Hemoterapie na ICU

ivana zýková

ARO, Krajská nemocnice Liberec,a.s.

Terapie na ICU:
transfuzní přípravky a krevní deriváty

- akutní indikace – krvácení
- “neakutní” indikace

Spahn et al. Critical Care 2013, 17:R76
http://ccforum.com/content/17/2/R76

CRITICAL CARE

RESEARCH Open Access

Management of bleeding and coagulopathy following major trauma: an updated European guideline

Donat R Spahn[1], Bertil Bouillon[2], Vladimir Cerny[3,4], Timothy J Coats[5], Jacques Duranteau[6], Enrique Fernández-Mondéjar[7], Daniela Filipescu[8], Beverley J Hunt[9], Radko Komadina[10], Giuseppe Nardi[11], Edmund Neugebauer[12], Yves Ozier[13], Louis Riddez[14], Arthur Schultz[15], Jean-Louis Vincent[16] and Rolf Rossaint[17*]

European Society of Anaesthesiology ESA

EJA European Journal of Anaesthesiology

European Society of Anaesthesiology ESA

Guidelines on the management of severe perioperative bleeding

2013

Sibylle A. Kozek-Langenecker[1], Arash Afshari[2], Pierre Albaladejo[3], Cesar Aldecoa Alvarez Santullano[4], Edoardo De Robertis[5], Daniela C. Filipescu[6], Dietmar Fries[7], Klaus Görlinger[8], Thorsten Haas[9], Georgina Imberger[10], Matthias Jacob[11], Marcus Lancé[12], Juan Llau[13], Sue Mallett[14], Jens Meier[15], Niels Rahe-Meyer[16], Charles Marc Samama[17], Andrew Smith[18], Cristina Solomon[19], Philippe Van der Linden[20], Anne Juul Wikkelsø[21], Patrick Wouters[22], Piet Wyffels[22]

Rossaint et al. Critical Care (2016) 20:100
DOI 10.1186/s13054-016-1265-x

2016

Critical Care

RESEARCH Open Access

The European guideline on management of major bleeding and coagulopathy following trauma: fourth edition

Rolf Rossaint[1], Bertil Bouillon[2], Vladimir Cerny[3,4,5,6], Timothy J. Coats[7], Jacques Duranteau[8], Enrique Fernández-Mondéjar[9], Daniela Filipescu[10], Beverley J. Hunt[11], Radko Komadina[12], Giuseppe Nardi[13], Edmund A. M. Neugebauer[14], Yves Ozier[15], Louis Riddez[16], Arthur Schultz[17], Jean-Louis Vincent[18] and Donat R. Spahn[19*]

erytrocyty

stáří

Storage lesions

We recommend that RBCs up to 42 days old should be transfused according to the first-in first-out method in, the blood services to minimise wastage of erythrocytes. **1C**

Old blood is just as good as fresh for blood transfusions: Canadian study

By Carmen Chai and Kathlene Calahan Global News

Review Article

Transfusion of fresher vs older red blood cells in hospitalized patients: a systematic review and meta-analysis

Paul E. Alexander,[1] Rebecca Barty,[2] Yutong Fei,[1,3] Per Olav Vandvik,[4-6] Menaka Pai,[7,8] Reed A. C. Siemieniuk,[9] Nancy M. Heddle,[7] Neil Blumberg,[10] Shelley L. McLeod,[11] Jianping Liu,[3] John W. Eikelboom,[7] and Gordon H. Guyatt[1]

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Conclusions

Our systematic review and meta-analysis provided no support for blood transfusion services implementing limits, or instituting preferential utilization, of RBC units that are fresh or stored for shorter periods. The consistent results across studies suggest that the impact of blood age does not differ across patient groups, nor that very fresh vs fresh RBCs, or old vs very old red RBCs, differ in their effects. Large ongoing studies may, however, challenge these results. It is more likely that they will show consistent results that further narrow the confidence intervals around key outcomes—and particularly mortality—and establish definitively that there is no need to change blood transfusion practices to ensure the use of younger or the freshest RBCs.

Transfusion of labile blood products

We recommend that all countries implement national haemovigilance quality systems. **1C**

We recommend a restrictive transfusion strategy which is beneficial in reducing exposure to allogeneic blood products. **1A**

We recommend photochemical pathogen inactivation with amotosalen and UVA light for platelets. **1C**

We recommend that labile blood components used for transfusion are leukodepleted. **1B**

We recommend that blood services implement st
operating procedures for patient identificat
staff be trained in early recogniti pt
response to, transfusion reaction

Příprava před elektivním výkonem

Preoperative correction of anaemia

We recommend that patients at risk of bleeding are assessed for anaemia 4–8 weeks before surgery. **1C**

If anaemia is present, we recommend identifying the cause (iron deficiency, renal deficiency or inflammation). **1C**

We recommend treating iron deficiency with iron supplementation (oral or intravenous). **1B**

If iron deficiency has been ruled out, we suggest treating anaemic patients with erythropoietin-stimulating agents. **2A**

If autologous blood donation is performed, we suggest treatment with erythropoietin-stimulating agents in order to avoid preoperative anaemia and increased overall transfusion rates. **2B**

Cost implications

Bleeding and transfusion of allogeneic blood products independently increase morbidity, mortality, length of stay in ICU and hospital, and costs. **B**

Lysine analogues (tranexamic acid and ε-aminocaproic acid; EACA) reduce perioperative blood loss and transfusion requirements; this can be highly cost-effective in several settings of major surgery and trauma. **A**

krvácení

Transfusion triggers

We recommend a target haemoglobin concentration of 7–9 g dl^{-1} during active bleeding. **1C**

Is it safe to use lower blood counts as a trigger for blood transfusion in order to give fewer blood transfusions?

Published:
12 October 2016

Background

Main results:

A total of 31 trials, involving 12,587 participants, across a range of clinical specialities (e.g. surgery, critical care) met the eligibility criteria. The trial interventions were split fairly equally with regard to the haemoglobin concentration used to define the restrictive transfusion group. About half of them used a 7 g/dL threshold, and the other half used a restrictive transfusion threshold of 8 g/dL to 9 g/dL. The trials were generally at low risk of bias .Some items of methodological quality were unclear, including definitions and blinding for secondary outcomes.

Restrictive transfusion strategies reduced the risk of receiving a RBC transfusion by 43% across a broad range of clinical specialties (risk ratio (RR) 0.57, 95% confidence interval (CI) 0.49 to 0.65; 12,587 participants, 31 trials; high-quality evidence), with a large amount of heterogeneity between trials ($I^2 = 97\%$). Overall, restrictive transfusion strategies did not increase or decrease the risk of 30-day mortality compared with liberal transfusion strategies (RR 0.97, 95% CI 0.81 to 1.16, $I^2 = 37\%$; N = 10,537; 23 trials; moderate-quality evidence) or any of the other outcomes assessed (i.e. cardiac events (low-quality evidence), myocardial infarction, stroke, thromboembolism (high-quality evidence)). Liberal transfusion did not affect the risk of infection (pneumonia, wound, or bacteraemia).

Key results

We identified a total of 31 relevant trials, which involved 12,587 participants. All of the studies compared different policies for blood transfusions. We found that participants who were assigned to receive blood at lower blood counts were 43% less likely to receive a blood transfusion than those who were given blood at higher blood counts. The risk of dying within 30 days of the transfusion was the same whether the participants received transfusion at lower or higher blood counts. We also evaluated harmful events that occurred after participants received, or did not receive, blood transfusions, including infection (pneumonia, wound infection, and blood poisoning), heart attacks, strokes, and problems with blood clots, and found that there was no clear difference in the instance of these events between the group that received transfusions at lower blood counts and the group that received transfusions at higher blood counts.

Authors conclusions

We concluded that it was not harmful to the participants' health status to give blood at lower or higher blood counts. If a policy of giving blood only at lower blood counts were followed routinely in clinical practice, it would reduce the amount of blood patients receive substantially and reduce the risk of patients receiving blood transfusions unnecessarily, as transfusions can have harmful effects. Additional studies are needed to establish the blood count at which a blood transfusion is needed in patients who have suffered a heart attack, brain injury, or have cancer.

Haemoglobin

Recommendation 10 We recommend that a low initial Hb be considered an indicator for severe bleeding associated with coagulopathy. (Grade 1B)

We recommend the use of repeated Hb measurements as a laboratory marker for bleeding, as an initial Hb value in the normal range may mask bleeding. (Grade 1B)

Main results:

A total of 31 trials, involving 12,587 participants, across a range of clinical specialities (e.g. surgery, critical care) met the eligibility criteria. The trial interventions were split fairly equally with regard to the haemoglobin concentration used to define the restrictive transfusion group. About half of them used a 7 g/dL threshold, and the other half used a restrictive transfusion threshold of 8 g/dL to 9 g/dL. The trials were generally at low risk of bias .Some items of methodological quality were unclear, including definitions and blinding for secondary outcomes.

Restrictive transfusion strategies reduced the risk of receiving a RBC transfusion by 43% across a broad range of clinical specialties (risk ratio (RR) 0.57, 95% confidence interval (CI) 0.49 to 0.65; 12,587 participants, 31 trials; high-quality evidence), with a large amount of heterogeneity between trials ($I^2 = 97\%$). Overall, restrictive transfusion strategies did not increase or decrease the risk of 30-day mortality compared with liberal transfusion strategies (RR 0.97, 95% CI 0.81 to 1.16, $I^2 = 37\%$; N = 10,537; 23 trials; moderate-quality evidence) or any of the other outcomes assessed (i.e. cardiac events (low-quality evidence), myocardial infarction, stroke, thromboembolism (high-quality evidence)). Liberal transfusion did not affect the risk of infection (pneumonia, wound, or bacteraemia).

Intensive care unit/septic shock — Restrictive transfusion appears to be safe in medical patients in an intensive care unit (ICU), with the possible exception of patients with ischemic heart disease/acute coronary syndrome.

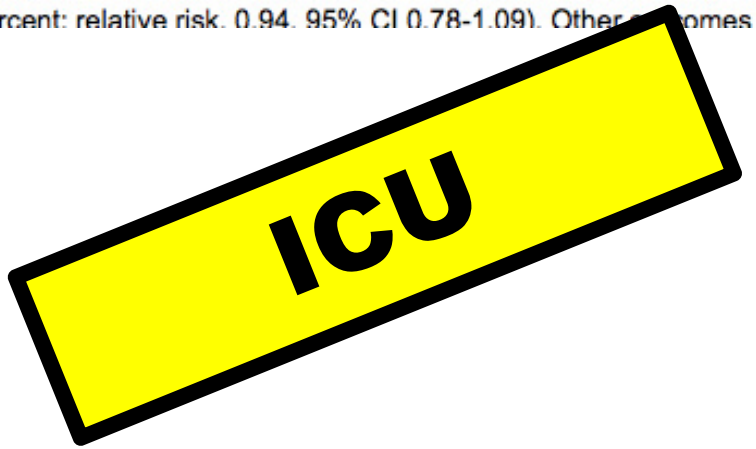
The use of a threshold of 7 g/dL in hemodynamically stable patients in the ICU is supported by data from the Transfusion Requirements in Critical Care (TRICC) trial [36]. This trial randomly assigned 838 critically ill, euvolemic patients with a hemoglobin less than 9 g/dL within 72 hours of admission to an intensive care unit to a restrictive transfusion strategy (RBCs transfused for hemoglobin concentration <7 g/dL and hemoglobin maintained at 7 to 9 g/dL) or a liberal strategy (RBCs transfused for hemoglobin <10 g/dL and hemoglobin maintained at 10 to 12 g/dL). The mean age was 58, and 82 percent were on mechanical ventilation.

Compared with liberal transfusion, 30-day mortality favored the restrictive strategy but was not statistically significant (23 percent in the liberal group versus 19 percent in the restrictive group). However, 30-day mortality rates were lower with the restrictive strategy in two predefined subgroups:

- Patients who were less severely ill (APACHE II score ≤20; mortality 9 versus 16 percent)
- Patients <55 years of age (mortality 6 versus 13 percent)

In contrast, in patients with ischemic heart disease, there was a reversal in the trend in 30-day mortality, with 30-day mortality in the restrictive strategy arm slightly higher than in the liberal strategy group (26 versus 21 percent) [37].

The use of a threshold of 7 g/dL was also shown to be safe in patients with septic shock. The Transfusion Requirements in Septic Shock (TRISS) trial randomly assigned 998 patients with septic shock and a hemoglobin level less than 9 g/dL to a restrictive or a liberal transfusion strategy (transfusion at a hemoglobin ≤7g/dL or ≤9 g/dL, respectively) [38]. Consensus criteria for sepsis were used (eg, infection, systemic inflammatory response, hypotension). Transfusions were given as single units of prestorage leukoreduced RBCs. Mortality at 90 days was similar in those transfused with the restrictive and the liberal strategy (43 versus 45 percent; relative risk, 0.94, 95% CI 0.78-1.09). Other [illegible]omes (eg, ischemic events, transfusion



tion and standardisatio
limitation of visc
ity to det
to a
due
ion is ex-
on tests, for ex-
aggregometry, should be
coelastic tests [213, 214]. More

agregometrie

agregometrie

Antiplatelet agents

Recommendation 31 We suggest administration of platelets in patients with substantial bleeding or intracranial haemorrhage who have been treated with antiplatelet agents. (Grade 2C)

We suggest the measurement of platelet function in patients treated or suspected of being treated with antiplatelet agents. (Grade 2C)

We suggest treatment with platelet concentrates if platelet dysfunction is documented in a patient with continued microvascular bleeding. (Grade 2C)

Holcomb *Critical Care* 2010, 14:162
http://ccforum.com/content/14/3/162

CRITICAL CARE

COMMENTARY

Traditional transfusion practices are changing

John B Holcomb*

See related research by Schochl *et al.*, http://ccforum.com/content/14/2/R55

It will be nice to **only transfuse what is needed,** based on level I data, finally **balancing risk and benefit** in data-driven fashion **for the benefit of our patients.**

Active, Personalized, and Balanced Coagulation Management Saves Lives in Patients with Massive Bleeding Anesthesiology 2010; 113:1–1

V. Management krvácení a koagulace

Antifibrinolytic agents

Recommendation 24

We recommend that tranexami
early as possible to th
at risk of signifi **1 g**
infused ov **venous**
infusi

W **d be administered to the**
within 3 h after injury. (Grade 1B)

W **cols for the management of bleeding**
der administration of the first dose of
t **mic acid en route to the hospital. (Grade 2C)**

tranexamová kyselina

CRASH-2
Clinical Randomisation of an Antifibrinolytic in Significant Haemorrhage

Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial

More than 20.000 patients were randomized to receive either tranexamic acid or placebo
10.060 patients received 1g tranexamic acid, initially followed by an infusion of 1g over 8 hours. 10.067 received placebo.

	Tranexamic acid (n=10 060)	Placebo (n=10 067)	RR (95% CI)	p value (two-sided)
Any cause of death	1463 (14·5%)	1613 (16·0%)	0·91 (0·85–0·97)	0·0035
Bleeding	489 (4·9%)	574 (5·7%)	0·85 (0·76–0·96)	0·0077
Vascular occlusion*	33 (0·3%)	48 (0·5%)	0·69 (0·44–1·07)	0·096
Multiorgan failure	209 (2·1%)	233 (2·3%)	0·90 (0·75–1·08)	0·25
Head injury	603 (6·0%)	621 (6·2%)	0·97 (0·87–1·08)	0·60
Other causes	129 (1·3%)	137 (1·4%)	0·94 (0·74–1·20)	0·63

Data are number (%), unless otherwise indicated. RR=relative risk. *Includes myocardial infarction, stroke, and pulmonary embolism.

Table 2: Death by cause

CRASH-2
Clinical Randomisation of an Antifibrinolytic in Significant Haemorrhage

Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial

A further analysis of the CRASH-2 data [323] showed that early treatment (≤1 h from injury) significantly reduced the risk of death due to bleeding [198/3747 (5.3%) events TXA vs. 286/3704 (7.7%) placebo; relative risk (RR) 0.68, 95% CI 0.57-0.82; P<0.0001].

tranexamová kyselina

European Society of Anaesthesiology ESA EJA European Society of Anaesthesiology ESA

Guidelines on the management of severe perioperative bleeding

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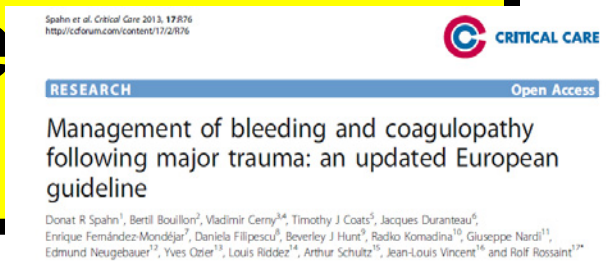
dávka 20-25 mg/kg

dávka 1 g bolus a 1 g kontinuálně



Spahn et al. Critical Care 2013, 17:R76
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CRITICAL CARE

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Management of bleeding and coagulopathy following major trauma: an updated European guideline

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V. Management krvácení a koagulace

Calcium

Recommendation 25

We recommend th

monitor

r

normal

sion. (Grade 1C)

iCa monitorace

V. Management krvácení a koagulace

Plasma

Recommendation 26

We recommend the ini
(fresh frozen
plasma
1C) in

tered, we suggest an optimal
ell ratio of at least 1:2. (Grade 2C)

W nd that plasma transfusion be avoided in
p nts without substantial bleeding. (Grade 1B)

FFP nebo fibrinogen

Initial coagulation resuscitation

Recommendation 24 **In the initial management of patients with expected massive haemorrhage, we recommend one of the two following strategies:**

- Plasma (FFP or pathogen-inactivated plasma) in a plasma–RBC ratio of at least 1:2 as needed. (Grade 1B)
- Fibrinogen concentrate and RBC according to Hb level. (Grade 1C)

Iniciální resuscitace

We define "initial resuscitation" as the period between arrival in the emergency department and availability of results from coagulation monitoring (coagulation screen, fibrinogen level and/or viscoelastic monitoring and platelet count). There are still conflicting opinions about use of plasma as the initial strategy to support coagulation, and several authors, mainly in Europe, strongly disagree with the initial transfusion of patients based on an empirical ratio rather than guided by concurrent laboratory data (goal-directed therapy) [388]. In the absence of rapid point-of-care coagulation testing to facilitate goal-directed therapy, initial treatment with blood components in a fixed ratio may constitute a reasonable approach. If concurrent coagulation results are available, they should be used to guide therapy.

- **Trauma indukovanou koagulopatii rozvíjí ¼ až ½ všech pacientů s traumatem**

- **V případě masivní krevní ztráty, dosahuje hladina fibrinogenu kritických hodnot dříve než ostatní prokoagulační faktory nebo trombocyty.**

Brohi K, Singh J, Heron M, Coats T: **Acute traumatic coagulopathy.** *J Trauma* 2003, **54(6)**:1127-1130.

Maegele M, Lefering R, Yucel N, Tjardes T, Rixen D, Paffrath T, Simanski C, Neugebauer E, Bouillon B: **Early coagulopathy in multiple injury: an analysis from the German Trauma Registry on 8724 patients.** *Injury* 2007, **38(3)**:298-304.

Podání již při podezření na deficit fibrinogenu

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Guidelines on the management of severe perioperative bleeding

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Kritických hodnot fibrinogenu může být dosaženo dříve než je nutné podávat PRBC

4 g fibrinogenu ...vzestup o 1g/l fibrinogenu

4 g fibrinogenu nebo 16 x FFP

Další resuscitace

VI. Further resuscitation

Goal-directed therapy

Recommendation 26 We recommend that resuscitation measures be continued using a goal-directed strategy guided by standard laboratory coagulation values and/or viscoelastic tests. (Grade 1C)

BUĎ

Fresh frozen plasma

Recommendation 27 If a plasma-based coagulation resuscitation strategy is used, we recommend that plasma (FFP or pathogen-inactivated plasma) be administered to maintain PT and APTT <1.5 times the normal control. (Grade 1C)

We recommend that plasma transfusion be avoided in patients without substantial bleeding. (Grade 1B)

ANEBO

Fibrinogen and cryoprecipitate

Recommendation 28 If a concentrate-based strategy is used, we recommend treatment with fibrinogen concentrate or cryoprecipitate if significant bleeding is accompanied by viscoelastic signs of a functional fibrinogen deficit or a plasma fibrinogen level of less than 1.5–2.0 g/l. (Grade 1C)

We suggest an initial fibrinogen supplementation of 3–4 g. This is equivalent to 15–20 single donor units of cryoprecipitate or 3–4 g fibrinogen concentrate. Repeat doses must be guided by viscoelastic monitoring and laboratory assessment of fibrinogen levels. (Grade 2C)

agregometrie

Antiplatelet agents

Recommendation 31 We suggest administration of platelets in patients with substantial bleeding or intracranial haemorrhage who have been treated with antiplatelet agents. (Grade 2C)

We suggest the measurement of platelet function in patients treated or suspected of being treated with antiplatelet agents. (Grade 2C)

We suggest treatment with platelet concentrates if platelet dysfunction is documented in a patient with continued microvascular bleeding. (Grade 2C)

PCC

Prothrombin complex concentrate

Recommendation 33 We recommend the early use of prothrombin complex concentrate (PCC) for the emergency reversal of vitamin K-dependent oral anticoagulants. (Grade 1A)

We suggest the administration of PCC to mitigate life-threatening post-traumatic bleeding in patients treated with novel oral anticoagulants. (Grade 2C)

Provided that fibrinogen levels are normal, we suggest that PCC or plasma be administered in the bleeding patient based on evidence of delayed coagulation initiation using viscoelastic monitoring. (Grade 2C)

Prothrombin complex concentrate

Recommendation 31

We recommend the early use of prothrombin

emergency reversal of vitamin K

If a cop we suggest that PCC

be oelastometric evidence of delayed

Thromboelastometry appears to be a useful tool to guide

py in patients with traumatic coagulopathy

PCC při prodloužení iniciace

Management koagulace – F XI

- In cases of ongoing
  strength desp
  concen
  tivity is
  gnificant FXIII
  tivity), we sug
  IU kg) can b

F XIII

Test : 24/7
Koncentrát v lednici
Zatím cca 10 podání

CRITICAL CARE

Crit Care. 2010 Apr 7;14(2):R55. [Epub ahead of print]

Goal-directed coagulation management of major trauma pa… using rotation thromboelastometry (ROTEM)-guide… administration of fibrinogen and prothrombin… concentrate.

Schoechl H, Nienaber U, Hofer G, Voelckel W, Jambor C, Sch…

Cílená terapie fibrinogenem a PCC dle trombelastometrie

"ROTEM-guided haem… as first-line hae… of PCC was goal… reliable diagnosis of the … able survival rate was observed."

… received fibrinogen concentrate as first-line therapy, 98 additionally … 3 patients with recent coumarin intake received only PCC. Twelve patients re… and 29 received platelet concentrate. The observed mortality was 24.4%, lower than the …ISS mortality of 33.7% and the RISC mortality of 28.7%. After excluding 17 patients with traumatic brain injury, the difference in mortality was 14% observed versus 27.8% predicted by TRISS and 24.3% predicted by RISC.

A = viskolelastické metody

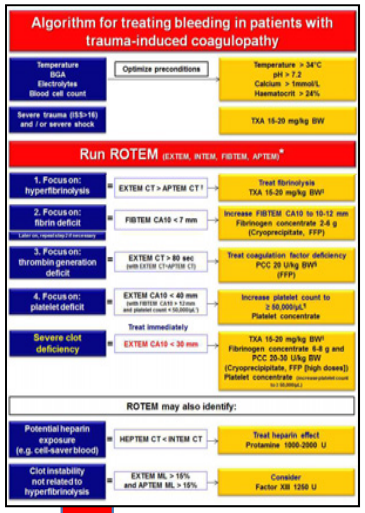
B = koncentráty koagulačních faktorů

A + B =

rychlejší výsledky

časnější terapie

+ fibrinogen



2008 2009 2010 2011 2012 2013 2014

„denní praxe“

Život ohrožující krvácení = přítomnost anesteziologa

- **Trauma tým**
- **Operační sály**
- **Porodnické krvácení**
- **Urgentní příjem**
- **ICU, …….**

Rotem je umístěn na lůžkové stanici ARO (2 přístroje a Platelet)

Vzorky jsou přinášeny na ARO z celé nemocnice

Všichni lékaři na ICU provádějí vyšetření a analýzu křivek s doporučením další terapie

Organizace urgentního traumatologického příjmu KNL

Triage pozitivní pacient

Standardní postup
15 minut (ATLS)

Diagnostika a terapie
Vyloučení či vyřešení život ohrožujících stavů

Dýchací cesty
Zdroje velkého krvácení: hemothorax, hemoperitoneum, nestabilní pánev, fraktury dlouhých kostí, zevní krvácení
Tenzní pneumothorax
Tamponáda srdeční

Oběhově stabilní x nestabilní pacient

CT v režimu polytrauma

Zástava krvácení: OR, AG,...

kasuistika první

Na místě nehody.....

- **autonehoda:**
  čelní náraz do stromu v 90 km/hod.
- **řidič na místě mrtev**
- **výzva ZZS v 20:38**

- **spolujezdec vyprošťován 30 minut, transport do trauma centra KNL**
- **muž,19 let**

Na místě nehody.....

- **dominují mnohočetná poranění pravé dolní končetiny**
- **během vyprošťování komunikuje**

- **po vyproštění vzhledem k potřebě analgosedace zaintubován**
- **hypotenzní, sinusová tachykardie**
- **volumoterapie**
- **příjezd na urgentní příjem v 21:52**

00:00

Urgentní příjem

- příjezd na urgentní příjem v 21:52
- příjem v režimu polytrauma – trauma tým
- zaintubovaný, analgosedace
- TK 90/50 TF 100/min Sp02 96%

- proveden FAST a rtg plic – negativní nález
- Hb 100 g/l
- provedeny odběry

00:00 – 00:10

Co nyní ?

výsledky KO a koagulace budou za 30 - 40 minut .....

Hbmetr: Hb 100 g/l

pacient hypotenzní, tachykardický

Podán Exacyl 1g

00:05

Co nyní?

výsledky KO a koagulace budou za 30 - 40 minut .....

Hbmetr: Hb 100 g/l

pacient hypotenzní, tachykardický...

podáno

- **Exacyl (k.tranexamová) 1 g**
- **Fibrinogen 2 g**

00:10

Podání již při podezření na deficit fibrinogenu

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Guidelines on the management of severe perioperative bleeding

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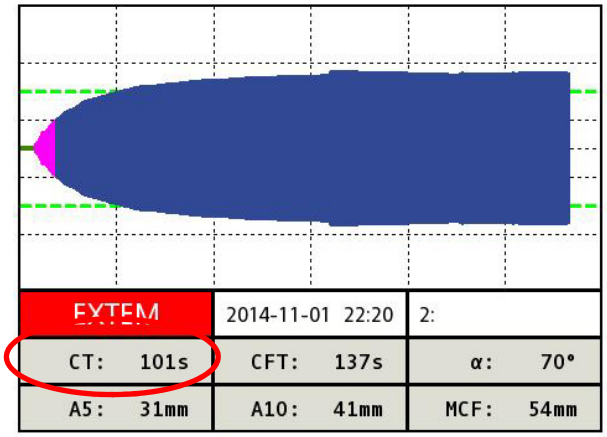
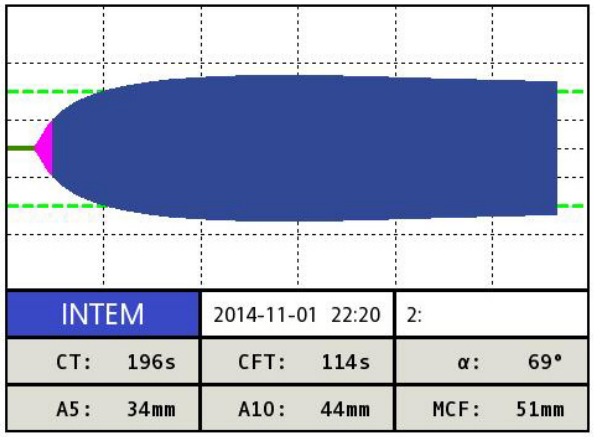
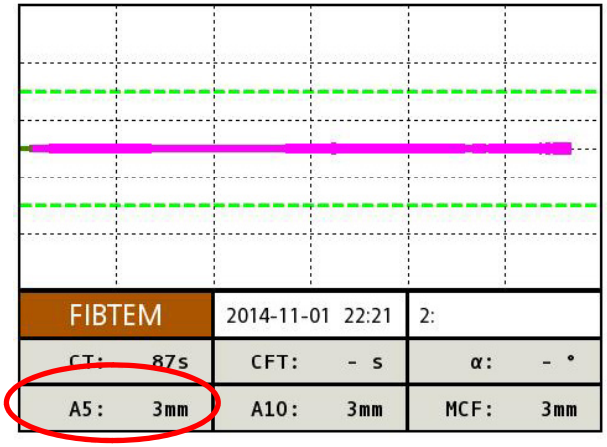
Kritických hodnot fibrinogenu může být dosaženo dříve než je nutné podávat PRBC

Výsledky z laboratoře nejsou ale máme trombelastometrii do 10 minut...

do1



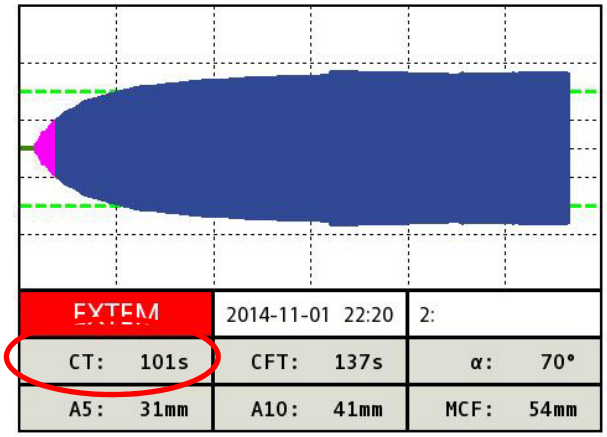


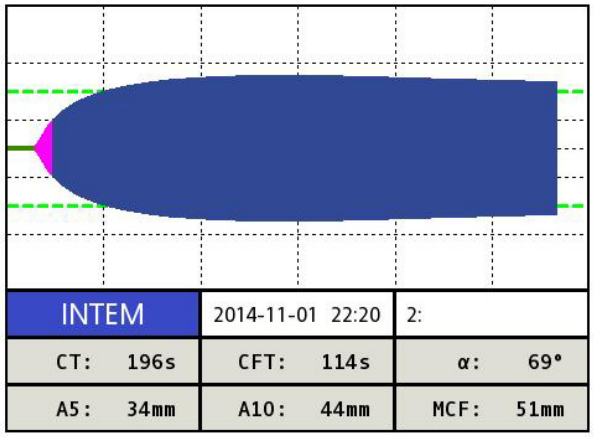


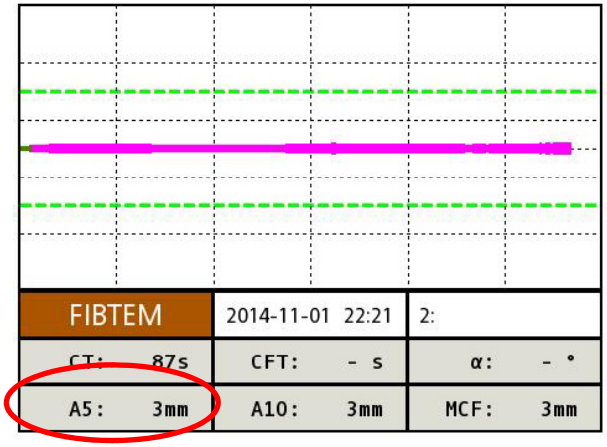
00:15

Výsledky z laboratoře nejsou ale máme trombelastometrii do 10 minut...

do1







00:15

podáno

- **Fibrinogen 4 g (celkem 6 g)**
- **PCC 2000 jednotek**

00:20

- **po iniciálním zajištění provedeno celotělové CT:**

  fraktura pánve, mnohočetné fraktury pravé dolní končetiny

- **pacient na operační sál**

00:30

konečně:...výsledek odběru při příjmu

- **Hb 101 g/l**
- **Htc 0,29**

- **Trombo 227 000/µl**

již vyřešeno ☺

- **INR 1,4**
- **APTT ratio 0,9**
- **Fibrinogen 1,2 g/l**

00:40

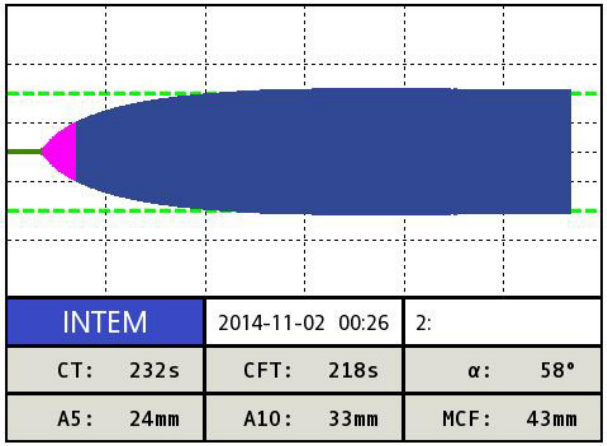
Operační sál

proveden ZF pánve, ZF femuru a bérce

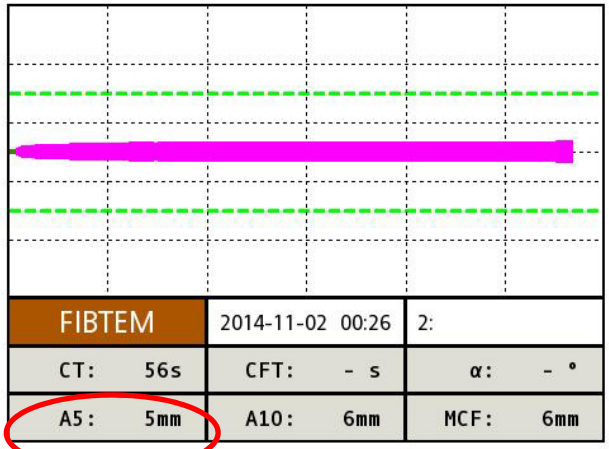
ošetření rozsáhlých poranění měkkých tkání pravé dolní končetiny

Perioperační kontrola

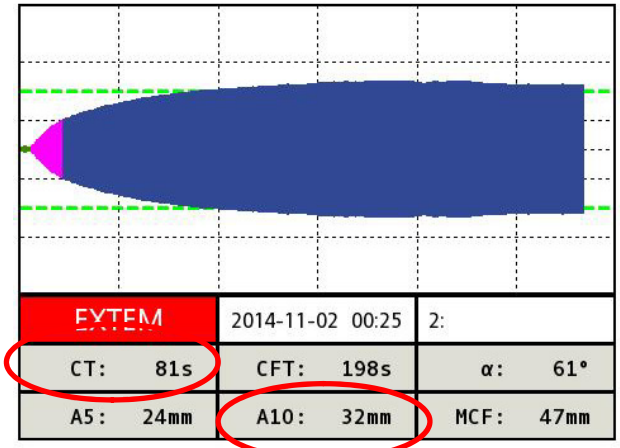
do2



INTEM	2014-11-02 00:26	2:
CT: 232s	CFT: 218s	α: 58°
A5: 24mm	A10: 33mm	MCF: 43mm



FIBTEM	2014-11-02 00:26	2:
CT: 56s	CFT: - s	α: - °
A5: 5mm	A10: 6mm	MCF: 6mm



EXTEM	2014-11-02 00:25	2:
CT: 81s	CFT: 198s	α: 61°
A5: 24mm	A10: 32mm	MCF: 47mm

02:20 po příjmu

podáno

- **Fibrinogen 4 g (celkem 10 g)**

02:30

Výsledky

- **Hb 118 g/l**
- **Htc 0,34**

již vyřešeno ☺

- **Trombo 113 000/µl**

- **INR 1,5**
- **APTT ratio 1,4**
- **Fibrinogen 0,9 g/l**

03:00 po příjmu

Podáno celkem perioperačně

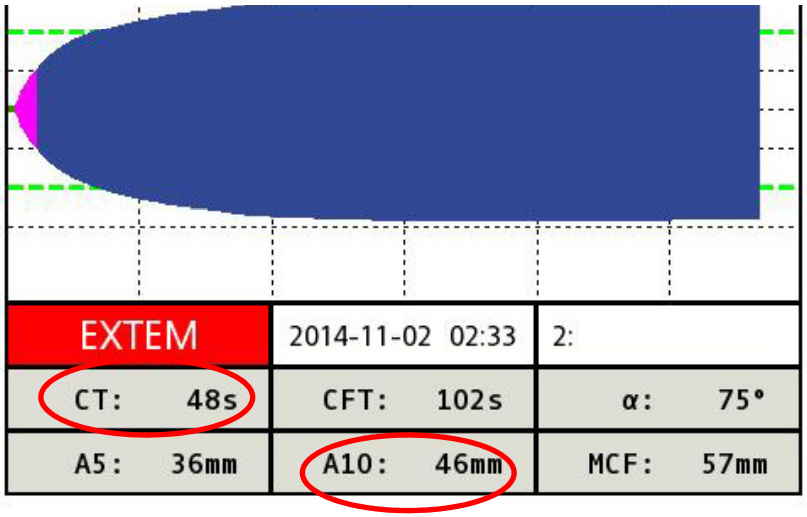
- **Exacyl 1 g**
- **Fibrinogen 10 g**
- **PCC 2000 jednotek**
- **Perioperačně 8 x PRBC**

Příjem na ARO

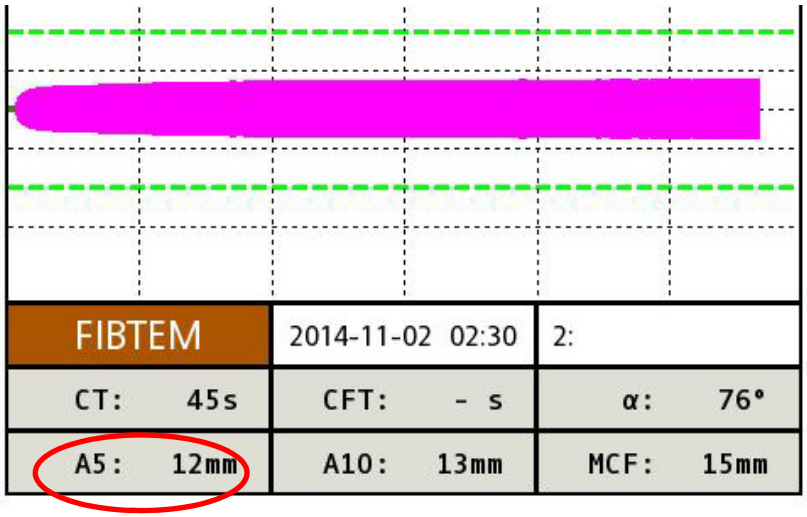
- **po ukončení výkonu příjem na ARO**
- **po příjmu odběry**
- **při příjmu již bez vasopresorů, normalizace laktátu**

04:00 po příjmu

vstupní odběr na oddělení



EXTEM	2014-11-02 02:33	2:
CT: 48s	CFT: 102s	α: 75°
A5: 36mm	A10: 46mm	MCF: 57mm

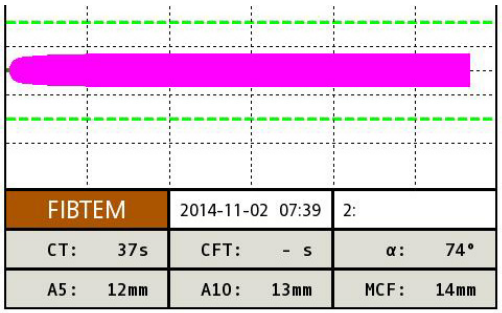


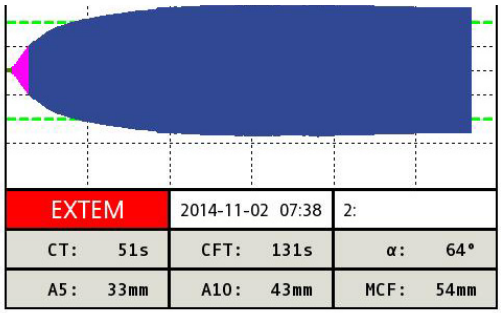
FIBTEM	2014-11-02 02:30	2:
CT: 45s	CFT: - s	α: 76°
A5: 12mm	A10: 13mm	MCF: 15mm

O.K.

druhý den ráno...

- **Hb 104 g/l, Htc 0,29**
- **Trombo 128 000/µl**
- **INR 1,3**
- **APTT ratio 1,0**
- **Fibrinogen 2 g/l**

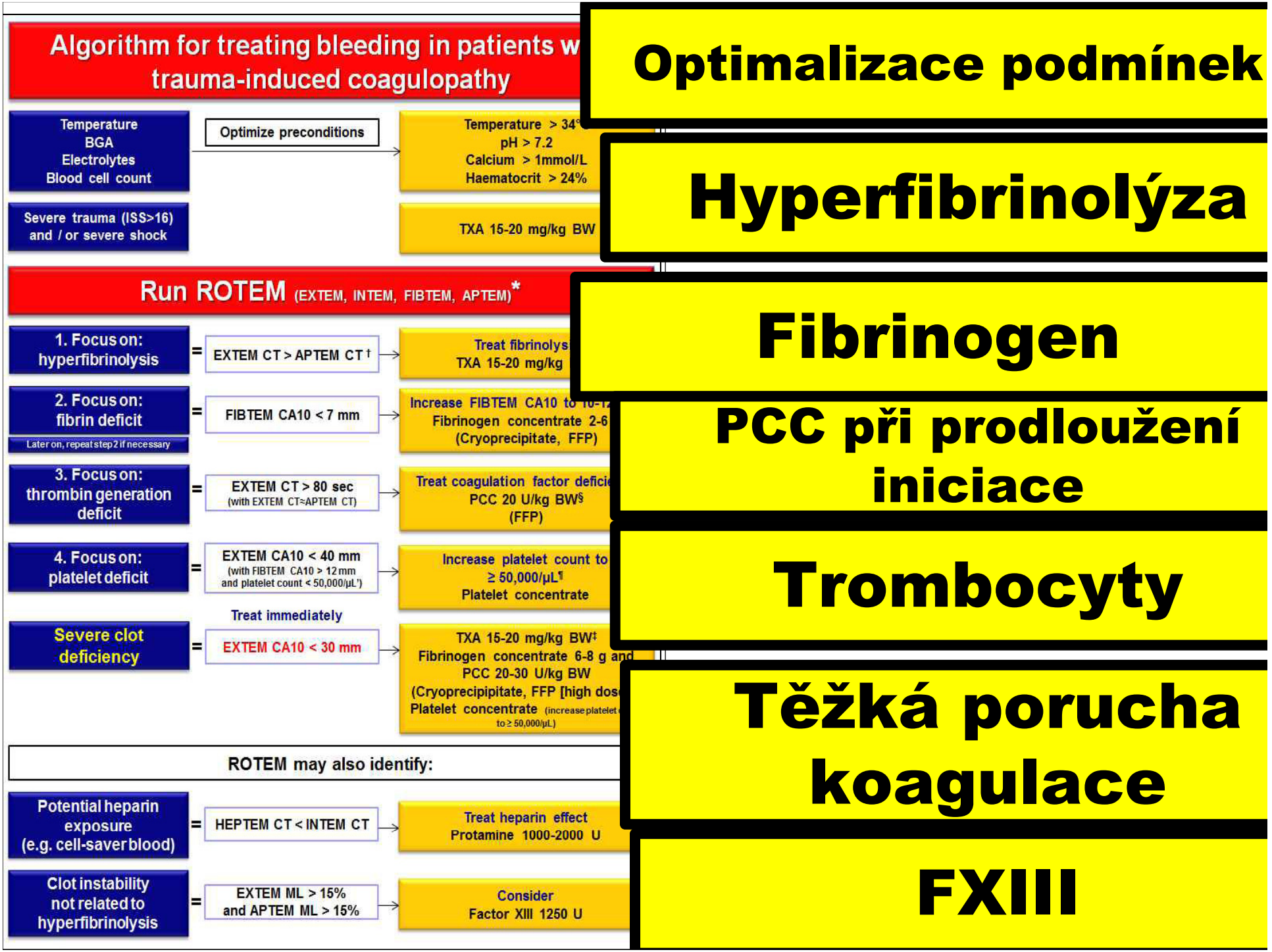




O.K.

další průběh

- **opakované převazy poranění PDK**
- **4. den extubace**
- **9. den překlad**



Optimalizace podmínek

Hyperfibrinolýza

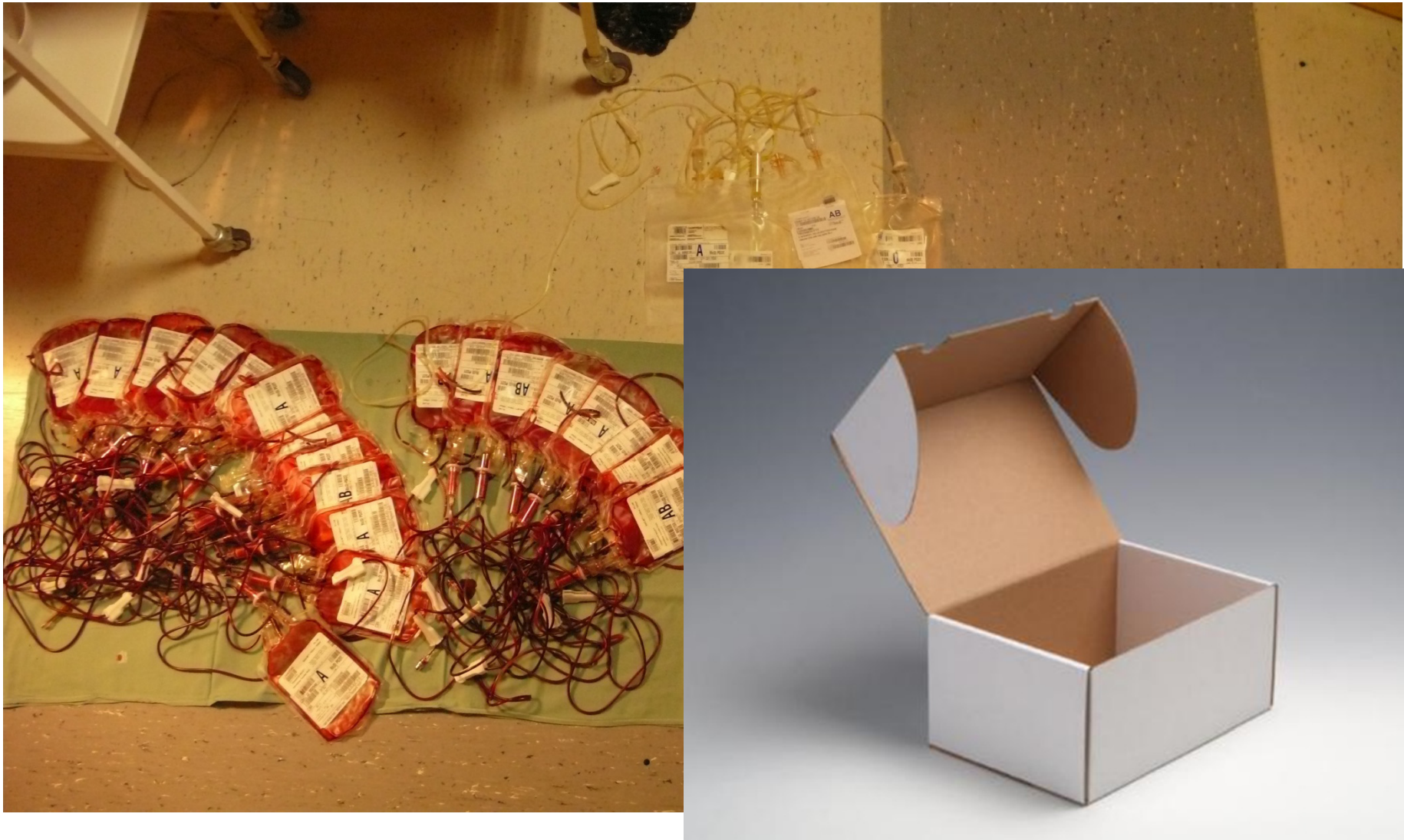
Fibrinogen

PCC při prodloužení iniciace

Trombocyty

Těžká porucha koagulace

FXIII



A = viskolelastické metody

B = koncentráty koagulačních faktorů

A + B =

rychlejší výsledky

časnější terapie