

Volumen- und Hämotherapie beim Polytrauma

Tobias Schürholz

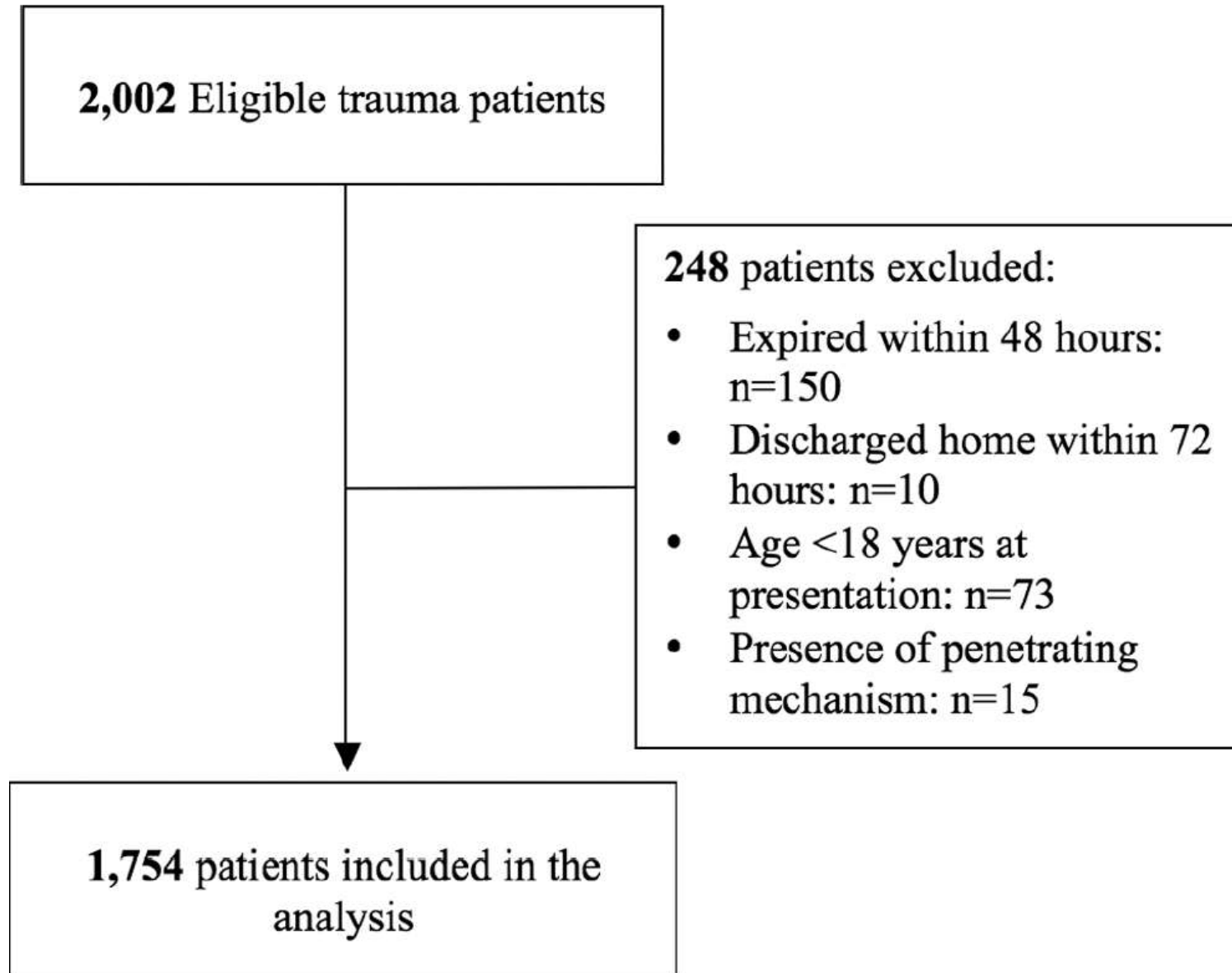


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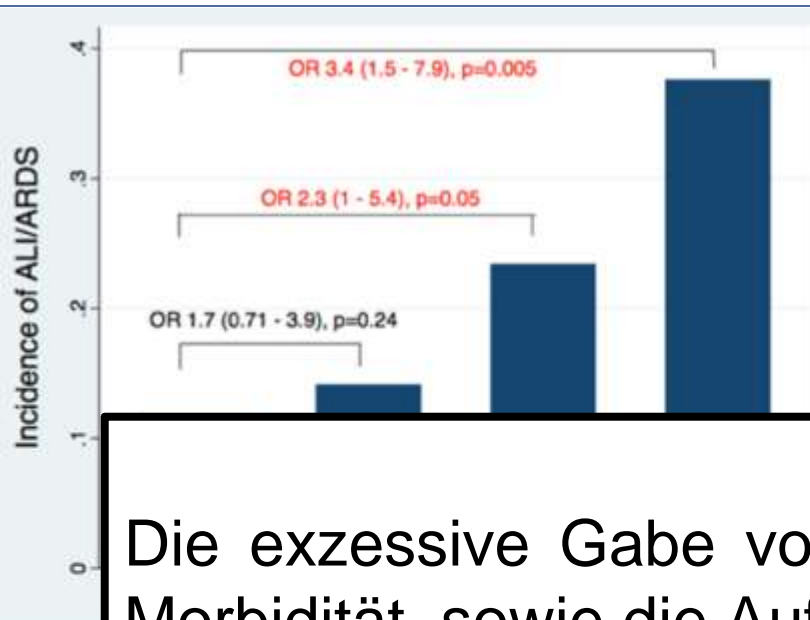


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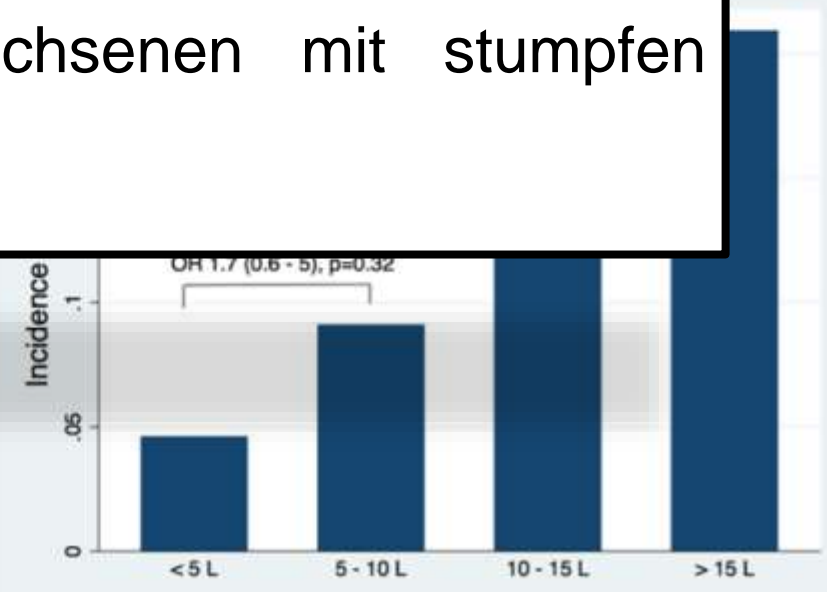
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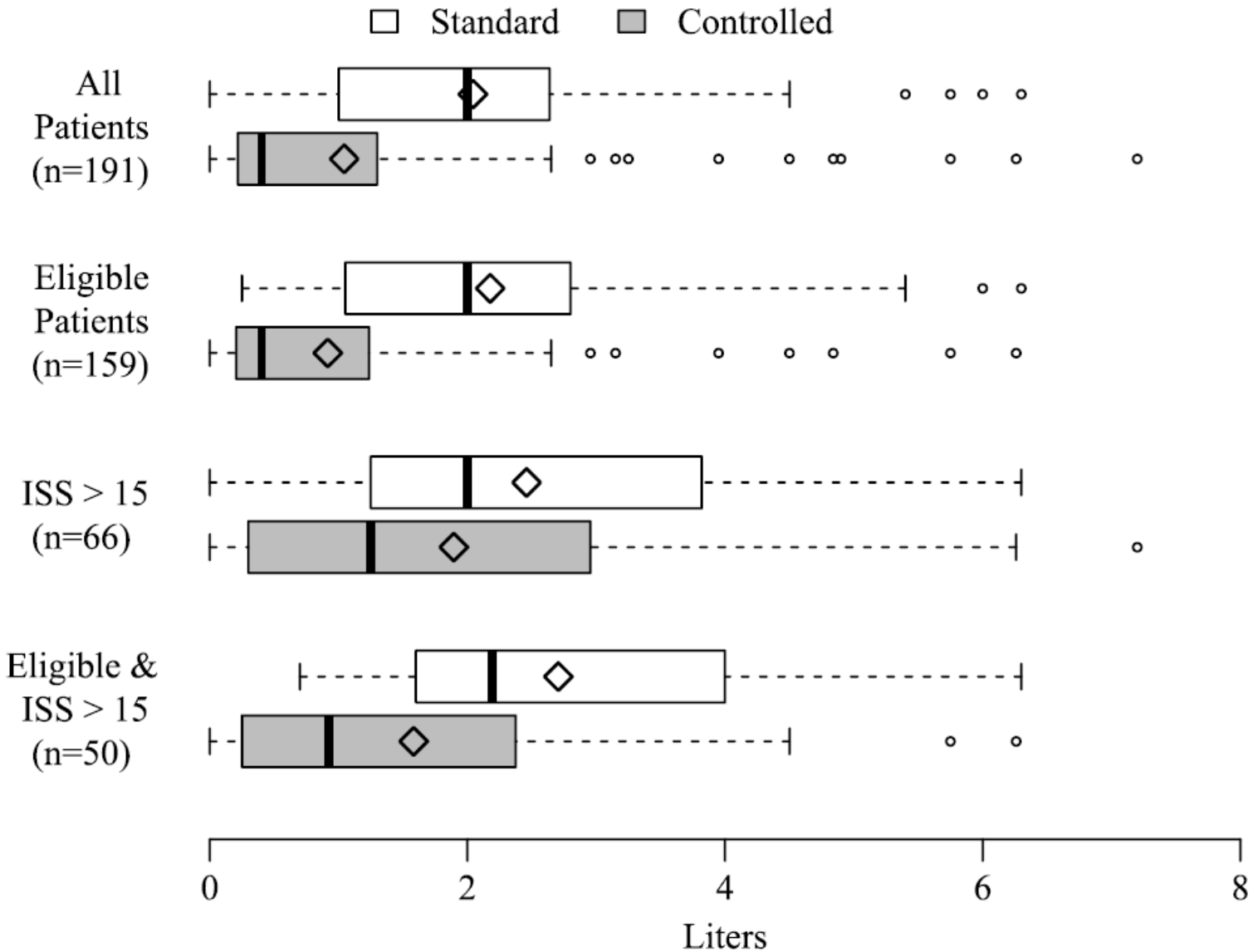
Viel hilft viel?

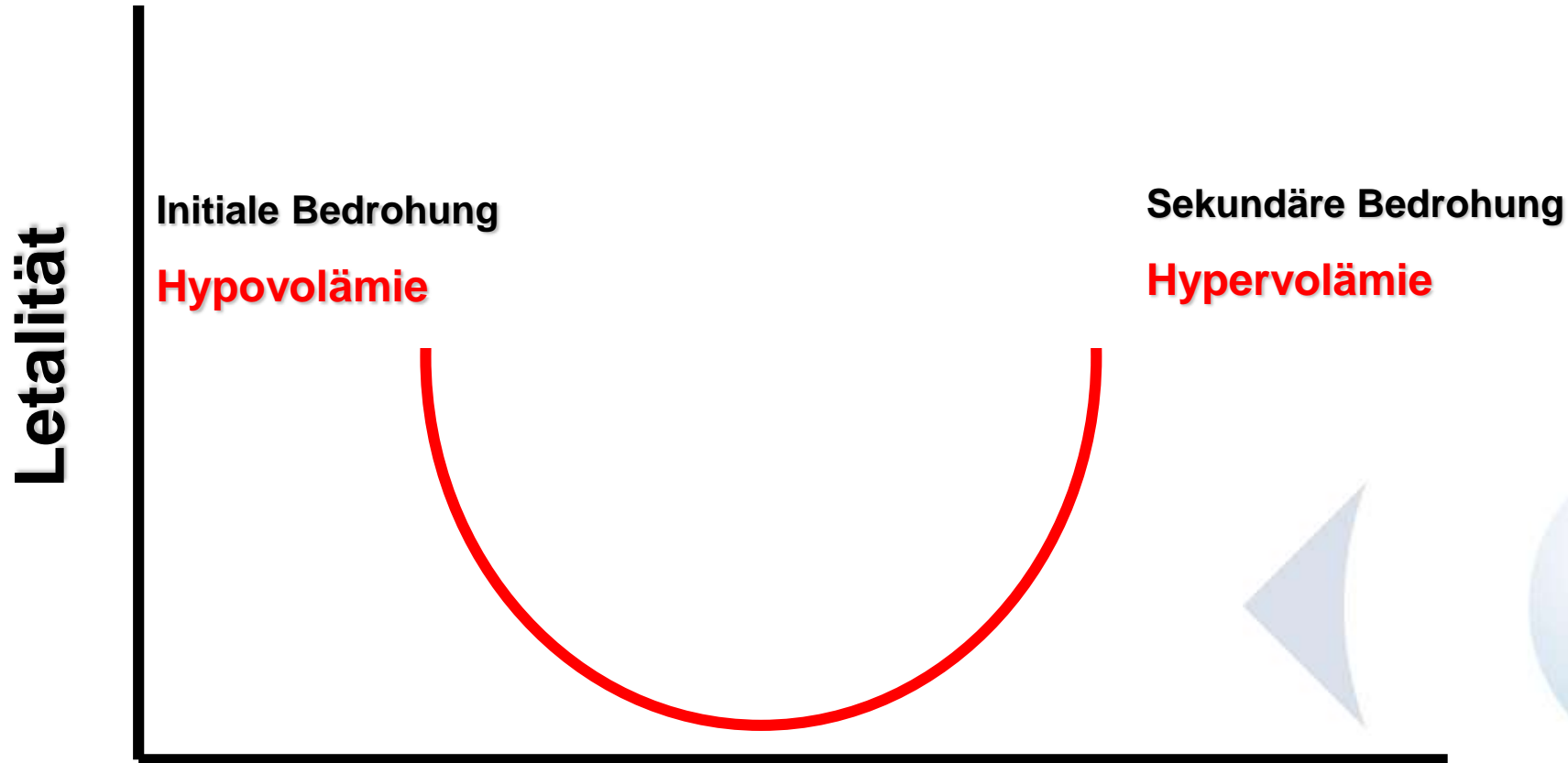


Die exzessive Gabe von Kristalloiden erhöht die Morbidität, sowie die Aufenthaltsdauer auf der ICU und im KH bei Erwachsenen mit stumpfen Traumata.



Kontrollierte Therapie

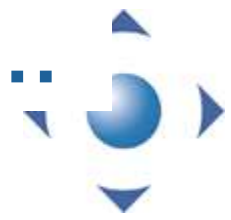






Volumenlösung	Empfehlung	Empfehlungsgrad
Kristalloide	Prinzipiell zum Volumenersatz bei Intensivpatienten verwenden.	B
NaCl 0,9%	Nicht zum Volumenersatz bei Intensivpatienten verwenden.	A
HES	Nicht bei Intensivpatienten verwenden. Im hämorrhagischen Schock kritisch erwägen.	A
Gelatine/Albumin	Wenn akute Hypovolämie mit Kristalloiden nicht ausreichend therapierbar.	0
Balanzierte Lösungen	Zum Volumenersatz bei Intensivpatienten verwenden, als balanzierte Kolloide bzw. als balanzierte Kristalloide.	B

Protokollbasierte Transfusion...



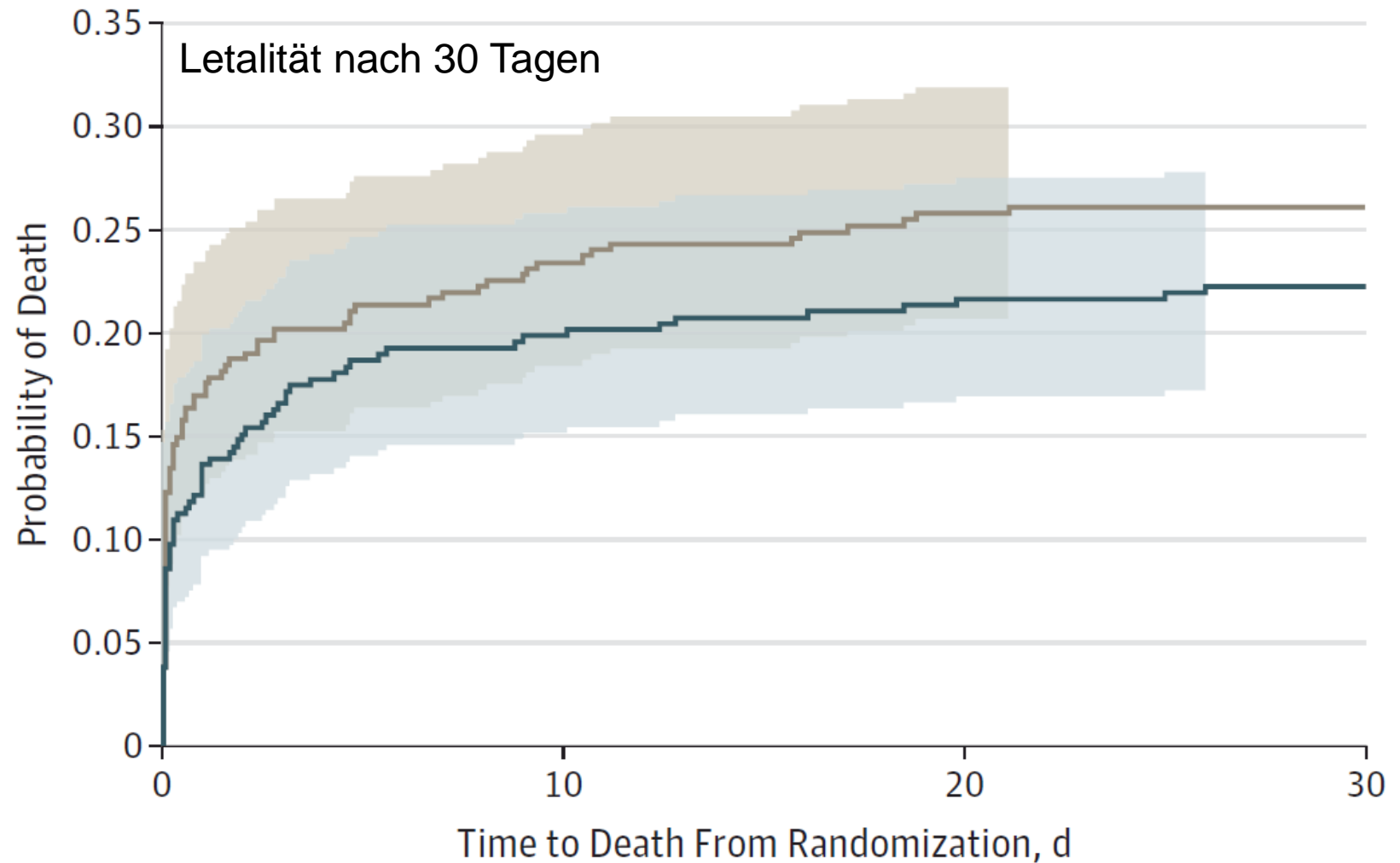
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Massive Transfusion Protocol in Helsinki University trauma center (for adult patients).

Emergency transfusion package (ETP)	PRBC	FFP	Platelets
ETP start (ready when the patient arrives)	4 (O-)	4 (AB)	No
Trauma leader makes the decision on whether to continue MTP			
ETP 2 (second package)	4 (O-)	4 (AB)	1 (4 donors) (O+)
ETP 3 (third package)	4 (group-specific)	4 (group-specific)	1 (4 donors) (O+)
ETP 4 (fourth package)	4 (group-specific)	4 (group-specific)	1 (4 donors) (group-specific)
...
MTP is continued, until it is called off.			
The reason for terminating the MTP: massive hemorrhage is ceased or the treatment is called off.			

PRBC: packed red blood cells; FFP: fresh frozen plasma; MTP: massive transfusion protocol.





No. at risk

1:1:2	342	261	253	252
1:1:1	338	269	263	260

Restriktion ist sicher bei Trauma-Patienten

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Patient Characteristics	Liberal Group (n = 103)		Restrictive Group (n = 100)
Mortality rates, n (%)			
30-day	9 (9)		10 (10)
60-day (N = 202)	10 (10)		10 (10)
ICU	6 (6)		8 (8)
Hospital	10 (10)		10 (10)
Organ failure and dysfunction			
MODS (n = 202)	7.7 +/- 3.9		7.9 +/- 4.4
ΔMODS (n = 202)	0.6 +/- 3.8		0.0 +/- 4.4
MODS ^a adjusted for death	9.0 +/- 6.0		9.2 +/- 6.3
ΔMODS ^a - change in MODS adjusted for death	1.9 +/- 5.7		1.2 +/- 6.1
Length of stay			
ICU (days)	10.2 +/- 8.7		9.8 +/- 8.1
Hospital (days)	33.7 +/- 17.7		31.4 +/- 17.1
Transfusions during ICU admission			
Transfusions (units per patient)	5.4 +/- 4.3	**	2.3 +/- 4.4
Proportion transfused, n (%)	103 (100)	**	65 (65)
Average daily hemoglobin concentrations	104.3 +/- 12.2	**	82.7 +/- 6.2
Proportion who developed infection, n (%)	13 (13)		8 (8)
Physician non-adherence, n (%)	7 (7)		3 (3)

Transfusionsalgorithmus



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Diagnostic	Intervention	
Preoperative	On-going diffuse bleeding	
1.	EXTEM /INTEM MCF < 40 mm CT EXTEM /INTEM normal MCF FIBTEM < 7 mm Hct > 0.21	Fibrinogen up to 6 g, followed by Factor XIII 15 U/kg BW crystalloid and colloid volume substitution
2.		
3.	MCF FIBTEM > 7mm Platelets < 50 000/ μ l (< 100 000/ μ l in cardiac surgery or in patients suffering from traumatic brain injury)	Platelet concentrates
Blood loss		
ROTEM	Coagulation test incl. F XIII, F V, INR, PT, aPTT	Target of Factor XIII: > 60% (Factor XIII 15 U/kg BW) Target of Factor V: > 20% (in particular in liver insufficiency /trauma or intra-abdominal sepsis: 2-4 U FFP)
	On-going diffuse bleeding	
	Quick's value < 30% and Factor V > 20 % OR EXTEM/INTEM: CT, CFT prolonged	4 factor prothrombin complex concentrate 1000-2000 IU - Factor II, VII, IX and X Depending on the patient's bodyweight
FIBTEM		
INTEM OR ACT pat	In case of massive transfusion	Target hematocrit: 0.21 -0.24
EXTEM	If massive diffuse bleeding continues and	
Decrease APTEM	Treated acidosis Treated hypothermia Excluded hypocalcemia Hematocrit: 0.21-0.24 Excluded DIC Fibrinogen was substituted Platelets > 50 000/ μ l (> 100 000/ μ l in cardiac surgery or in patients suffering from traumatic brain injury)	Recombinant Factor VIIa 60 μ g/kg bodyweight i.v. A second dose of 60 μ g/kg bodyweight i.v. can be given again after 2-4 hours, if bleeding has not completely stopped.





VI. Treatment pathway

R35
Treatment algorithm

Each institution should implement an evidence-based treatment algorithm for the bleeding trauma patient.

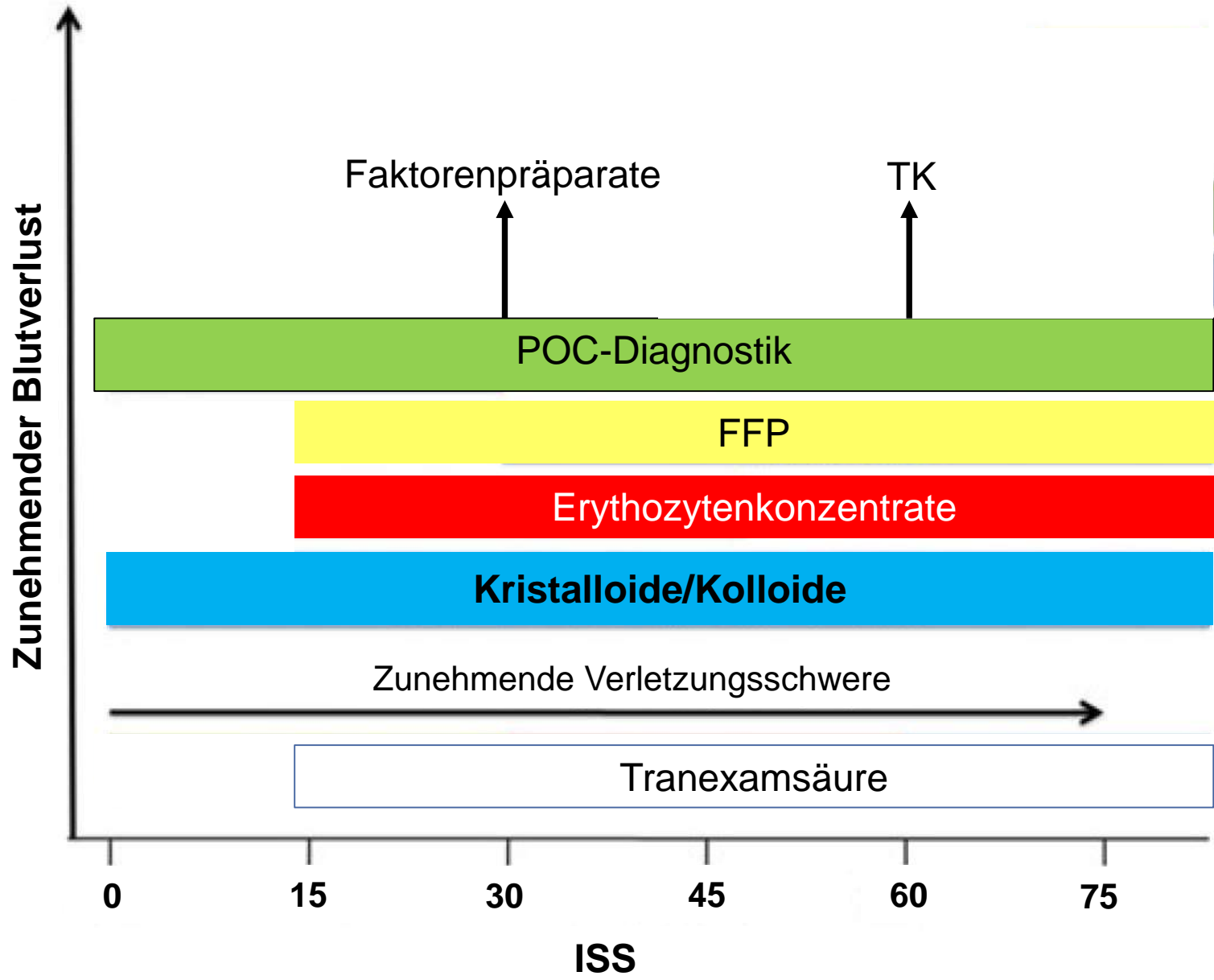
R36
Checklists

Treatment checklists should be used to guide clinical management.

R37
Quality management

Each institution should include an assessment of adherence to the institutional algorithm in routine quality management

Abgestufte Therapieoptionen





- Volumentherapie
 - Früh liberal, spät restriktiv
 - Zielwerte definieren
 - Rationale Therapie (siehe S3-Leitlinie)

- Hämotherapie
 - Transfusion nach individueller Indikation.
 - Transfusionmanagement, um Infusion allogener Blutprodukte zu vermeiden oder wenigstens zu reduzieren.
 - Transfusionsalgorithmen und POC-Diagnostik zur Reduktion

