

Platelet transfusion support

in

daily clinical practice

HICC-Workshop, St. Gallen, September 2007

Platelet transfusion

- **technology**
- **strategy**
- **refractoriness**
- **contraindications**

Case 1: 34-year-old female patient

- **gravida 2, para 5**
- **38 weeks and 2 days gestation
in early labor**
- **platelets 57,000/ μ l**
- **no signs of bleeding**
- **management?**

Case 2: 64-year-old male patient

- **acute leukemia**
- **body temperature: 36.8°C,
petechial bleeding**
- **platelets 16,000/ μ l**
- **requires suprapubic cystostomy**
- **management?**

Case 3: 28-year-old male patient

- polytraumatic patient
- massive blood loss > 3l/h
- coagulopathy
- platelets 26,000/ μ l
- management?

Case 4: 45-year-old female patient

- **pulmonary embolism, stage IV
requiring surgical thrombectomy**
- **postoperative septicemia**
- **renal failure, CVVH**
- **skin bleeding**
- **platelets 30,000/ μ l**

Case 5: 35-year-old male patient

- **hemolytic anemia, coombs negative
acute episode of TTP**
- **platelets 21,000/ μ l**
- **purpura and mucosal bleeding**
- **requires surgical intervention**
- **perioperative management?**

Platelet products

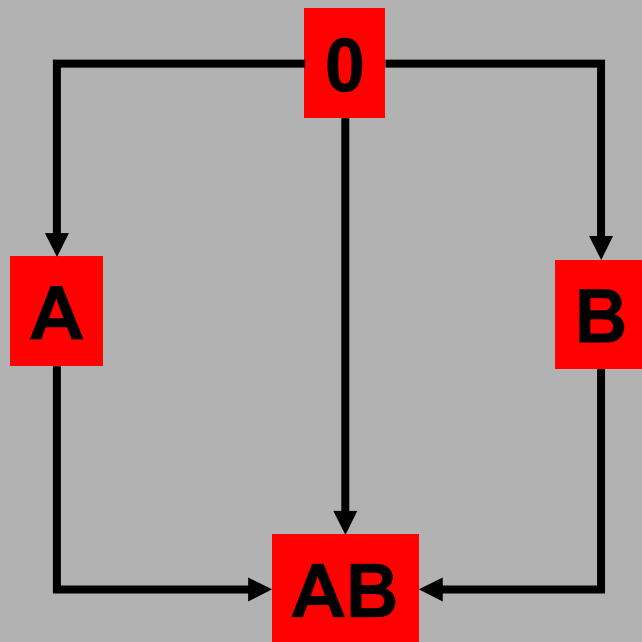
- **Apheresis platelets**
collection of platelets using
blood cell separators
→ single-donor platelets
- **Buffy coat platelets**
preparation of PRP from pooled
AB0/Rh-identical buffy coats (4 – 6)
→ multi-donor platelets

Platelet products

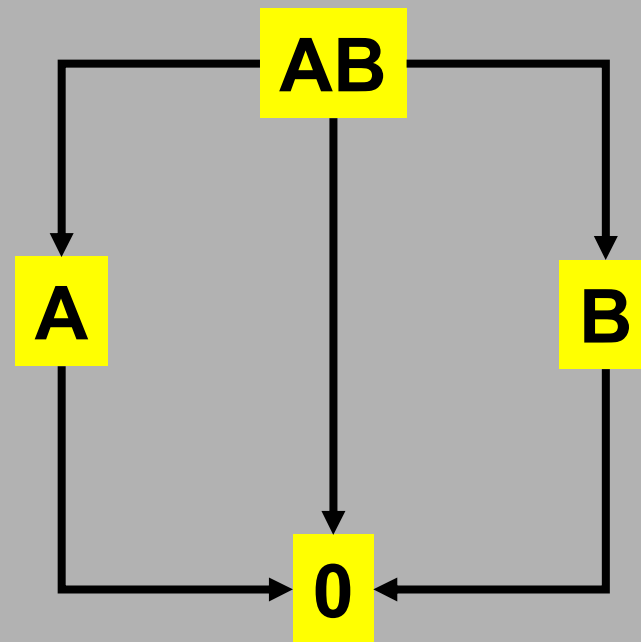
- **Minimal platelet count*:
200 x 10⁹ per unit**
- **storage at 20 – 24°C**
- **usable 5 days after collection**
- **all platelet products contain
plasma**

** according to Council of Europe standards*

Platelets: AB0 blood groups



platelet



plasma

Platelet transfusion: basics

- **AB0-identical, if not available:**
 - **AB0 **cell**-compatible**
 - **children (< 25 kg):**
AB0 **plasma-compatible**
- **rh-neg. girls and females in child-bearing age require rh-neg. transfusions. If not, Rh-prophylaxis within 48 h of transfusion**

Platelet transfusion

- **technology**
- **strategy**
- **refractoriness**
- **contraindications**

Platelet transfusion: aims

Platelets will be administered for ...

- **prevention of thrombocytopenic bleeding.**
→ **prophylactic indication**
- **treatment of thrombocytopenic bleeding.**
→ **therapeutic indication**

Transfusion trigger: definition

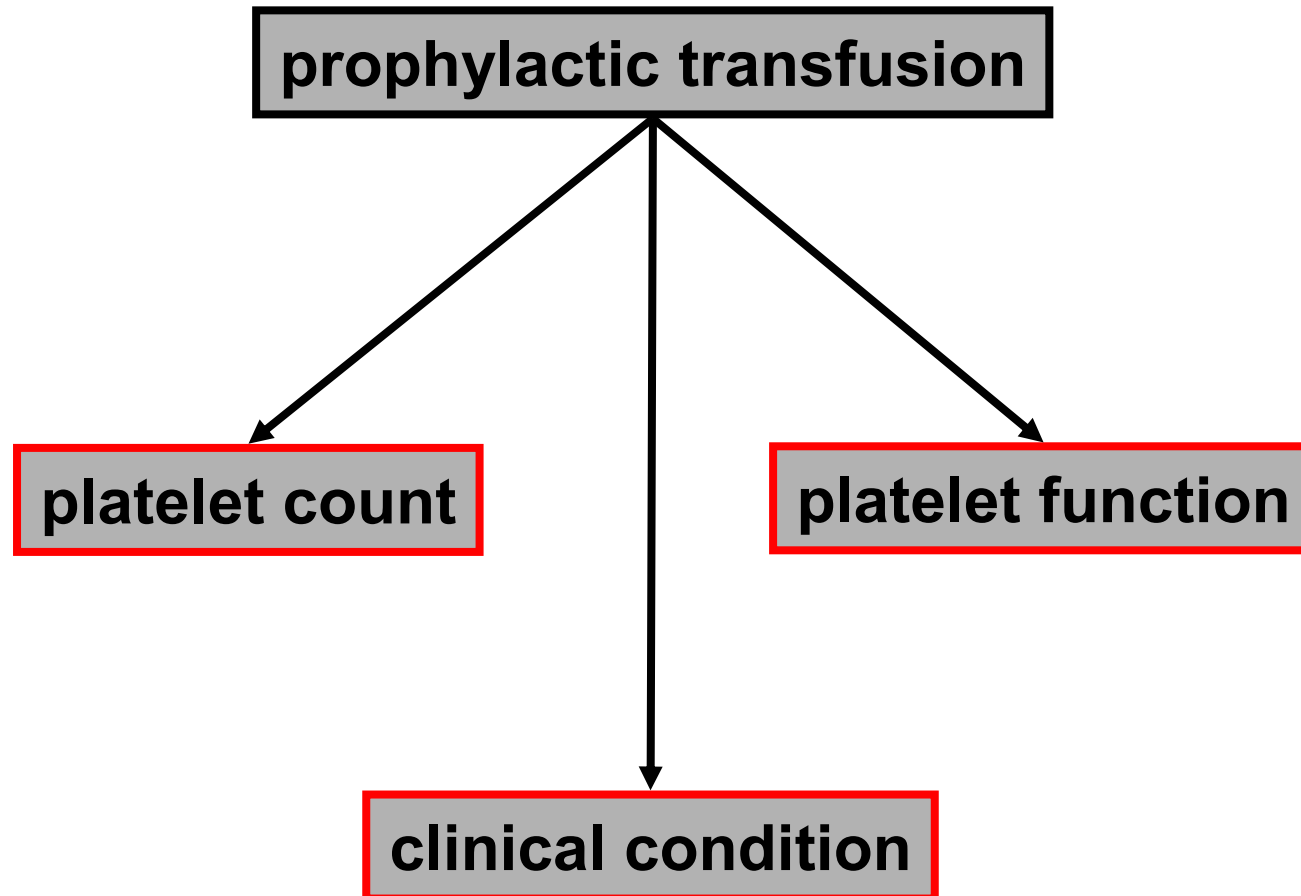
Definition:

The time point at which the use of platelets will significantly favour the clinical outcome.

Determination:

Definition of transfusion triggers require prospective diagnostic-management studies.

Platelet transfusions: trigger



Trigger: platelet count

Aim: prophylactic transfusion

Clin. condition: leukaemia, malignancies,
secondary
bone-marrow failure

Trigger: < 10.000/ μ l

Evidence level: 1A*

* Stanworth SJ et al. Cochrane Database Syst. Rev. 2004 Oct 18,(4):
CD004269. Review

Trigger: platelet count

Aim: prophylactic transfusion

Clin. condition: hematologic malignancies,
secondary
bone-marrow failure

Trigger: < 10.000/ μ l
< 20000/ μ l in the presence
of fever

Evidence level: 1A*

* Stanworth SJ et al. Cochrane Database Syst. Rev. 2004 Oct 18,(4):
CD004269. Review

Case 2: 64-year-old male patient

- **acute leukemia**
- **body temperature: 36.8°C,
petechial bleeding**
- **platelets 16,000/ μ l**
- **requires suprapubic cystostomy**
- **prophylactic platelet transfusion?**

Prophylactic platelet transfusion

Aim: prevention of bleeding
platelet count: $> 20,000/\mu\text{l}$

Trigger: platelet count:
 $< 10,000/\mu\text{l}$ or $20,000/\mu\text{l}$

Transfusion dose: 1 unit?, 2 or more units?
continuous infusion?

Platelet transfusion: dosing?

Data: metaanalysis* including 5 RCTs

Methods: High dose
($3.4 - 7.7 \times 10^{11}$ platelets, $\approx 2 - 4$ U)

versus

Low dose
($2.0 - 4.6 \times 10^{11}$ platelets, $\approx 1 - 2$ U)

Results: posttransfusion increment: $H > L$
transfusion intervall: $H > L$
bleeding complications: $H > L$

** Cid J and Lozano M. Lower or higher doses for prophylactic platelet transfusions: results of a meta-analysis of randomized controlled trials. Transfusion 2007; 47: 464 - 470*

Prophylactic platelet transfusion

Aim: prevention of bleeding
platelet count: $> 20,000/\mu\text{l}$

Trigger: platelet count:
 $< 10,000/\mu\text{l}$ or $20,000/\mu\text{l}$

Transfusion dose: 1 – 2 units according to
the actual platelet count

Case 1: 34-year-old female patient

- **gravida 2, para 5**
- **38 weeks and 2 days gestation
in early labor**
- **platelets 57,000/ μ l**
- **no signs of bleeding**
- **prophylactic platelet transfusion, yes/no?**

Case 1: 34-year-old female patient

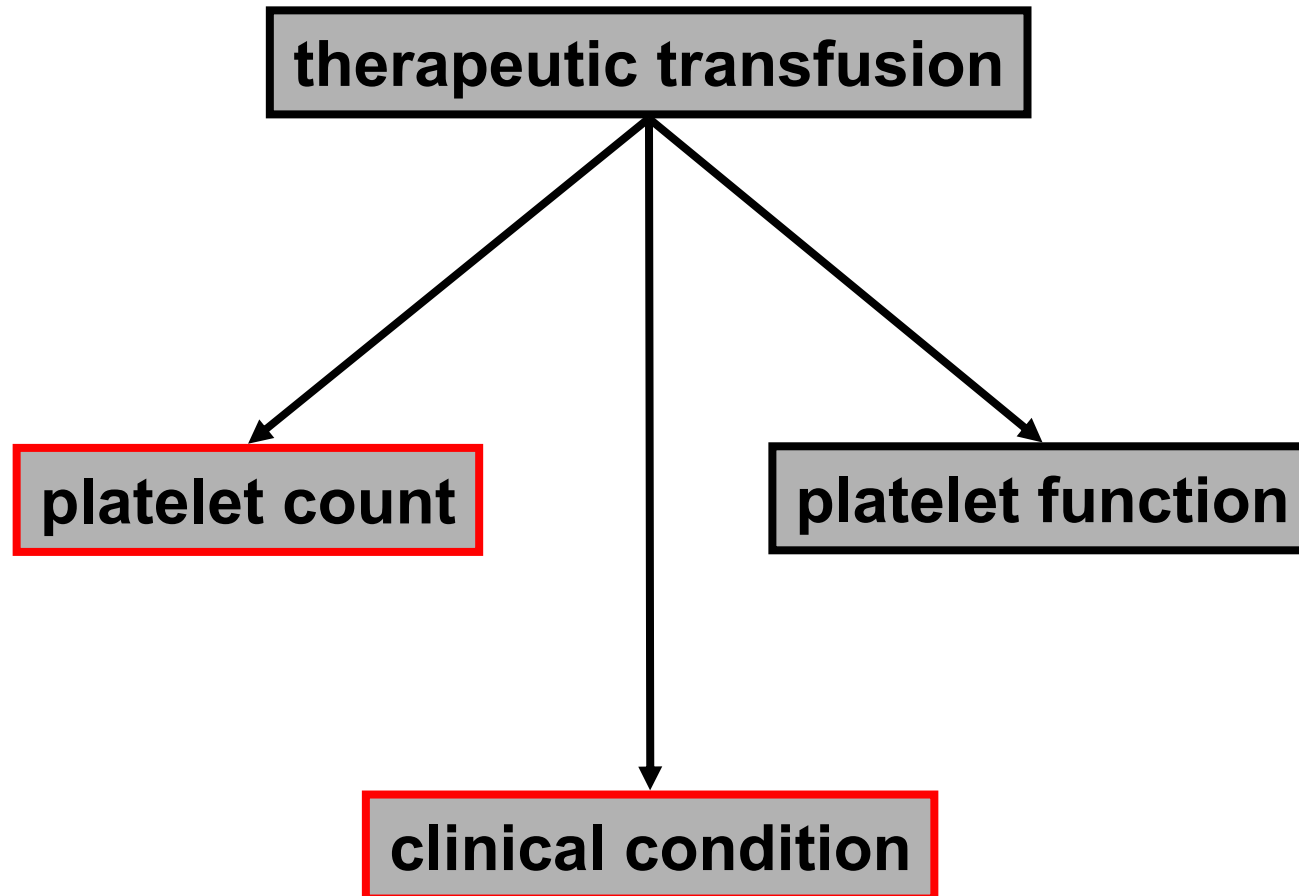
History:	normal platelet counts before pregnancy thrombocytopenia during 1st pregnancy
Clinical finding:	no signs of bleeding
Diagnosis:	gestational thrombocytopenia
Management:	delivery without platelet transfusions

Platelet transfusion: aims

Platelets will be administered for ...

- prevention of thrombocytopenic bleeding.
→ prophylactic indication
- treatment of thrombocytopenic bleeding.
→ **therapeutic indication**

Platelet transfusions: trigger



WHO-Grading*: Bleeding

Grad 0: no signs of bleeding

Grad 1: hematomas, purpura, mucosal bleeding

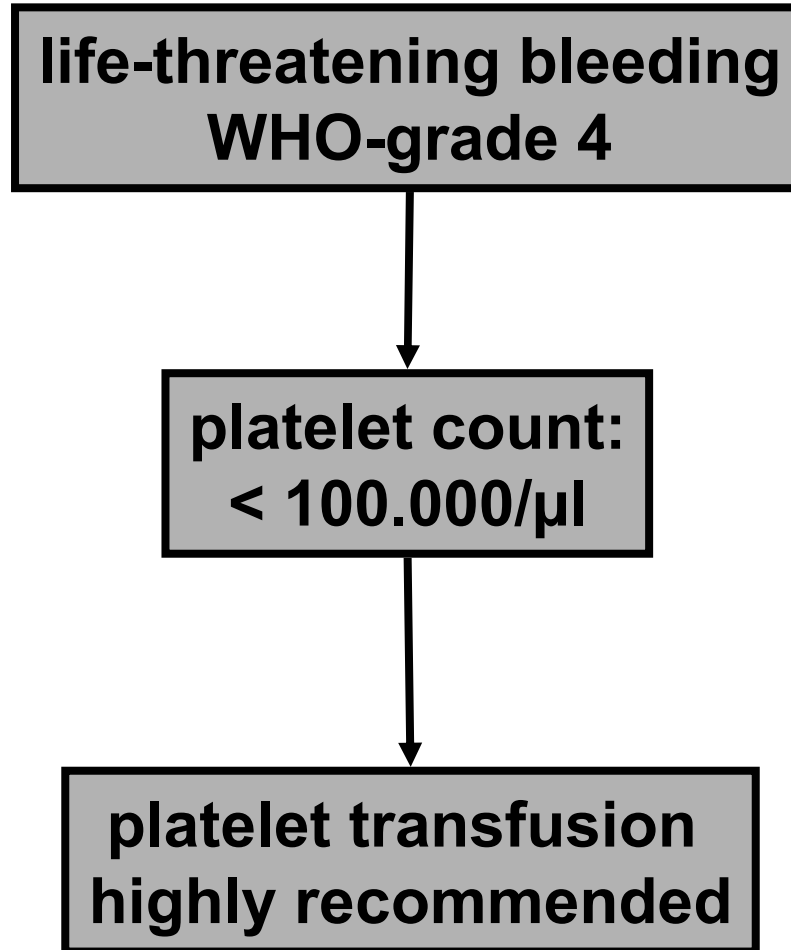
Grad 2: bleeding not requiring transfusions of red cells within 24 hours

Grad 3: bleeding requires transfusion of red cells within 24 hours

Grad 4: life-threatening hemorrhages

* *Miller AB, et al. Cancer 1981; 47: 207 – 214.*

Therapeutic platelet transfusions



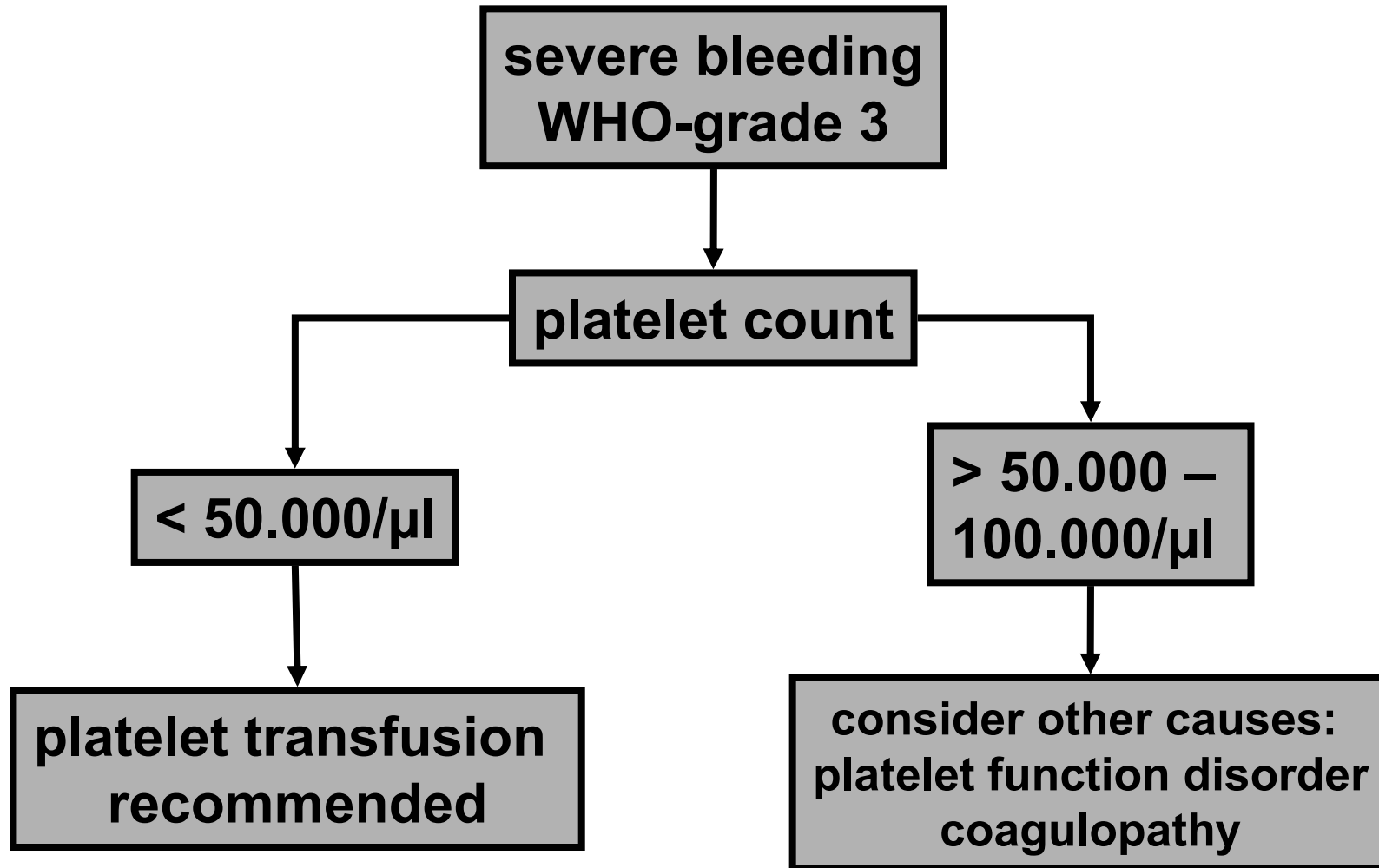
Case 3: 28-year-old male patient

- polytraumatic patient
- massive blood loss > 3l/h
- coagulopathy
- platelets 26,000/ μ l
- therapeutic platelet transfusion?
Yes, until stopp of bleeding

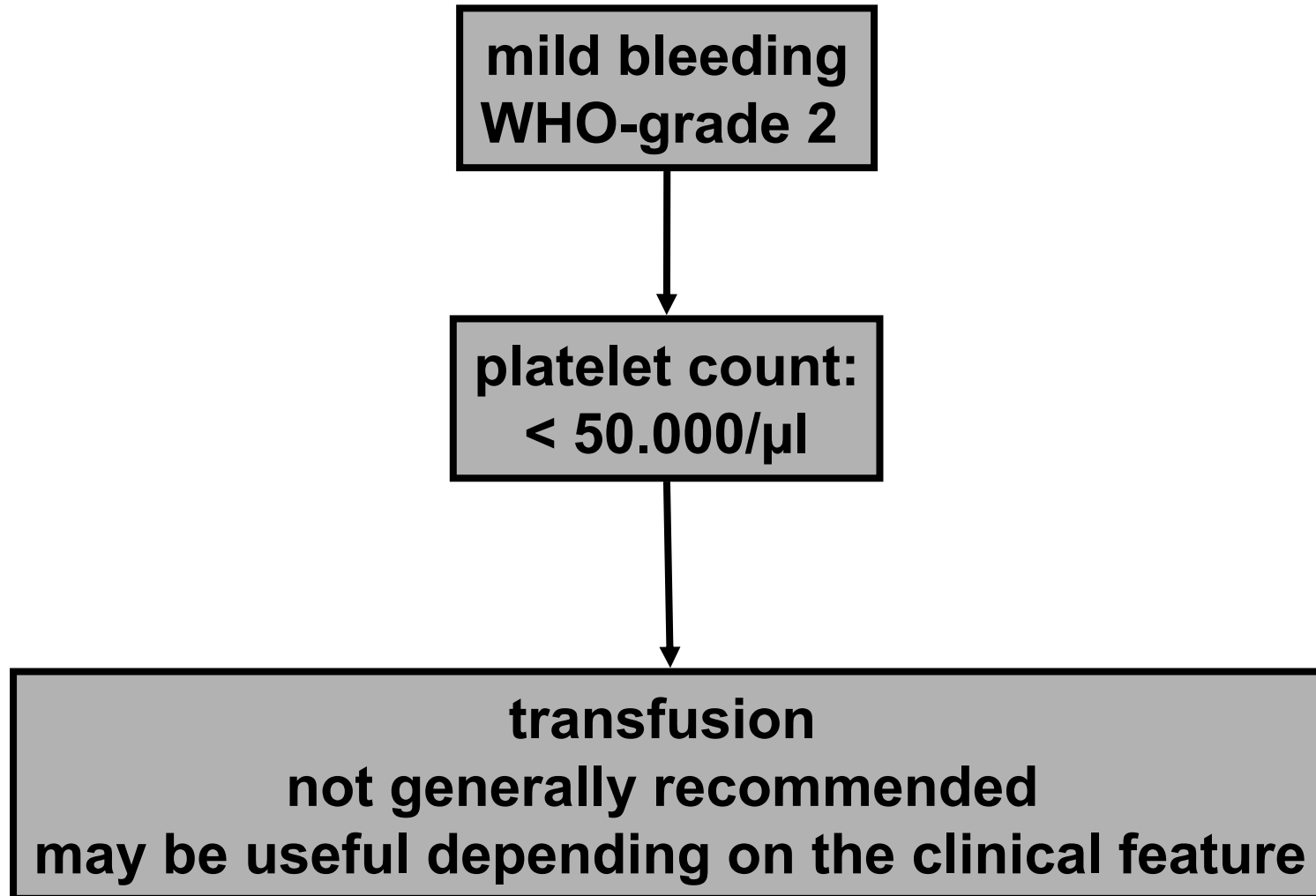
Trauma: „Triad of death“

- **Acidosis**
- **Hypothermia**
- **Coagulopathy**

Therapeutic platelet transfusion



Therapeutic platelet transfusions



Case 4: 45-year-old female patient

- **pulmonary embolism, stage IV
requiring surgical thrombectomy**
- **postoperative septicemia**
- **renal failure, CVVH**
- **signs of skin bleeding**
- **platelets 30,000/ μ l**

Platelet transfusions: monitoring

Measures to assess the effectiveness:

- **clinical bleeding**
- **platelet count**
- **platelet functions**

Platelet transfusions: monitoring

$$CI^* = \frac{\text{increment (x } 10^9/l) \times \text{patient's body surface}}{\text{number of platelets transfused (x } 10^{11})}$$

* *CI, corrected count increment*

Platelet transfusion: Monitoring

PLT transf. units	Expected increase after	
	1 h	24 h
1	> 20.000	> 10.000/ μ l
2	> 40.000	> 20.000/ μ l
4	> 60.000	> 30.000/ μ l

PLT, platelet

Platelet transfusion

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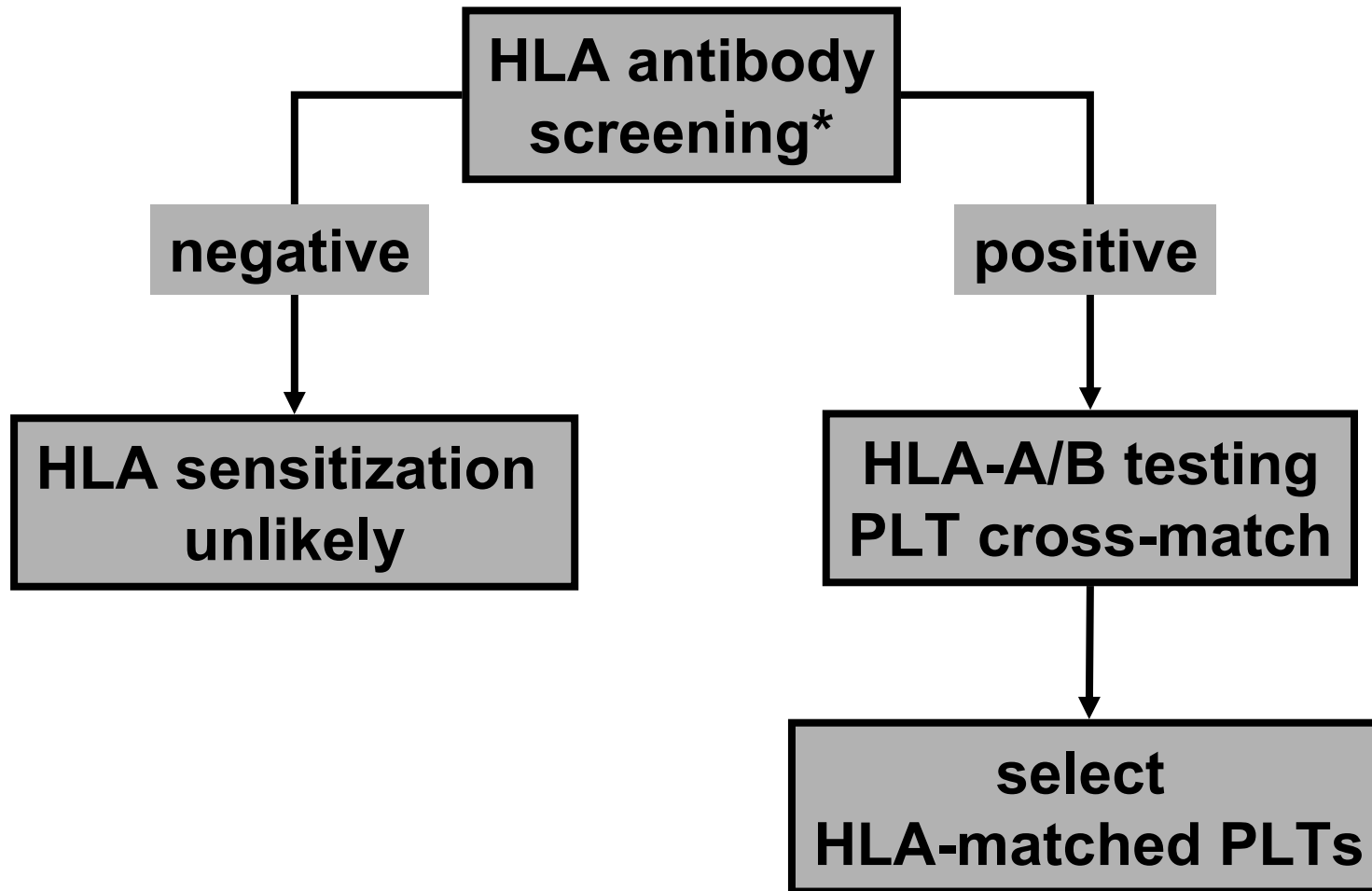
Refractoriness to transfusion

Definition: Bad increment after transfusion of 3 platelet concentrates from 3 different donors in the absence of active bleeding.

Factors:

- non-immune factors**
 - consumption (DIC)**
 - splenomegaly**
- immune factors**
 - HLA antibodies**
 - antibodies to platelet specific antigens**

Refractoriness: management



* *ELISA; lymphocytotoxic assay; PLT, platelet*

Platelet transfusion

- **technology**
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PLT-transfusions: contraindications

Absolute contraindications:

- **none, if life-threatening bleeding occurs**

Relative contraindications:

- **microangiopathic diseases
thrombotic thrombocytopenic purpura**
- **immune thrombocytopenic purpura**
- **heparin-induced thrombocytopenia**

Case 5: 35-year-old male patient

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acute episode of TTP**
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Summary (1)

- **Platelet products are prepared through apheresis or from pooled buffy coats.**
- **Platelets contain AB0 blood antigens, plasma may contain AB-antibodies.**
 - **AB0 identical transfusion**
 - **> 25 kg: AB0 cell compatible**
 - **< 25 kg: AB0 plasma compatible**
- **Indications: prophylactic versus therapeutic**

Summary (2)

- **Main transfusion triggers: platelet count and the clinical condition.**
- **The optimum dose: 1- 2 Units.**
- **Increment $< 10,000/\mu\text{l}$ after 1 h may indicate refractoriness → HLA-antibody screening.**
- **Contraindications:
none in case of WHO grade 4 bleeding**