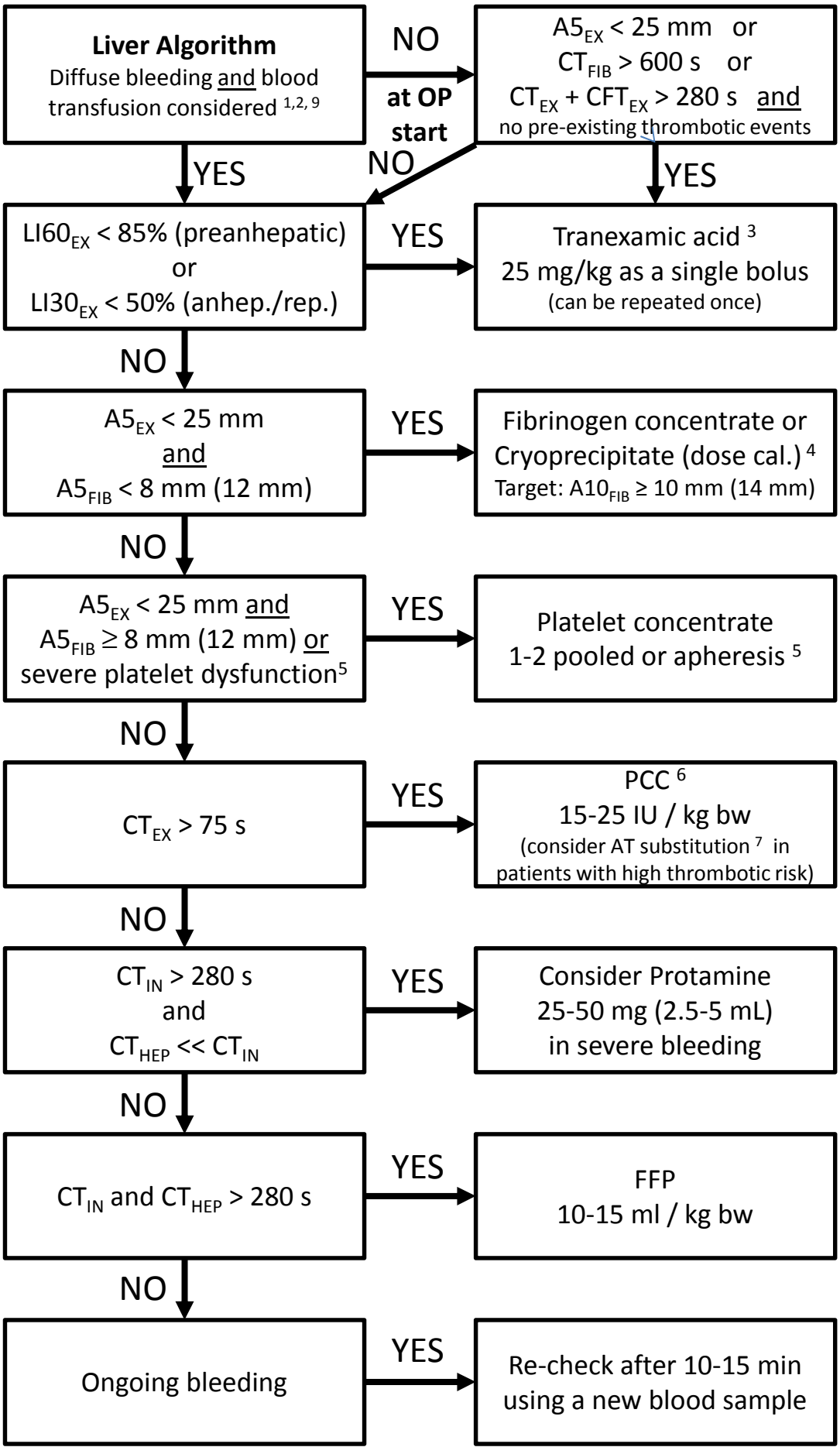
Liver Algorithm
Diffuse bleeding and blood transfusion considered [1,2,9]
NO
at OP start
A5EX < 25 mm or
CTFIB > 600 s or
CTEX + CFTEX > 280 s and
no pre-existing thrombotic events
YES
NO
YES
LI60EX < 85% (preanhepatic)
or
LI30EX < 50% (anhep./rep.)
YES
Tranexamic acid [3]
25 mg/kg as a single bolus
(can be repeated once)
NO
A5EX < 25 mm
and
A5FIB < 8 mm (12 mm)
YES
Fibrinogen concentrate or
Cryoprecipitate (dose cal.) [4]
Target: A10FIB ≥ 10 mm (14 mm)
NO
A5EX < 25 mm and
A5FIB ≥ 8 mm (12 mm) or
severe platelet dysfunction[5]
YES
Platelet concentrate
1-2 pooled or apheresis [5]
NO
CTEX > 75 s
YES
PCC [6]
15-25 IU / kg bw
(consider AT substitution [7] in
patients with high thrombotic risk)
NO
CTIN > 280 s
and
CTHEP << CTIN
YES
Consider Protamine
25-50 mg (2.5-5 mL)
in severe bleeding
NO
CTIN and CTHEP > 280 s
YES
FFP
10-15 ml / kg bw
NO
Ongoing bleeding
YES
Re-check after 10-15 min
using a new blood sample

Liver Algorithm - Footnotes

- **[1] Timing of ROTEM-analysis:**
  - Baseline, re-check after 60 min or in case of bleeding during pre-anhepatic phase, 5-10 min after cava clamping (early anhepatic phase), 30-45 mm after cava clamping (late anhepatic phase), 5-10 min after reperfusion, 30-45 min after reperfusion, skin closure, and always in case of diffuse bleeding as well as 10-15 min after a specific hemostatic intervention
- **[2] Check basic conditions:**
  - Temp. > 35°C; pH < 7.2; Ca^{++} > 1 mmol/L
  - Hb ≥ 7 g/dL
- **[3] Antifibrinolytic therapy:**
  - EACA can be used instead of TXA (based on local practice)
  - Dirkmann et al. Anesth Analg. 2014
  - CT_{FIB} > 600 s represents a flat-line in FIBTEM
  - Increased fibrinolysis at/after reperfusion without diffuse bleeding may be self-limiting; re-check ROTEM analysis after ML reached 15% and consider avoidance of TXA treatment
- **[4] Fibrinogen dose calculation (stepwise approach):**

Targeted increase in $A5_{FIB}$ (mm)	Fibrinogen dose (mg/ kg bw)	Fibrinogen concentr. (mL / kg bw)	Cryoprecipitate (mL / kg bw)
2	12.5	0.6 [1 g per 80 kg]	1 [5 U per 80 kg]
4	25	1.2 [2 g per 80 kg]	2 [10 U per 80 kg]
6	37.5	1.9 [3 g per 80 kg]	3 [15 U per 80 kg]
8	50	2.5 [4 g per 80 kg]	4 [20 U per 80 kg]
10	62.5	3.1 [5 g per 80 kg]	5 [25 U per 80 kg]
12	75	3.8 [6 g per 80 kg]	6 [30 U per 80 kg]

  - Fibrinogen dose (g) = targeted increase in $A5_{FIB}$ (mm) x body weight (kg) / 160
  - Correction factor (140-160 mm kg g^{-1}) depends on the actual plasma volume
  - Reached increase can be lower than calculated increase in severe bleeding
  - 10 U Cryoprecipitate ≈ 2 g Fibrinogen concentrate
- **[5] Platelet concentrate (PC) transfusion:**
  - Cave: Platelet transfusion is associated with increased mortality in liver transplantation!
  - Consider compensation by increased $A5_{FIB} \geq 14$ mm
  - Check platelet function with ROTEM *platelet* or Multiplate (ADPtem and TRAPtem)
  - $A5_{EX}$ 16-25 mm or ADPtem < 30 Ohm x min: 1 pooled or apheresis PC
  - $A5_{EX} \leq 15$ mm or ADPtem < 30 Ohm x min (and TRAPtem < 50 Ohm x min): 2 pooled or apheresis PC
  - $A5_{EX} \leq 5$ mm: Platelet concentrate + fibrinogen
- **[6] If Prothrombin-Complex-Concentrate (PCC) is not available:**
  - 10-15 mL FFP /kg bw or
  - 45-90 µg rFVIIa /kg bw (if $A5_{EX}$ and $A5_{FIB}$ are ok but FFP is not effective)
- **[7] AT substitution:**
  - Consider AT substitution in patients with an increased risk of thrombosis (e.g., PBC, Budd-Chiari-Syndrome, portal vein thrombosis, malignancies) and/or known pre-existing severe AT deficiency
- **[8] Protamine:**
  - Endogenous heparin effect after liver graft reperfusion usually is self-limiting and does not require reversal by protamine. However, consider protamine administration in severe bleeding.
- **[9] Simultaneous interventions:**
  - Maximal three interventions at the same time (in first analysis and severe bleeding)
  - Maximal two interventions at the same time (in second analysis and moderate to severe bleeding)
  - Only one intervention at the same time (in second or later analysis and mild to moderate bleeding)

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