Kam dál v péči o trauma v PNP?

TRF v PNP ano či ne?

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Kam by měla směřovat lékařská PNP?

- Dostupnost traumacenter ve zlaté hodině
  - 100%
    - Bez ohledu na krajskou příslušnost
      - Operační řízení ZOS ZZS
- Invazivní KPR
  - X %
- ATLS doporučení
  - TK 80 – 90 systoly
  - Krystaloidy 250 – 500ml inf → NADR v LD
  - Tranexamová kyselina
- **<u>TRF přípravky k pacientovi?</u>**
  - **<u>?</u>**

TRF u traumat ve světě

PREHOSPITAL BLOOD PRODUCT RESUSCITATION FOR TRAUMA: A SYSTEMATIC REVIEW

Iain M. Smith,[*†‡] Robert H. James,[§‖¶] Janine Dretzke,[**] and Mark J. Midwinter[*†]

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limited to mortality outcomes. **Results:** No prospective comparative or randomized studies were identified. Sixteen case series and 11 comparative studies were included in the review. Seven studies included mixed populations of trauma and non-trauma patients. Twenty-five of 27 studies provided only very low quality evidence. No association between PHBP and survival was found (OR for mortality: 1.29, 95% CI: 0.84–1.96, $P = 0.24$). A single study showed improved survival in the first 24 h. No consistent physiological or biochemical benefit was identified, nor was there evidence of reduced in-hospital transfusion requirements. Transfusion reactions were rare, suggesting the short-term safety of PHBP administration. **Conclusions:** While PHBP resuscitation appears logical, the clinical literature is limited, provides only poor quality evidence, and does not demonstrate improved outcomes. No conclusions as to efficacy can be drawn. The results of randomized controlled trials are awaited.

TRF u traumat ve světě

CONCLUSIONS

The literature reporting PHBP for trauma resuscitation is contradictory and provides only poor-quality evidence. Evidence-based conclusions to guide practice cannot be drawn. While PHBP resuscitation appears logical the potential harms of this practice must be recognized. More rigorous evidence of benefit is required to justify universal adoption. Whether PHBPs improve survival despite these competing risks is unknown. The only satisfactory way to answer this outstanding question of benefit from PHBP-based resuscitation for major traumatic haemorrhage is by randomized controlled trials.

TRF u traumat ve světě

Characteristics and outcomes of patients administered blood in the prehospital environment by a road based trauma response team

Daniel Bodnar,[1,2,3] Stephen Rashford,[1,2] Catherine Hurn,[2] Jamie Quinn,[1] Lachlan Parker,[1] Katherine Isoardi,[1,4] Sue Williams[5]

Results Over an 18-month period (1 January 2011 to 30 June 2012), 71 trauma patients were administered pRBCs by the TRT. Seven patients (9.9%) died on scene and 39 of the 64 patients (60.9%) transported to hospital survived to hospital discharge. 57 (89.1%) of the transported patients had an Injury Severity Score (ISS) > 15, with a mean ISS, Revised Trauma Score (RTS) and Trauma-Injury Severity Score of 32.11, 4.70 and 0.57, respectively. No patients with an RTS < 2 survived to hospital discharge. 53 patients (82.8%) received additional pRBCs in hospital with 17 patients (26.6%) requiring greater than 10 units pRBCs in the first 24 h. 47 patients (73.4%) required surgical or interventional radiological procedures in the first 24 h.

TRF u traumat ve světě

Conclusions

This retrospective study demonstrates that an integrated trauma system incorporating highly skilled **prehospital** clinicians with access to pRBCs, handheld ultrasound equipment and excellent lines of communication with receiving trauma centres facilitates early definitive intervention and may decrease mortality.

We have also demonstrated that it is possible and appropriate for severely injured, hypovolaemic patients to receive pRBCs **transfusions** much earlier **in** their clinical course by commencing **transfusions** in the **prehospital** environment.

Although there may be an overall survival benefit, we found that no patient with an RTS less than 2 based on the first recorded parameters survived. As such, the RTS may be a useful tool **in** determining **in** which patients the administration of **prehospital** pRBC **transfusions** would be futile.

Further work is required to examine whether our results are consistent with other physician embedded, civilian **trauma** systems and if it is feasible and beneficial to use other **blood** products or haemostatic agents like fresh frozen plasma, prothrombin complex concentrates and fibrinogen concentrates in the **prehospital** environment.

TRF u traumat ve světě

The feasibility of civilian prehospital trauma teams carrying and administering packed red blood cells

Daniel Bodnar,[1,2,3] Stephen Rashford,[1,2] Sue Williams,[4] Emma Enraght-Moony,[1] Lachlan Parker,[1] Benjamin Clarke[1,2]

Results Over an 18-month period (1 January 2011–30 June 2012), of 500 pRBC units provided to the TRT, 130 (26%) were administered to patients in the prehospital environment. Of the non-transfused units, 97.8% were returned to a hospital blood bank and were available for reissue. No instances of equipment failure directly contributed to wastage of pRBCs. The cost of providing pRBCs for prehospital use was $A551 (£361) for each unit transfused.

TRF u traumat ve světě

CONCLUSION

This retrospective review demonstrates that supplying pRBCs to civilian prehospital trauma teams within an urban setting is feasible with low rates of wastage. Available equipment provides reliable temperature control for prolonged periods of time while being sturdy enough to handle a hostile, prehospital environment. Stringent logistical and clinical governance is required to ensure that supplied pRBCs are stored, exchanged and used appropriately.

Further studies are required to examine the characteristics and outcomes of patients who are administered prehospital blood transfusions, and to identify which patients are the most likely to benefit from this therapy.

Contributors DB: responsible for collating data between blood bank QAS, author of paper. SR: author of paper. SW: collating blood bank database, author of paper. LP: collating QAS database. EE-M: author of paper, BC: author of paper.

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TRF u traumat ve světě

Prehospital blood transfusions in pediatric trauma and nontrauma patients: a single-center review of safety and outcomes

Fahy, Aodhnait S; Thiels, Cornelius A; Polites, Stephanie F; Parker, Maile; Ishitani, Michael B; et al. **Pediatric Surgery International; Berlin** 33.7 (Jul 2017): 787-792.

Results

28 children were transfused during transport; median age was 8.9 ± 7 years and 15 patients were male (54%). Most patients required at least one additional unit of **blood** products during their hospitalization (79%), and/or required operative intervention (53%), endoscopy (7%), or died during their hospitalization (14%). Comparison of trauma patients (n = 16) and nontrauma patients (n = 12) revealed that nontrauma patients were younger, more anemic, more coagulopathy on admission, and required more ongoing **transfusion** in the hospital. Trauma patients were more likely to need operative intervention. No patient had a **transfusion** reaction.

TRF u traumat ve světě

Conclusion

The majority of patients who received prehospital blood transfusions were non-trauma patients. Transfusion reactions were rare, and the majority of the patients who received prehospital blood transfusions required further transfusion and procedural intervention for hemorrhage control. These data suggest while the current prehospital damage control resuscitation protocol is being utilized appropriately further research may be warranted to confirm best practices and assess if prehospital blood transfusion in non-trauma patients is associated with improved outcomes.

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Author contributions Thiels, Habermann, Zietlow, and Zielinski contributed to the conception and design. Thiels, Aho, Fahy, Berns, and Parker contributed to the acquisition of data. Thiels, Glasgow, and Zielinski contributed to the analysis and interpretation of the data. The authors participated in writing the manuscript and critical revision and have approved of the final version.

TRF u traumat ve světě

Helicopter In-flight Resuscitation with Freeze-dried Plasma of a Patient with a High-velocity Gunshot Wound to the Neck in Afghanistan – A Case Report

Mikael Gellerfors, MD;[1,2] Joacim Linde, MD;[2,3] Dan Gryth, MD, PhD[4]

Conclusion

Freeze-dried plasma may have several potential advantages in the prehospital resuscitation of major hemorrhage. These include easy reconstitution, good intravascular volume effect, and coagulation factor content. Blood transfusions should be done with caution. Yet, early administration of FDP may contribute to reduce trauma-induced coagulopathy and acidosis, especially when the administration is followed by a balanced transfusion of RBC, plasma, and platelets. However, large-scale studies are needed to define the prehospital use of FDP and other blood products.

TRF u traumat ve světě

Freedom from frozen: the first British military use of lyophilised plasma in forward resuscitation

S G Gokhale,[1] Thomas Scorer,[2] H Doughty[3]

CONCLUSIONS

Lyophilised plasma makes it logistically possible to provide advanced prehospital resuscitation. In addition, dried plasma has the potential for wider application in disaster work and remote medical treatment facilities where early transfusion is indicated but not available. However, there is still a need for a safe, universal, haemostatically competent resuscitation fluid packaged for the prehospital environment. Such a product would provide true 'freedom from frozen'.

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Competing interests None.

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TRF u traumat ve světě

Prehospital blood transfusion in the en route management of severe combat trauma: A matched cohort study

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RESULTS

A total of 1,592 patients were included: 439 before July 1, 2008 (pre-PHB), and 1,153 thereafter (post-PHB). Of the latter group, 310 (26.9%) received PHBTx during transfer (Fig. 2). Table 1 compares the two cohorts. Prehospital transfusions totaled 576 U of PRBC and 527 U of FFP. The rate of severe injury (Injury Severity Score [ISS] $\geq$ 16) rose from 28% to 42.5% ($p < 0.001$, χ^2) between the two cohorts. Mortality was higher in the post-PHB group. However, mortality among severely injured post-PHB patients was 134 (27.6%) of 485, whereas it was 39 (32.0%) of 122 in the pre-PHB cohort ($p = 0.343$, χ^2).

Of the 310 patients who received PHBTx, 97 were paired with patients from the pre-PHB cohort (Fig. 2). Table 2 shows the matched characteristics. The groups had excellent matching

TRF u traumat ve světě

TABLE 2. Matched Characteristics of Paired Groups of Patients Who Did and Did Not Receive PHBTx

		Recipients	Nonrecipients	*p*
n		97	97	
Age		24 (20–28)	23 (21–28)	0.975*
Patient category	UK military	45 (46.4)	38 (39.2)	0.248*
	Coalition military	31 (32)	45 (46.4)	
	Afghan civilian	21 (21.6)	14 (14.4)	
Sex	Male	95 (97.9)	97 (100)	U/T
Mechanism of injury	Blunt	1 (1)	3 (3.1)	U/T
	Burn	0 (0)	0 (0)	
	Explosive	50 (51.5)	48 (49.5)	
	Gunshot wound	46 (47.4)	46 (47.4)	
	Other	0 (0)	0 (0)	
Military ISS		16 (9–25)	16 (9–24.5)	0.686**
Military NISS		22 (15–33)	21 (14–34)	1**
AIS score ≥ 3	Head/neck	0	1 (1)	1*
	Face	0	1 (1)	1*
	Chest	24 (24.7)	25 (25.8)	1*
	Abdomen	18 (18.6)	18 (18.6)	1*
	Extremity	67 (69.1)	65 (67)	0.727*
	External	2 (2)	3 (2)	1*

*Categorical data are shown as n (%) and compared using McNemar test.

**Ordinal and scale data are shown as median (IQR) and compared using the Wilcoxon signed-rank test.

U/T, untestable because of the limitations of McNemar test (because of zero value o multiple categories; patient category was dichotomized to coalition or Afghan to allow testing)

of injury profiles, with 89 in each group being severely injured. Table 3 shows the treatments received and outcomes for both groups. The mortality rate in the prehospital transfusion recipients was half that of the nonrecipients (8.2% vs. 19.6%, $p = 0.013$, McNemar). There was also a small improvement in admission heart rate although not in other observations. However, matched recipients received more prehospital airway interventions and reached hospital more quickly than nonrecipients. Matched recipients patients received more blood products overall (Fig. 3*A*) and in higher FFP/PRBC ratios.

TRF u traumat ve světě

CONCLUSION

Transfusion of PRBC and FFP within a DCR treatment paradigm has been successfully projected into the prehospital phase of combat casualty care. Extensive changes in resuscitation practice make an isolated assessment of the contribution of PHBTx impossible. However, adoption of an aggressive approach to DCR, with early use of blood product transfusion, including in the prehospital setting, was associated with a halving of mortality.

TRF u traumat ve světě

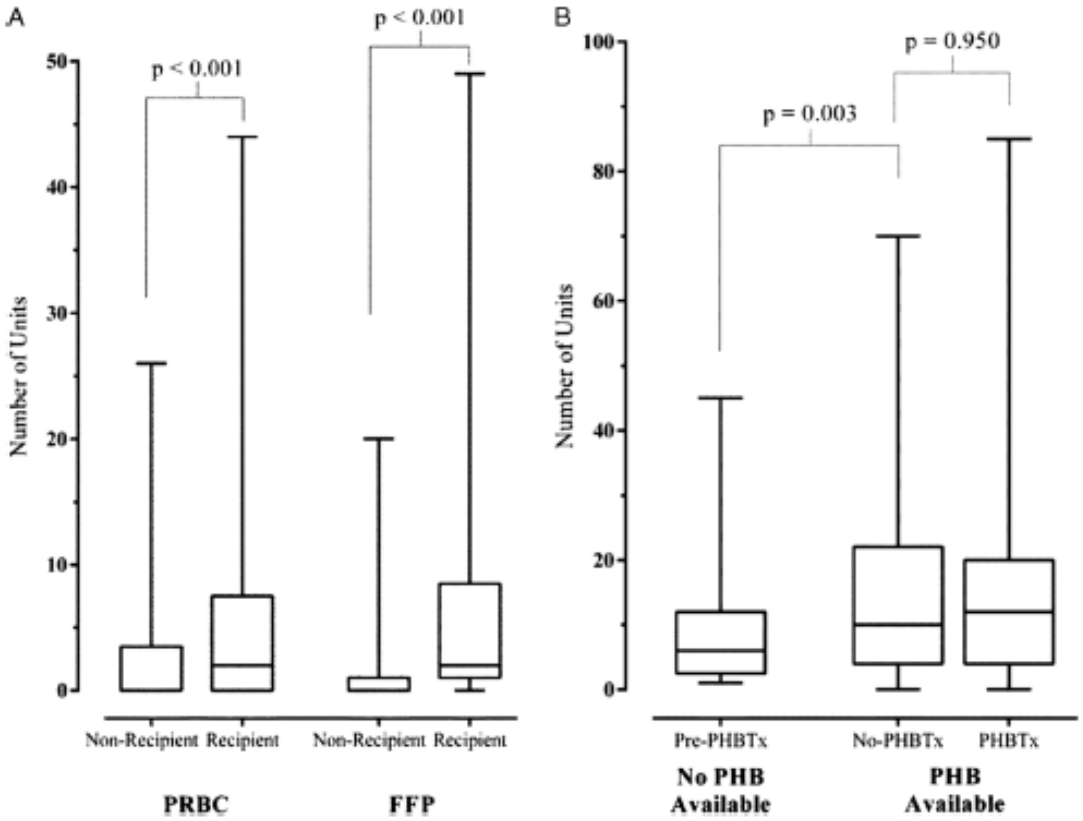

Figure 3. *A*, Units of PRBC and FFP transfused in the first 24 hours in the hospital to matched recipients and nonrecipients of prehospital transfusion. Groups compared with Wilcoxon signed-rank test. *B*, Total units of PRBC transfused in the first 24 hours to severely injured (ISS > 15) patients who received any PRBC or FFP and (1) were admitted before PHBTx was available, (2) were admitted after PHBTx was available but did not receive PHBTx, (3) received PHBTx. Groups were compared using Mann-Whitney U-test. *Boxes* show interquartile range with median. *Whiskers* show range.

TRF u traumat ve světě

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Prehospital blood transfusion: 5-year experience of an Australian helicopter emergency medical service

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Results

Go to:

We identified 158 missions involving a prehospital blood transfusion, of which 147 patient datasets were complete. The majority of patients had a blunt mechanism of injury (93.9%) and were male (69.3%) with a median (IQR) age of 34.5 (22 to 52) years (Table 1). The majority of patients were haemodynamically unstable, with a median (IQR) heart rate and systolic blood pressure of 115 (90 to 130) and 80 (65 to 105) mmHg, respectively. Twenty-two patients (15.0%) were pronounced life extinct on the scene. A total of 382 units of packed red blood cells were transfused, with a median of 3 units (range 1 to 6). No early transfusion reactions were noted. A variety of prehospital interventions accompanied the transfusions, ranging from rapid sequence intubation through to thoracotomies (Table 2).

TRF u traumat ve světě

Conclusion

Go to:

Despite the controversies over the role of fluids in the prehospital environment, the carriage and use of blood is both feasible and safe in a physician-led helicopter emergency medical service.

TRF u traumat ve světě

PREHOSPITAL BLOOD PRODUCT RESUSCITATION FOR TRAUMA: A SYSTEMATIC REVIEW

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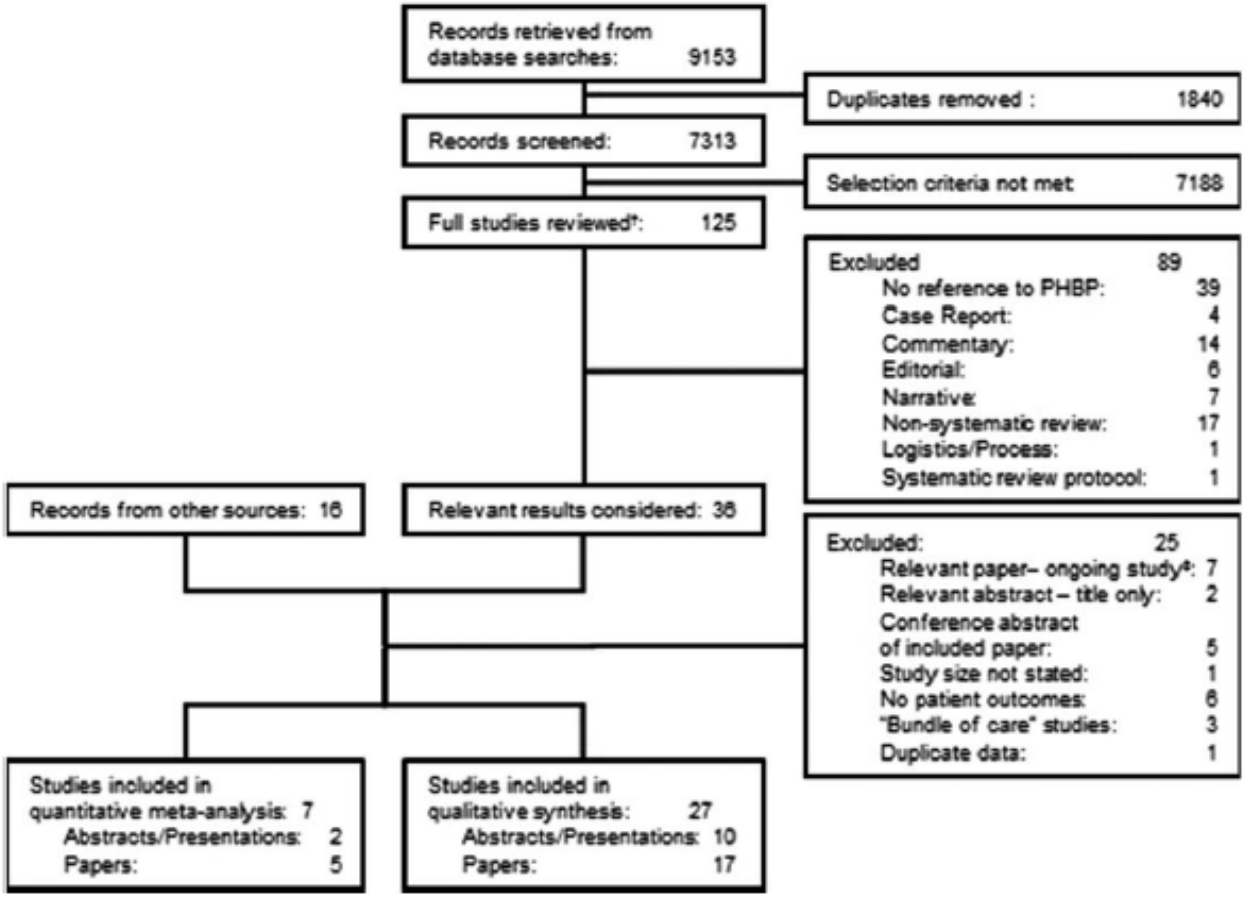
RESULTS

Study selection is shown in Figure 1. Sixteen case series and 11 comparative studies (one case control, 10 retrospective cohorts) were included. Nine studies considered military trauma patients. Eighteen considered civilian patients, of which seven pooled trauma and non-trauma patients. The aims of case series were varied; frequent themes were feasibility, process description, or characterization of PHBP recipients. Comparative studies examined associations between PHBP receipt and physiological parameters or clinical outcomes.

Both arms of one cohort study (37) formed part of a case series (38) which formed one arm of a second cohort study (39). As each study reported different aspects of PHBP resuscitation, each was considered individually. Only the final study was included in summary measures. One military study (40) contained an intervention cohort drawn from a larger case series (41).

TRF u traumat ve světě

PRA HA
PRA GUE
PRA GA
PRA G



PRISMA diagram for selection of included studies. †Including studies only available in abstract; ‡trial design or authors blinded to allocations.

TRF u traumat ve světě

CONCLUSIONS

The literature reporting PHBP for trauma resuscitation is contradictory and provides only poor-quality evidence. Evidence-based conclusions to guide practice cannot be drawn. While PHBP resuscitation appears logical the potential harms of this practice must be recognized. More rigorous evidence of benefit is required to justify universal adoption. Whether PHBPs improve survival despite these competing risks is unknown. The only satisfactory way to answer this outstanding question of benefit from PHBP-based resuscitation for major traumatic haemorrhage is by randomized controlled trials.

TRF u traumat ve světě

Theater Blood Support in the Prehospital Setting

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LTC Jason B. Corley, MS, USA

CONCLUSION

As the ABP continues to be engaged with research and advanced development, partnerships with industry and other alliances are vital to the continued success and efforts to provide blood support in the prehospital setting. Freeze dried plasma is available to US Army Special Forces, the 75th Ranger Regiment can now deploy with known Blood Group O low titer donors, and the FDA has approved cold stored apheresis platelets. This collaborative type of effort must continue as we work diligently to decrease cold chain management requirements, provide pathogen reduction technology, and move blood products further forward on the battlefield into the prehospital setting. Lessons learned by the ABP will have significant effect on future doctrine and training.

Trauma na ZZS Praha 2017

- Polytrauma 184 pacientů
- Nestabilní oběh STK < 90 36 pacientů
- Volumoterapie krystaloidy 36 pacientů
  - Do 500 ml inf
  - NADR +

KARIM FNM 2017

- Trauma NACA 4,5,6 73 pacientů
- Polytrauma T07
  - Dospělých 33 pacientů (1 exitus při příjmu)
  - Dětských 22 pacientů (4 měsíce – 18let)
    - Vstupní Hb, TRF 1. den

Dospělí FNM

Vstupní Hb	Tranzfusní přípravky 1. den	EM	MP	Tromboseparátory
51	24	14	8	2
74	12	6	6	0
90	34	16	16	2
94	6	2	4	0
95	14	8	5	1
95	2	2	0	0
97	16	6	8	2
99	10	4	4	2
104	0	0	0	0
105	0	0	0	0
106	0	0	0	0

Dospělí FNM

Vstupní Hb	Tranzfusní přípravky 1. den	EM	MP	Tromboseparátory
108	14	7	7	0
112	0	0	0	0
114	9	3	6	0
114	4	0	4	0
114	12	6	6	0
116	7	4	3	0
116	4	2	2	0
116	15	7	8	0
116	4	2	2	0
117	20	9	9	2
117	6	2	4	0

Dospělí FNM

Vstupní Hb	Tranzfusní přípravky 1. den	EM	MP	Tromboseparátory
118	4	0	4	0
118	4	0	4	0
119	2	2	0	0
129	7	2	3	2
135	10	6	4	0
140	0	0	0	0
141	10	4	4	2
145	0	0	0	0
147	0	0	0	0
147	0	0	0	0
153	0	0	0	0
156	0	0	0	0

Děti FNM

- **22 pacientů** (4 měsíce – 18 let, průměr 11.8 roku)
  - průměrná vstupní hodnota Hb – 112.3 g/l (78 – 142)
  - průměrná vstupní hodnota hematokritu – 0.328 (0.230 – 0.414)

- **18 pacientů**
  - 10 pacientů EM (celkem 49 TU, max. 15 TU)
  - 18 pacientů FFP (celkem 73 TU, max. 19 TU)
  - 2 pacienti separované trombocyty (celkem 3 TU)

KAR ÚVN

hb	ERD	FFP	TAD
122.00	0	0	0
111.00	7	6	0
135.00	0	0	0
138.00	4	2	0
155.0	0	0	0
125	4	4	0
144.0	0	0	0
156.0	0	0	0
118.00	5	2	0
155.0	0	2	0
98.00	2	0	0
68.0	16	12	4
122.00	2	0	0
122.00	0	0	0
62.0	16	9	3
109.00	0	0	0
123.00	3	2	0
50.00	24	30	8
147.0	0	0	0
126.00	0	0	0

hb	ERD	FFP	TAD
142.00	0	0	0
139.00	0	0	0
88.00	3	6	0
118.0	6	4	0
136.00	0	0	0
74.0	38	27	2
124.0	0	0	0
157.00	0	0	0
144.0	0	0	0
107.00	0	0	0
159.0	0	0	0
121.0	0	0	0
115.0	0	0	0
123.00	0	0	0
79.00	16	20	0
144.0	0	0	0
148.0	0	0	0
78.00	0	0	0
130.00	0	0	0
138.00	0	0	0
128.0	0	0	0

Shrnutí

- Data nebyla hodnocena statisticky!

  → Prostor pro další výzkum

- U pacientů s hodnotou Hb < 100 zaznamenán vyšší počet TRF v 1. dni

  (odchylka nehodnocena)

Závěr

- Dojezdové časy do 1h splnit ve 100%
- Hb v době přijetí bývá ještě v normě
- Klíčové je dodržení doporučení ATLS
  - Krystaloidy 250ml
  - NADR LD k udržení sTK 90
  - Termokomfort
  - Tranexamová kyselina v PNP
  - Invazivní KPR…

Letální triáda!

Pokud ano v PNP tak…

- Jaké TP?
  - FFP, Fibrinogen, EM, TRO, Protromplex…
- Kdo vydá TP?
- Jak skladovat TP?
  - LZS? RV? RLP?
- Jak ohřát TP?
  - TIC
- Jak vykázat TP?

- Jak srovnat účelnost…?

Děkuji za pozornost