

Austrian perspective

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conflict of interest:

Braun

přehled



1. nefrologické intro
2. situace v Rakousku
3. přístroje
4. léčebné modality
5. antikoagulace
6. substituce kalcia
7. *patient data monitoring system (PDMS)*
8. *cytokine removal therapy (hemoperfusion)*

nefrologické intro



- v Rakousku je cca **200-900.000** pacientů s **CNI**
- cca **250 nefrologů** se specializovanou způsobilostí
- poměr **muži/ženy** v dialyzačním programu: **60/40**
- ročně cca **430-500** transplantací ledviny
- jedna z mála zemí, kde počet pacientů s **fční ledvinou** převyšuje počet pacientů v **dialyzačním** programu
- první mezinárodní *kidney paired donation* v Evropě: Rakousko – Česko (2016)

intensive care

- **ICU:** incidence **AKI** překračuje i **50%**
- **etiologie:** sepse (40%), hypovolémie (34%), nefrotoxické látky (14%), kardiogenní šok (13%)
- cca **25 %** pacientů s AKI potřebují **RRT**
- **> 30%** pacientů na UPV potřebují **RRT**

*situace
v Rakousku*



CRRT on ICU in Austria

- typy přístrojů
- používané mody
- antikoagulace
- substituce kalcia
- PDMS (*patient data monitoring system*)
- *cytokine removal therapy (hemoperfusion)*

*typy
přístrojů*

intensive care

- **90,9%** ICUs má možnost **CRRT**
- **80,2%** ICUs má možnost **IRRT**
- **35,4%** ICUs má možnost **PIRRT**
- **42,5%** ICUs má možnost ***cytokine removal therapy***
- **58,0%** ICUs má možnost **TP**
- **96,6%** ICUs má možnost **RRT 24/7**



Baxter

≈ 65%



Braun



Fresenius

≈ 35%

*používané
mody*

terapeutické modality

- CVVHD, CVVHDF, CVVH
- PIRRT (prolonged intermittent RRT)
- TPE
- HP
- oXiris, Septex, LPS...
- MARS

*patient
data
monitoring
system*

„ordinaace“

ml	g	g=4kcal
33 %	Glucose	(g=4kcal)
40 %	Glucose	(g=4kcal)
5 %	Amino-mel „hepa“	
10 %	Amino-mel „nephro“	
10 %	Eloamin	
15 %	Eloamin	
	Dipeptiven	
	L - Valin	
20 %	Intralipid (g=9kcal)	
	Omegaven (10% Fett)	
20 %	Humanalbumin	
	Nephromix (800 ml / 380 cal)	
	Clinomel 4% GFE (1000 ml / 1040 kcal)	
	Nutriflex Lip.plus (1875 ml / 1575 kcal)	
Gesamt		

Menge	Rate	Einheit / Perfusion
	ml/h	Kalium - Malat
	ml/h	10 % NaCl
	ml/h	Emgecard (Mg-40)
	ml/h	Cornegesin (Mg-8)
Vitamine/Zusätze		
1		Cemevit (Soluvit/Vitalis)
1		Konakion Di + Fr.
		L-Carnitin
		Folsan / Vit. B 12 Di + Fr.
weitere Zusätze		
		Kationen/Anionen
		Alkohol 50% (20 ml = 70 kcal)

Trinkmenge:	min	max	ml
Sondennahrung			kcal
esenius			O Abbot
.....	ml/h		
.....	ml Bolus/	/ Tag?
/ Galorade / Suppe			
ose 5 %			
Mineralwasser mild			
Normolyt			
Iso Source Standard			
Iso Source Fibre			
Nova Source Start			
Glucerna			
Pulmocare (ml = 1,6 kcal)			
Nova Source GI Kontr.			
Impact			
Impact oral (1B = 250ml / 130kcal)			
Proten Plus (1B = 250ml / 130kcal)			
Sucralfat			
Lactulose / Humatin			
Prepulsid			
Gesamt			

Bypass - Infusionen			
	Lösung	ml/h	ml/h
Bypass 1	RL, NaCl, Aqua	100	
Bypass 2	RL, NaCl, Gl. Aqua, Mannit 20%, Hämlil, Hyperhes		40
Kat.-Byp.	RL, NaCl, Gl. Aqua, Hofcomant, Mannit 20%		
Gesamt			

Stuhl am: _____ 2002	
Einlauf	
Relaxyl	
El. Lactulose	

Tag	Antibiotikum	Dosis	Uhrzeit
	Penicillin	10 M I.E.	
	Floxapen	1,0 g	
	Augmentin	2,2 g	
	Standacillin	2,0 g	
	Tazonam	4g / 0,5 g	
	Kefzol	2,0 g	
	Mandokel	2,0 g	
	Curocef	1,5 g	
	Mefoxitin	2,0 g	
	Claforan	2,0 g	
	Rocephin	2,0 g	
	Kefazim	2,0 g	
	Cefrom	2,0 g	
	Maxiplime	2,0 g	
	Azaktäm	2,0 g	
	Zienam	0,5/1,0 g	
	Optinem	0,5/1,0 g	
	Colistin	1 Mega	

Tag	Antibiotikum	Dosis	Uhrzeit
	Relobacin	80/160/240 mg	
	Tobrasix	80/160/240 mg	
	Certomycin	150/200 mg	
	Biklin	500 mg	
	Ciproxin	200 mg	
	Erythrocin	1,0 g	1 g über 24 Std. 2 ml/h
	Lidaprim	250 ml	
	Klacid	0,5 %	
	Dalacin	600/1200 mg	
	Metronidazol	0,5 g	
	Fosfomycin	4g / 8 g	
	Vancomycin	0,5g / 1 g	
	Targocid	400 mg	
	Zyvox	600 mg	
	Fucidin	500 mg	
	Rifoldin	600 mg	
	Amphotericin B	50 mg	
	Amphocil	100 mg	
	Diffucan	200/400 mg	
	Zovirax	250 mg	
Antibiotika Gesamt-Flüssigkeit / 24 Std. ml			

I.v. - Perfusion: (Standard-Verdünnung 50ml)	ml/h
Dopamin 250 mg	
Dobutamin 250/400 mg	
Suprarenin 5/10 mg (mg=ml)	
Arterenol 5/10 mg (mg=ml)	
Vasopressin / DHE	
Adalat 5 mg pur	
Nimotop 10 mg pur	
Ebrantil 250 mg pur	
Perlinganit 50 mg pur	
Renitec 10 mg 2 Amp.	
Sotacor / Brevibloc 40/2500 mg 1 Amp.	
Sedacoron 900 mg 5 Amp.	
Rytmonorma 2 Amp pur	
Gilurytinal 250 mg 5 Amp.	
Euphyllin 1,2 mg pur pur	
Bricanyl 1 mg Amp.	
Heparin 1.000 I.E. / 1ml ACT.	
Flolan 0,5 mg pur	
Inasul 1 I.E. BZ=100	
Trasyrol 500.000 I.E. pur	
Losec Amp/50	
Dihydroergocristin 1 / 2 % kcal	
Thiopental / Bribetal 2 / 4 g / 500 mg	
Dormicum 50 mg pur 1	
Sufenta 1 / 5 / 20 ml Amp	
Delpal / Truxal 5/10 Amp	
Haldol 4 Amp.	
Clonidin 10 ml	
Rivotril 3 Amp	
Xylanäst Amp	
Lasix 20 / 40 / 250 mg Amp.	
Aldactone Amp	
Takus 1 Amp / 50 ml NaCl	
Naropin 20ml 7,5mg +20ml NaCl + (epidural)	

Medikament	Dosis	Uhrzeit
Digimerck / Lanitop 1 x 6 - 7 - 8		
Alupent / Atropin / Itrop		
Adalat		
Beloc / Sotacor		
Isoptin / Verapabene		
Sedacoron		
Dihydergot (DHE)		
Efortil 1 ml = 10 mg		
Euphyllin		
Bricanyl s.c.		
Aldactone 2 = 200mg		
Lasix / Burinex 3 - 4		

ml	1 x verdünnte Infusionen	Bemerkung
	Ischaes / Voluven	
	Hyperhaes	
	Biseko	
	250 ml Humanalbumin 5%	
	Pentaglobin (x 100 ml / die)	
	75 mg Voltaren / 100 NaCl	
	15 mg Dipidolor (1A) / 10 ml NaCl	
	Schmerzpumpe lt. Protok.	

Richtbilanz			
O Minus - Bilanz	O Plus - Bilanz	O Null - Bilanz	
O ZVD	mmHg	O PAP	mmHg
O PCWP	mmHg		
Gesamt - Einfuhr 24 Std. ml kcal			

Tag	orale Dekontamination	Uhrzeit
	SDD (Tobra, Colistin) 4x tgl 1/1/3/5	
	Mykostatin 4x tgl 1/1/3/5	
	Amphotericin 4x tgl 1/1/3/5	

orale Medikation	Dosis	Uhrzeit
siehe Verordnungsblatt vom _____ 2002		
Mucosolvan 4 ml		

Medikament	Dosis	Uhrzeit
Fortecortin 4/8 / 40 mg 4 x 1		
Solu-Dacortin 250 mg		
Dobondin / Fenistil		
Calcium		
Ambroxene / Mucosolvan 4 x 1		
Nootropil (Starfonyl) 4 x 1		
Metogastrol / Paspertin		
1 A Zofran / Navoban / 100 NaCl		
DXBP		
Zantac		
Fragmin / Heparin 4 x 1		
AT3 / Fibrinoggn		
Prothrombex / Beriplex 500 I.E.		
Recomron / Eryp 10.000 I.E.		
Ferlicit		
Deca - Durabolin 3 x 8 0,9		

"teplotka"

Patient

Datum: 18.03.97

Post-OP-Tag: 4 Größe: 185 Gewicht: 80,66 kg

Allergie oder Ausnahmefaktoren: ETA

ZUGANG	LAGE	TAG	EINSTICHSTELLE
MS Uno	ch 16 re NL	5	o.b.
ZVK	jug. Subcl. dex	5	o.B.
ART	reel. dex	5	
POTM ART	reel. m	1	o.B.
BDK	Rusid Cl 14	5	o.B.
SPBP			
ZVK Quina	subcl. dex	1	o.B.
	CS-AS12-E		

TRACHEALKANÜLE / TUBUS
Typ: Halo Euc 8.0 LOK: Oral 24cm TAG: 2

PFEGEKRAFT: TD: *dule, Supe* NO: *Shue*

ARZT:

MIKROBIOLOGISCHE UNTERSUCHUNGEN:
Ureidit / Bronchiektase / HIV

BS nach Bronchiektase / Lasege



Verlauf/Befunde

Harnstoff-N 2% Biotin 1000 mg 80 ml Ch.E.: 134106	Harnstoff-N 2% Biotin 1000 mg 250 ml Ch.E.: 131126	Harnstoff-N 2% Biotin 1000 mg 250 ml Ch.E.: 131126	Harnstoff-N 2% Biotin 1000 mg 250 ml Ch.E.: 131126
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EINFUHR 24 h	AUSFUHR
HA 5% ml	HARN 6:00-18:00 7450 ml
HA 20% ml	HARN 18:00-6:00 3680 ml
FFP ml	HARN GES. 24 h 11630 ml
VB ml	DRAINAGEN 24 h 300 ml
EK ml	MAGENSACHT 24 h 300 ml

Gesamtbilanz

Einfuhr 24 Std	Summe
Einfuhr ml	1590
Ausfuhr ml	1140
Bilanz ml	+450

Monitoring

50	170	140	37	+10
40	145	120	36	0
30	120	100	35	-10
20	95	80	34	
10	70	60	33	
0	45	40	32	

Lagerung: *Foto Res. L*

VERORDNUNGEN:

GLUCOSE	BZ mg%
147	

Medikamente

REFORACON	1mg/10	240	250
TBAZAM	500	4	50
LOSEC	40	4	
ALDACTONE	500	200	
VERASON	100		
Digoxin	1		

Einfuhr

0.72 Euphyllin	ml/1h	2	
100mg Nifedipin	ml/1h	2	
1000mg Nifedipin	ml/1h	2	
50mg Nifedipin	ml/1h	1	
100mg Nifedipin	ml/1h	3	
2mg Nifedipin	ml/1h	3	
50mg Nifedipin	ml/1h	3	
20mg Nifedipin	ml/1h	1	

Inf./Transf.

H ₂ O	ml	1040	
NaCl	ml	1000	
5% Mannit	ml	100	
5% Mannit	ml	100	
5% Mannit	ml	100	
5% Mannit	ml	100	
5% Mannit	ml	100	
5% Mannit	ml	100	

per OS

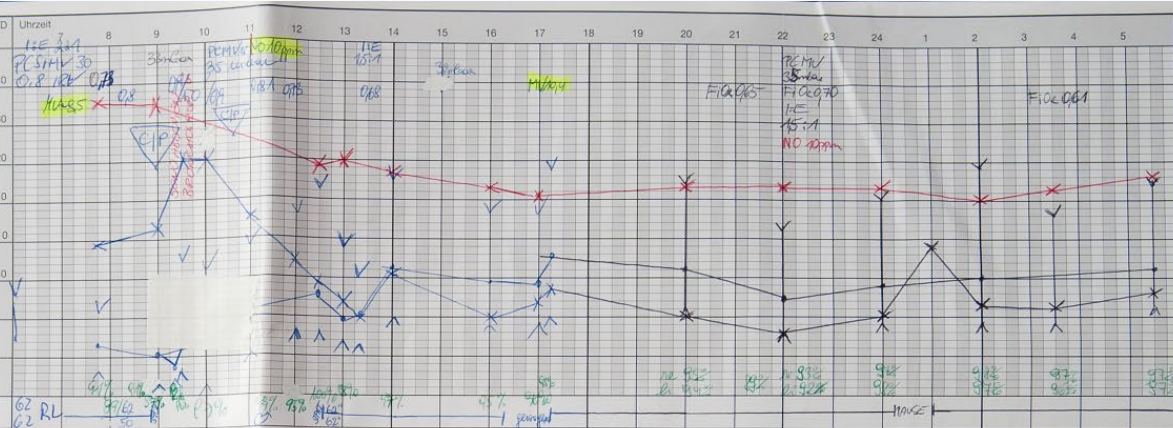
SONDE			
Verweil			

Ausfuhr

URIN	ml	1140	
DRAINAGE 1	ml		
DRAINAGE 2	ml		
FFP	ml		
VB	ml		
EK	ml		

MAGENSACHT

MAGENSACHT	ml	100	
ERBRECHEN	ml		
STUHL	ml		



ZEIT DER VERABREICHUNG MENGE in ml

6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24:00	1:00	2:00	3:00	4:00	5:00
147				140	135	133		50				164				235	400					354	204

Medikamente

REFORACON	1mg/10	240	250
TBAZAM	500	4	50
LOSEC	40	4	
ALDACTONE	500	200	
VERASON	100		
Digoxin	1		

Einfuhr

0.72 Euphyllin	ml/1h	2	
100mg Nifedipin	ml/1h	2	
1000mg Nifedipin	ml/1h	2	
50mg Nifedipin	ml/1h	1	
100mg Nifedipin	ml/1h	3	
2mg Nifedipin	ml/1h	3	
50mg Nifedipin	ml/1h	3	
20mg Nifedipin	ml/1h	1	

Inf./Transf.

H ₂ O	ml	1040	
NaCl	ml	1000	
5% Mannit	ml	100	
5% Mannit	ml	100	
5% Mannit	ml	100	
5% Mannit	ml	100	
5% Mannit	ml	100	
5% Mannit	ml	100	

per OS

SONDE			
Verweil			

Ausfuhr

URIN	ml	1140	
DRAINAGE 1	ml		
DRAINAGE 2	ml		
FFP	ml		
VB	ml		
EK	ml		

MAGENSACHT

MAGENSACHT	ml	100	
ERBRECHEN	ml		
STUHL	ml		

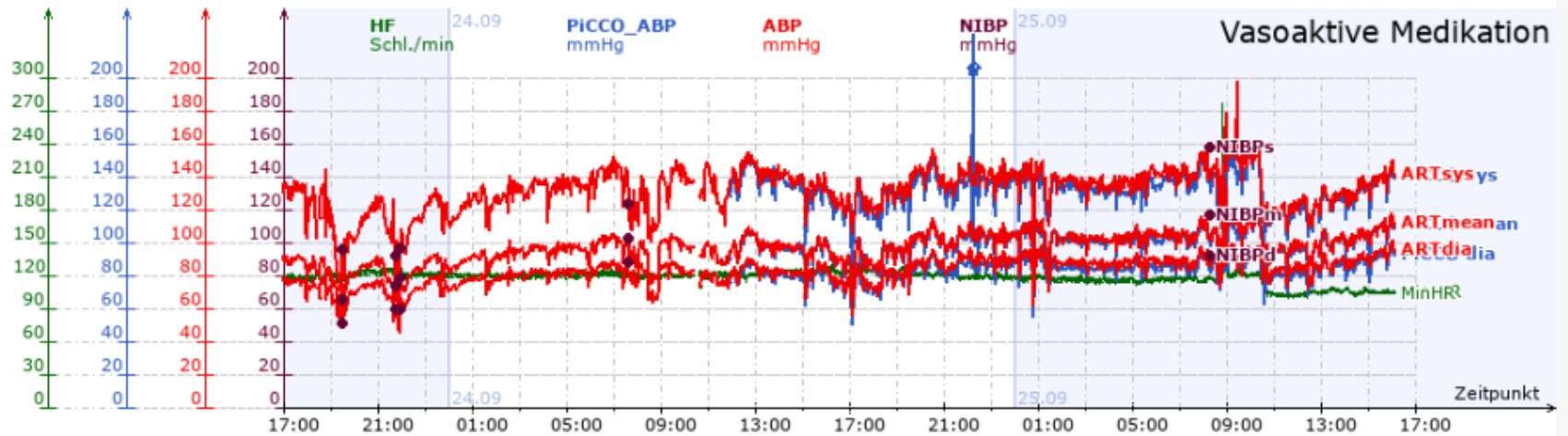
Bilanz

Summe	10:00	14:00	18:00	22:00	2:00	6:00
Summe E	1590	2390	2470	1620	1170	1890
Summe A	1140	4150	3100	1800	1130	1760
Bilanz	+450	-1760	-640	-180	+640	+1060

HÄMODYNAMIK

Trend PICCO

Vasoaktive Medikation



23.09.2019 - 25.09.2019	17	19	21	23	01	03	05	07	09	11	13	15	17	19	21	23	01	03	05	07	09	11	13	15	Gesamt
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Medikamente

Regelmässig																										
Cormagnesin 400 mg / 100 ml NaCl KI 4 mg/ml		400						400																		800 mg
Inspira 50 mg - Filmtbl. 50 mg/Tabl								25													25					50 mg
Solu-Cortef NaCl 0.9 % 1 mg/ml		100																								100 mg 100 ml

Medikamenteninfusionen

Ziel																										
Dobutamin 250 mg / 50 ml 5 mg/ml	6	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	15 !	2921 mg
Perfusor	4	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	[ug/kg/min]
NORadrenalin 5mg Perfusor 0.1 mg/ml							8 !	8 !	8 !											8 !	8 !					24.5 mg
Perfusor							0.107	0.107	0.107											0.107	0.107					[ug/kg/min]
NORadrenalin 5mg Perfusor 0.1 mg/ml	10 !	8 !	8 !	7 !			7 !	7 !	7 !				7 !						7 !	7 !						35.4 mg
Perfusor	0.133	0.107	0.107	0.093			0.093	0.093	0.093				0.093						0.093	0.093						[ug/kg/min]
Rapibloc 300 mg Perfusor 6 mg/ml																								2 !		68.7 mg
Perfusor																										
Simdax 0.23 mg/ml Glukose 5% 0.91 ml/ml 12,5mg/50ml	1.5						2 !	2 !							1 !								2 !			15.6 mg 62.4 ml
	0.045						0.061	0.061							0.03								0.061			[ug/kg/min]

CVVHDF

29.05.2015 00:00 - 04.06.2015 23:59

	29.05	30.05	31.05	01.06	02.06	03.06	04.06
	-						
	BGA						
#CCAI [mmol/l]	1.08	1.07	0.99	1.05	1.08	1.13	1.16
CA [mmol/l]	2.24	2.12	2.14	2.09	2.06	2.2	2.31
#HCO3I-A [mmol/l]	31.2	33.9	32.2	36.6	37	33.7	33.1
#PHI-A	7.47	7.51	7.51	7.49	7.5	7.47	7.48
#LAK-I-A [mmol/l]	1.2	0.8	0.4	0.8	0.4	0.4	0.4

05.06.2015 00:00 - 11.06.2015 23:59

	05.06	06.06	07.06	08.06	09.06	10.06	11.06
CiConc [mmol/L]				75	75	75	
CiDose [mmol/l]				3.5	3.6	3.6	
	-						
Blutfluß [ml/min]				120	120	120	
PBP Fl. [ml/h]				223	229	229	
Dialysat Fl. [ml/h]				0	0	0	
Substit. Fl. [ml/h]				750	750	750	
Entzug/h (s)				0	0	0	
CaComp [%]				100	100	100	
	BGA						
#Ca postFilt [mmol/l]				0.36	0.35	0.37	
#CCAI [mmol/l]	1.14	1.15	1.14	1.21	1.17	1.15	1.09
CA [mmol/l]		2.35	2.38	2.76	2.66	2.62	2.28
#HCO3I-A [mmol/l]	30.2	35	33.9	34.9	34.5	35.3	34.3
#PHI-A	7.46	7.48	7.49	7.48	7.46	7.47	7.48
#LAK-I-A [mmol/l]	0.4	0.6	0.7	0.6	0.7	0.7	0.8

Prismaflex Citrat 24h

10.06.2015 15:00 - 11.06.2015 02:59

	15:00	16:00	17:00	18:00	19:00
CRRT Verfahren	Ther plasma exchange	Ther plasma exchange	Ther plasma exchange	Ther plasma exchange	
Blutfluß [ml/min]	120	120	120	120	
Entzug/h (s)	0	0	0	0	
Dialysat Fl. [ml/h]	0	0	0	0	
PBP Fl. [ml/h]	229	229	229	229	
Substit. Fl. [ml/h]	750	750	750	750	
Sub.pre Flow [ml/h]	0	0	0	0	
Ultra. Flow [ml/h]	750	750	750	750	
Zugangsdruck [mmHg]	-39	-30	-31	-35	
Filterdruck [mmHg]	81	78	73	70	
TMP - [mmHg]	25	26	22	23	
Rückfl.Druck [mmHg]	30	31	25	23	
Ablaufdruck [mmHg]	26	27	21	18	
FDP [mmHg]	28	24	21	20	
DialysatVolC [ml]	0	0	0	0	
Ultra. Volum [ml]				3000	
UltraFVolC [ml]	868	1631	2389	2982	
SubstPost C [ml]	884	1647	2405	2991	
SubstPrä C [ml]	0	0	0	0	
OUTdial(cm) [ml]	-16	-16	-16	-9	
#Ca postFilt [mmol/l]			0.37		
#Probearth		CICA	CICA	n. spez.	
BloodVol [L]	10	17	24	30	
CaComp [%]	100	100	100	100	
CaConc [mmol/L]	80	80	80	80	
CaFlow [mL/h]	0	0	0	0	
CiAcidConc [mmol/L]	38	38	38	38	
CiConc [mmol/L]	75	75	75	75	
CiDose [mmol/l]	3.6	3.6	3.6	3.6	
CiLoad [mmol/L]	20.3	20.3	20.3	20.3	
FluidRemoved [ml]	0	0	0	0	
UFratio [%]	10	10	10	10	
RelusIntroval [h]	6	6	6	6	

antikoagulace

types of anticoagulation

1. systemic anticoagulation

UFH, LMWH

prostacycline, direct thrombin inhibitors (argatroban)

serine protease inhibitors (nafamostat mesilate)

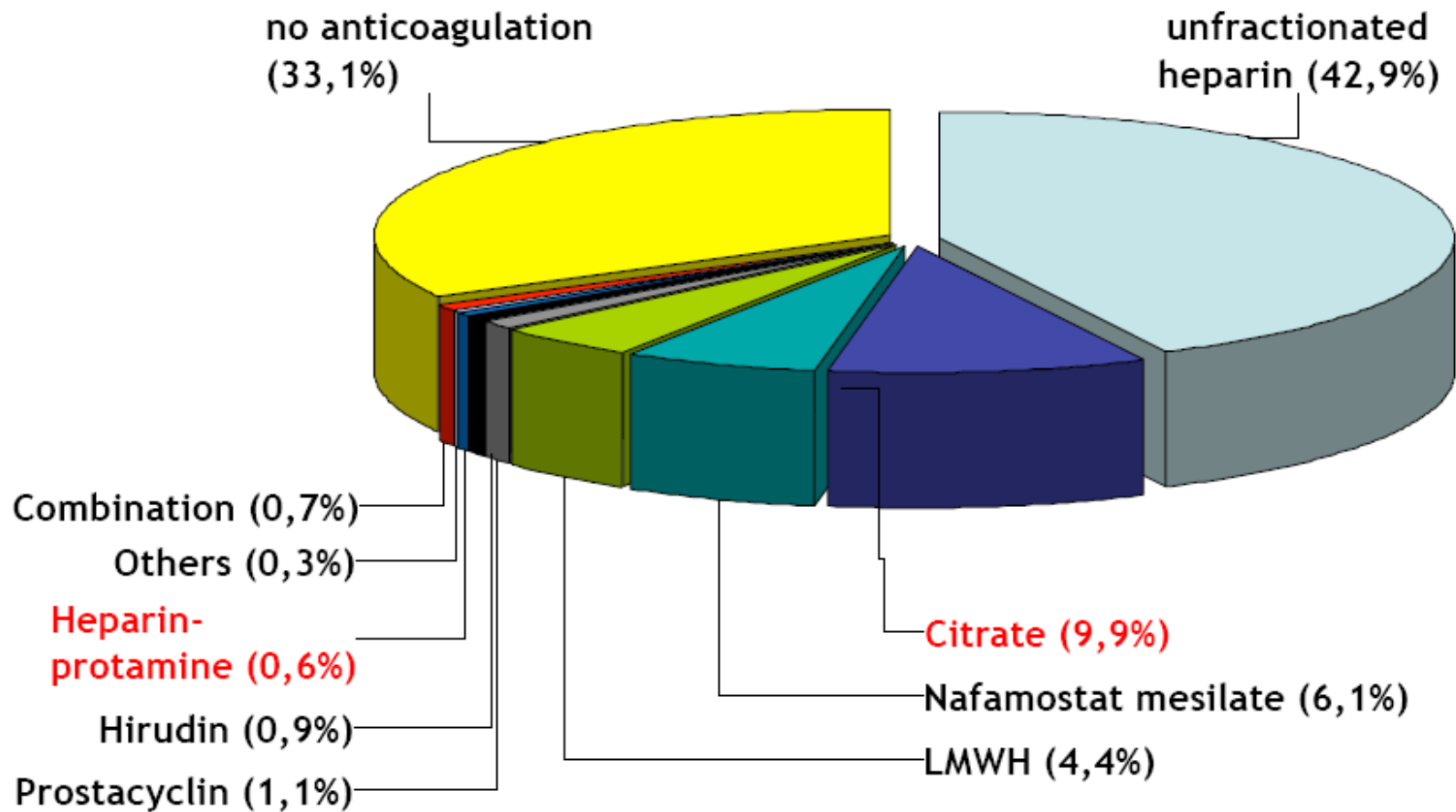
2. regional anticoagulation

citrate

heparin/protamine

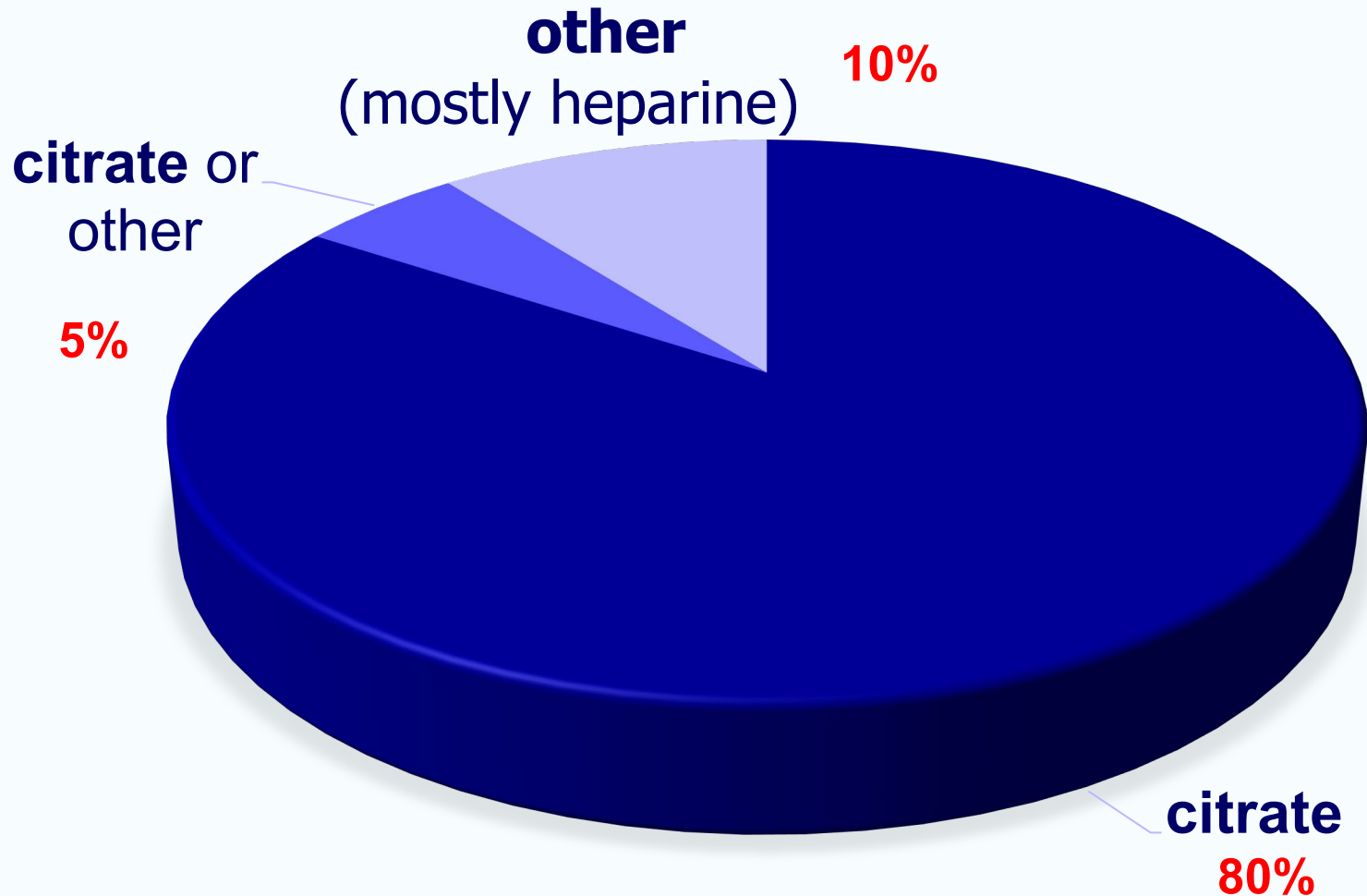
3. no anticoagulation

saline flushes



CRRT and anticoagulation, Uchino, ICM 2007.

Austria 2014



Formen/Protokolle der Antikoagulation bei Nierenersatz			
	Ohne Blutungsgefahr		Mit Blutungsgefahr
Keine Antikoagulation			
Kontinuierlich		5,7	16,5
Intermittierend		5,8	22,8
Unfraktioniertes Heparin			
Kontinuierlich		49	15,2
Intermittierend		63,3	24
FH/ Faktor-Xa-Antagonisten			
Kontinuierlich		3,4	1,9
Intermittierend		4,5	1,5
Argatroban			
Kontinuierlich		16,8	7,8
Intermittierend		13,1	5,7
Heparinbeschichtete Membran			
Kontinuierlich		8,1	6,1
Intermittierend		7,3	6,5
Zitrat			
Kontinuierlich		72,6	79,5
Intermittierend		21,1	31,6

JAMA | **Original Investigation**

Effect of Regional Citrate Anticoagulation vs Systemic Heparin Anticoagulation During Continuous Kidney Replacement Therapy on Dialysis Filter Life Span and Mortality Among Critically Ill Patients With Acute Kidney Injury

A Randomized Clinical Trial


Alexander Zarbock, MD; Mira Küllmar, MD; Detlef Kindgen-Milles, MD; Carola Wempe, PhD; Joachim Gerss, PhD; Timo Brandenburger, MD; Thomas Dimski, MD; Bartosz Tyczynski, MD; Michael Jahn, MD; Nils Mülling, MD; Martin Mehrländer, MD; Peter Rosenberger, MD; Gernot Marx, MD; Tim Philipp Simon, MD; Ulrich Jaschinski, MD; Philipp Deetjen, MD; Christian Putensen, MD; Jens-Christian Schewe, MD; Stefan Kluge, MD; Dominik Jarczak, MD; Torsten Slowinski, MD; Marc Bodenstein, MD; Patrick Meybohm, MD; Stefan Wirtz, MD; Onnen Moerer, MD; Andreas Kortgen, MD; Philipp Simon, MD; Sean M. Bagshaw, MD; John A. Kellum, MD; Melanie Meersch, MD; for the RICH Investigators and the Sepnet Trial Group

IMPORTANCE Although current guidelines suggest the use of regional citrate anticoagulation (which involves the addition of a citrate solution to the blood before the filter of the extracorporeal dialysis circuit) as first-line treatment for continuous kidney replacement therapy in critically ill patients, the evidence for this recommendation is based on few clinical trials and meta-analyses.

OBJECTIVE To determine the effect of regional citrate anticoagulation, compared with systemic heparin anticoagulation, on filter life span and mortality.

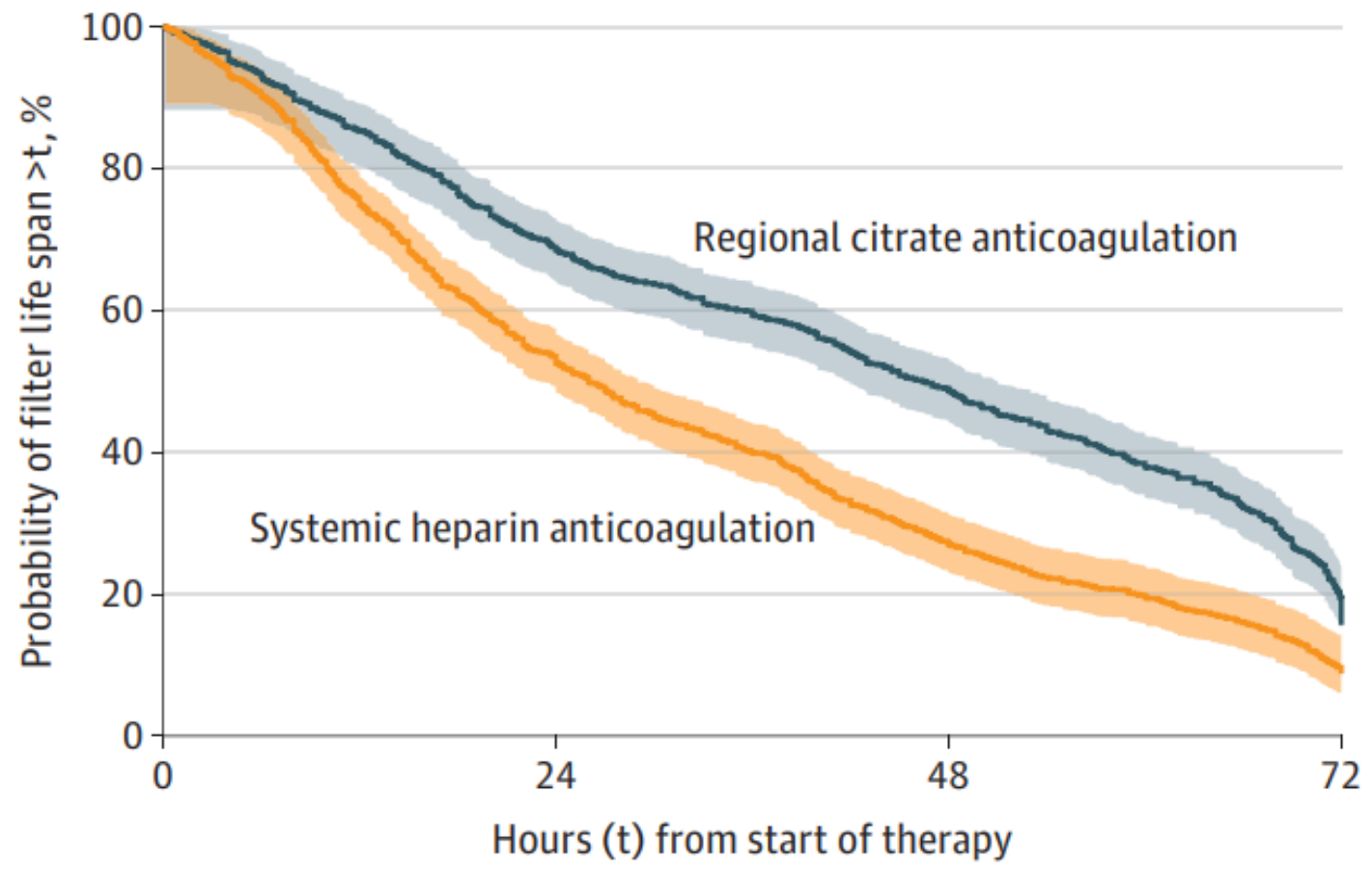
 [Visual Abstract](#)

 [Supplemental content](#)

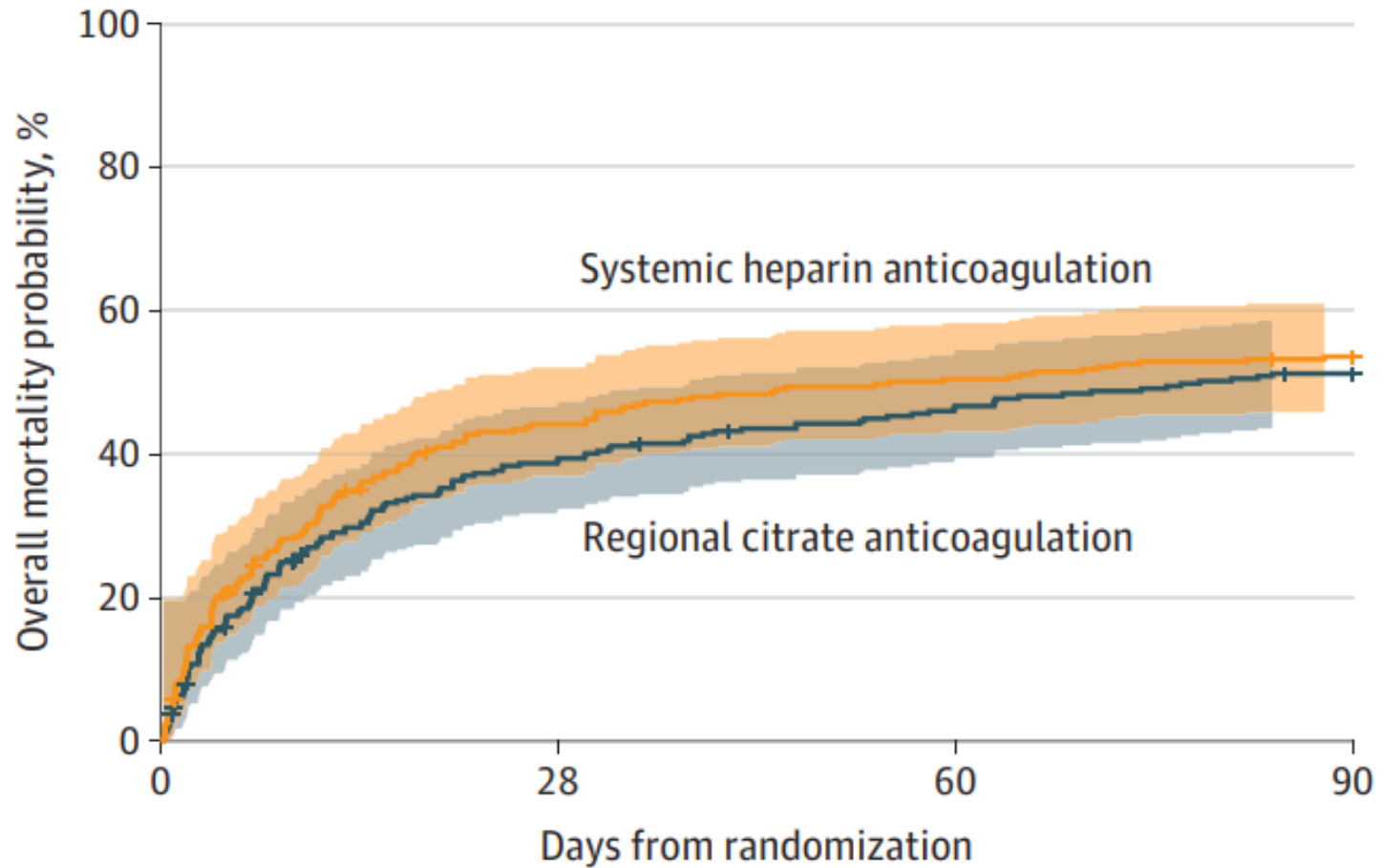
 [CME Quiz at
jamacmelookup.com](#)

- from III/2016 to XII/2018 (end of follow-up **I/2020**)
- **26 ICUs** in Germany
- **638** patients enrolled (5.069 patients screened)
- **primary** end-points:
 - **dialysis filter life span**
 - **90-day all-cause mortality**
- **secondary** end points:
 - 38 others prespecified end points
- trial was **stopped early** (end of the trial was reached)

A Circuit survival truncated at 72 h



B 90-d overall mortality



	<i>citrate</i>	<i>heparine</i>	P
median filter life span	47 h	26 h	< 0.001
90day all-cause mortality	51,2 %	53,6 %	0.38
bleeding complications	5,1 %	16,9 %	< 0.001
new infections	68,0 %	55,4 %	0.002
36 secondary end points			NS

anticoagulation with regional **citrate** resulted in significantly **longer filter life span**

the trial was **terminated early** and was therefore **underpowered** to reach conclusions about the effect of anticoagulation strategy on **mortality**

***substituce
a monitorace
kalcia***

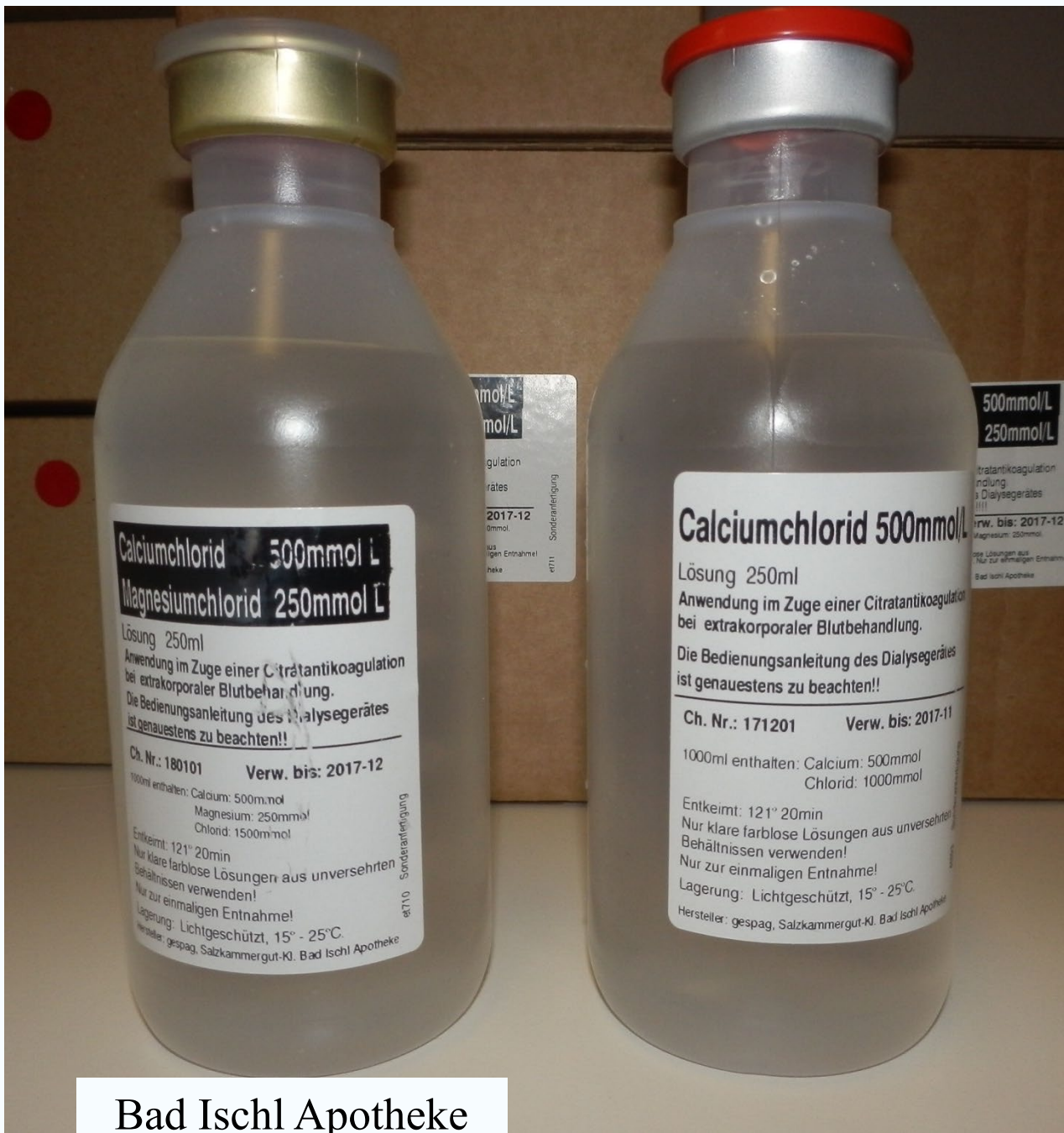
substituce kalcia

dříve:

- calcium chloride 10%
- 2x denně kontrola Ca, Na, K, P, Mg

nyní:

- calcium : magnesium 2:1 mmol/l
- kontrola 1x denně (rutinní odběry)
- takřka odpadla nutnost substituce magnésia



Bad Ischl Apotheke

Calciumchlorid 500mmol/L
Magnesiumchlorid 250mmol/L

Lösung 250ml

Anwendung im Zuge einer Citratantikoagulation bei extrakorporaler Blutbehandlung.

Die Bedienungsanleitung des Dialysegerätes ist genauestens zu beachten!!

Ch. Nr.: 180101 Verw. bis: 2017-12

1000ml enthalten: Calcium: 500mmol
Magnesium: 250mmol
Chlorid: 1500mmol

Entkeimt: 121° 20min

Nur klare farblose Lösungen aus unversehrten Behältnissen verwenden!

Nur zur einmaligen Entnahme!

Lagerung: Lichtgeschützt, 15° - 25°C.

Hersteller: gespag, Salzkammergut-Kl. Bad Ischl Apotheke

84710 Sonderanfertigung

Calciumchlorid 500mmol/L

Lösung 250ml

Anwendung im Zuge einer Citratantikoagulation bei extrakorporaler Blutbehandlung.

Die Bedienungsanleitung des Dialysegerätes ist genauestens zu beachten!!

Ch. Nr.: 171201 Verw. bis: 2017-11

1000ml enthalten: Calcium: 500mmol
Chlorid: 1000mmol

Entkeimt: 121° 20min

Nur klare farblose Lösungen aus unversehrten Behältnissen verwenden!

Nur zur einmaligen Entnahme!

Lagerung: Lichtgeschützt, 15° - 25°C.

Hersteller: gespag, Salzkammergut-Kl. Bad Ischl Apotheke

500mmol/L
250mmol/L

gulation
rates

2017-12
0mmol

us
igen Entnahme!

heke

er11 Sonderanfertigung

500mmol/L
250mmol/L

trantikoagulation
ndlung
u Dialysegerätes

!!!

rw. bis: 2017-12

Magnesium: 250mmol

oge Lösungen aus
Nur zur einmaligen Entnahme!

Bad Ischl Apotheke

***cytokine
removal
therapy***

cytokine removal therapy

- Cytosorb[®]



- Jafron[®]



- Oxiris[®]

- Septex[®]

- LPS[®] filter

- ...

cartridges

selective

cutoff point \approx 60 kDa

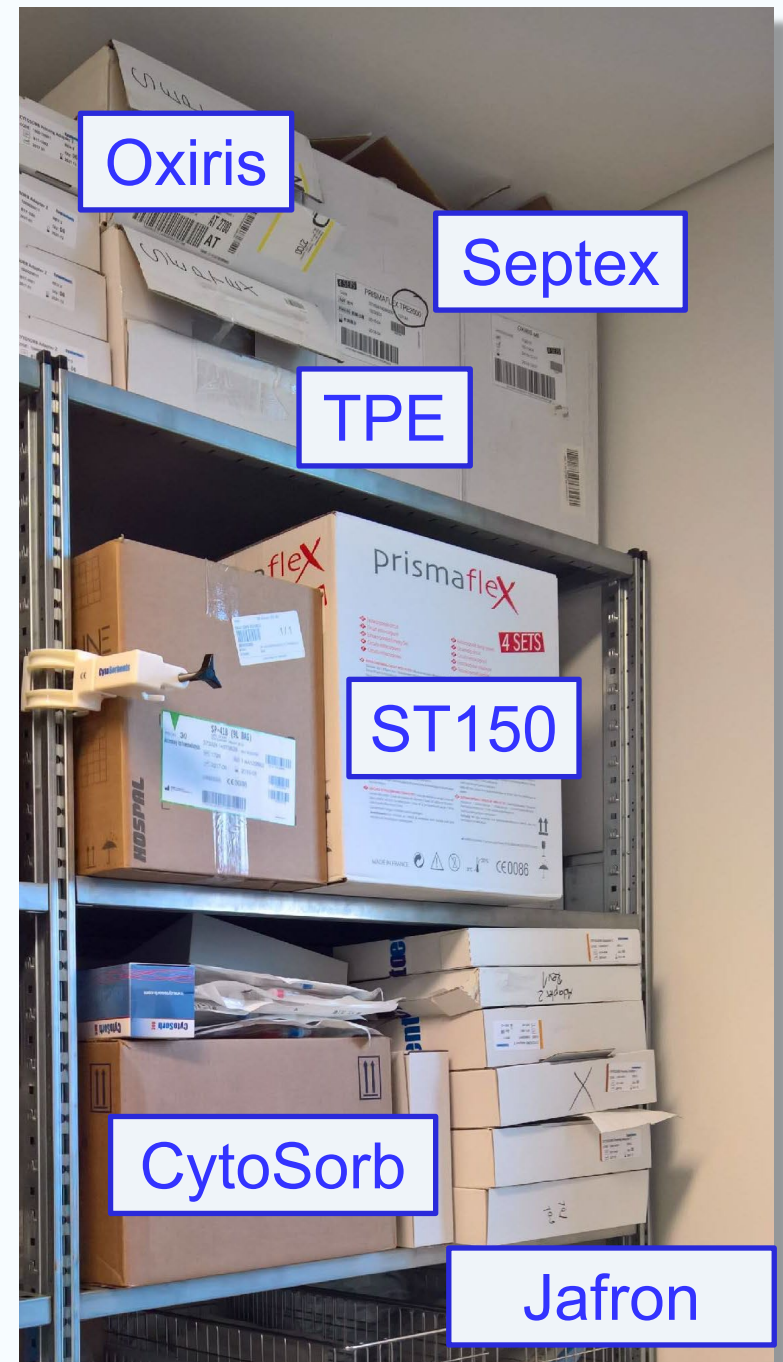
polymyxin B

non-selective

cutoff point \approx 100 kDa

Cytosorb[®] USA

Jafron[®] China



cytokine removal therapy

- sepsse a septický šok
- rhabdomyolýza (*crush syndrom*)
- jaterní selhání
- intoxikace (lékové či jiné)
- SIRS (st.p. CPR, akutní pankreatitida)
- *many others ...*

obecně přijímané indikace neexistují

Hemoadsorption

with Jafron hemoperfusion cartridge HA330/HA380

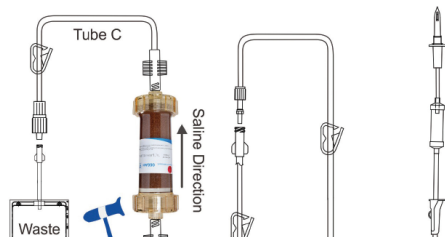
ON PRISMAFLEX OR PRISMAX WITH CITRATE ANTICOAGULATION

Machine setup : CVVHDF therapy

- Set up as usual with a ST 150 dialyzer and citrate anticoagulation (Prismocitrate 18/0 mmol)
- **Timing:** Once the machine completes its first rinsing cycle, put it on hold and proceed with the steps below.

Priming of the hemoperfusion cartridge

- Connect the male luer lock of the infusion line (with closed clamp) to the female connector of tube B (with closed clamp). Connect the other end of this infusion line to the physiological saline solution.
- Open the clamps on both tubes to fill the lines with physiological saline solution and remove all air bubbles. Once the tubes are filled with this saline solution, close the clamp on tube B.
- Open the inlet side of the HA330/HA380 cartridge (top) with the wrench provided in the packaging. Pay attention not to get air inside the cartridge. Connect the inlet side of the cartridge to tube B.
- Turn the cartridge upside down, open the outlet side of the HA330/HA380 cartridge (bottom) with the same wrench and connect to tube C. Connect the other end of tube C to the waste bag.
- Keeping the cartridge upside down, insert it on the cartridge holder. Open the clamp on tube B and prime the cartridge with 2 L of physiological saline solution. During the priming, tap the cartridge gently with the rubber hammer to facilitate air removal.
- After priming, close all clamps.



GENERAL CHARACTERISTICS OF THE THERAPY

- Jafron hemoperfusion cartridge: HA330/HA380 (location: post-dialyzer)
- Dialyzer: standard dialyzer (e.g. ST 150 [AN 69, 1,5 m²])
- Blood flow: 120-130 ml/min
- Anticoagulant: Prismocitrate 18/0 mmol
- Dialysate/substitution fluid: Phoxilium (Ca⁺⁺ Mg⁺⁺ combination)
- Post-cartridge Ca⁺⁺ concentration: 0,25 – 0,30 mmol/L

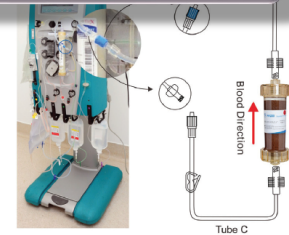
MATERIALS REQUIRED FOR HEMOADSORPTION

- HA hemoperfusion cartridge + wrench (included in packaging)
- Rubber hammer

Connection of the cartridge to PRISMAFLEX or PRISMAX

- Disconnect tube B from the infusion line.
- On the PRISMAFLEX or PRISMAX system, disconnect the male luer lock of the tube connected to the venous side of the dialyzer (going to the bubble trap). Now connect this male luer lock to the female connector of tube B. You have now connected the dialyzer to the hemoperfusion cartridge.
- Disconnect tube C from the waste bag and connect it to the line going to the venous bubble trap.

February '20



Starting therapy

- After integrating the hemoperfusion cartridge into the extracorporeal circuit, start the second rinsing cycle of the machine with 1 L of physiological saline solution.
- Once the second rinsing cycle has completed, connect the patient and begin therapy

- Blood flow ≈ 80 ml/min
- Citrate ≈ 5,2-5,6 mmol/min
- Ca⁺⁺ compensation ≈ 100%
- Increase the blood flow to 120-130 ml/min

After 1 hour of therapy:

- Measure and adjust the citrate dose to a post-filter Ca⁺⁺ concentration of 0,25-0,30 mmol/L
- Measure and adjust the ionized body Ca⁺⁺ concentration to 1,15-1,25 mmol/L using a Ca⁺⁺ substitution

After 6-12 hours of therapy:

- Measure and adjust the values (defined above)

Changing the hemoperfusion cartridge

Recommendation: “2+1+1” therapy

Day 1: 2 cartridges (1 every 12 hours) | Days 2-3: 1 cartridge (1 every 24 hours)

Day 1: The first and second hemoperfusion cartridges

- **Timing:** after 12 hours, rinse the extracorporeal circuit with physiological saline to flush the dialyzer and hemoperfusion cartridge
 - Change the hemoperfusion cartridge and its connectors. The CRRT system may be used up to 72 hours if there is no clotting.
 - However, if there are signs of clotting, change the entire CRRT system.

Day 2: The third hemoperfusion cartridge

- **Timing:** after 24 hours, repeat the steps defined for Day 1.

Day 3: The fourth hemoperfusion cartridge

- **Timing:** after 24 hours, repeat the steps defined for Day 1.
- If necessary, continue CVVHDF therapy.

Stopping therapy

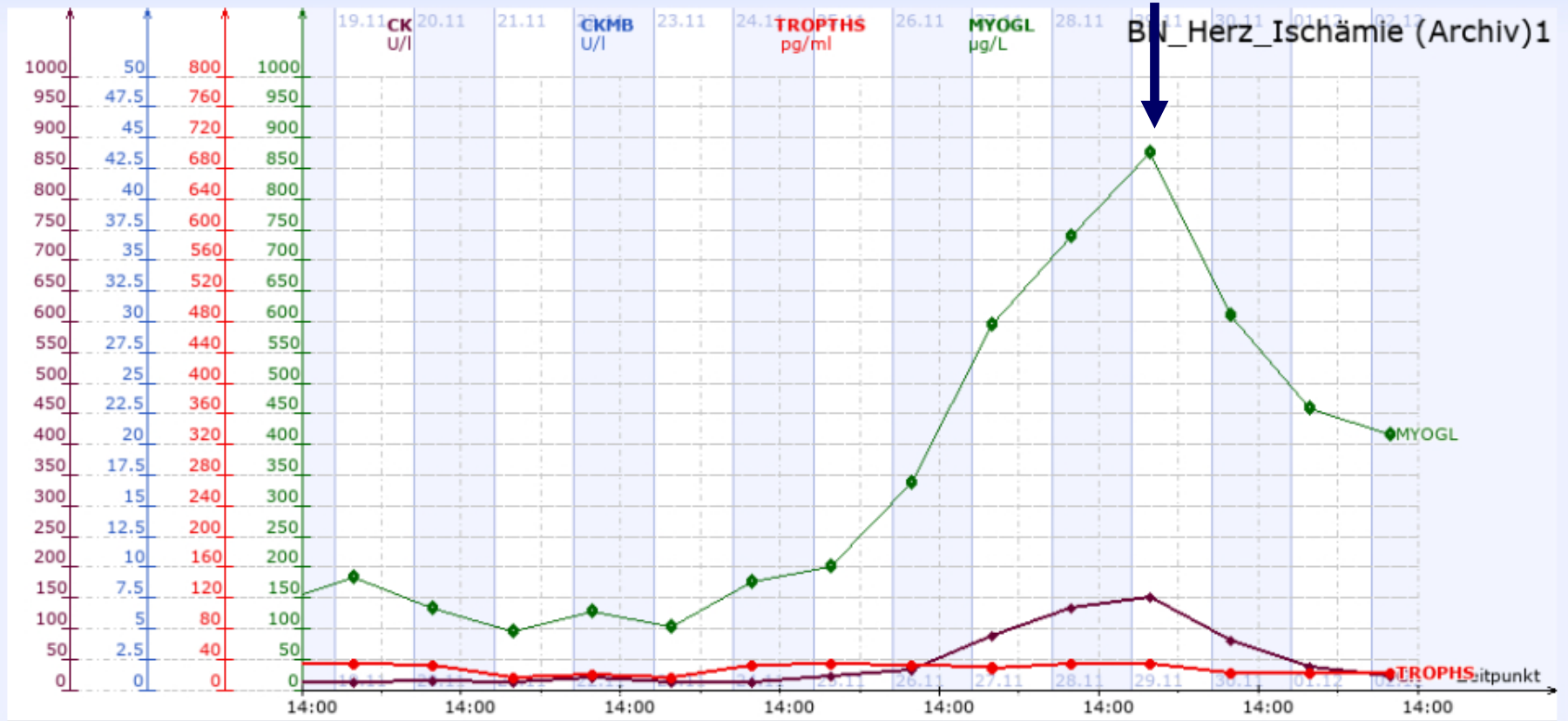
- **Timing:** after having performed the “2+1+1” therapy or when the desired goals have been achieved (e.g. a marked reduction of vasopressor)



Herz_Iσχämie

18.11.2017 14:00 - 02.12.2017 14:00

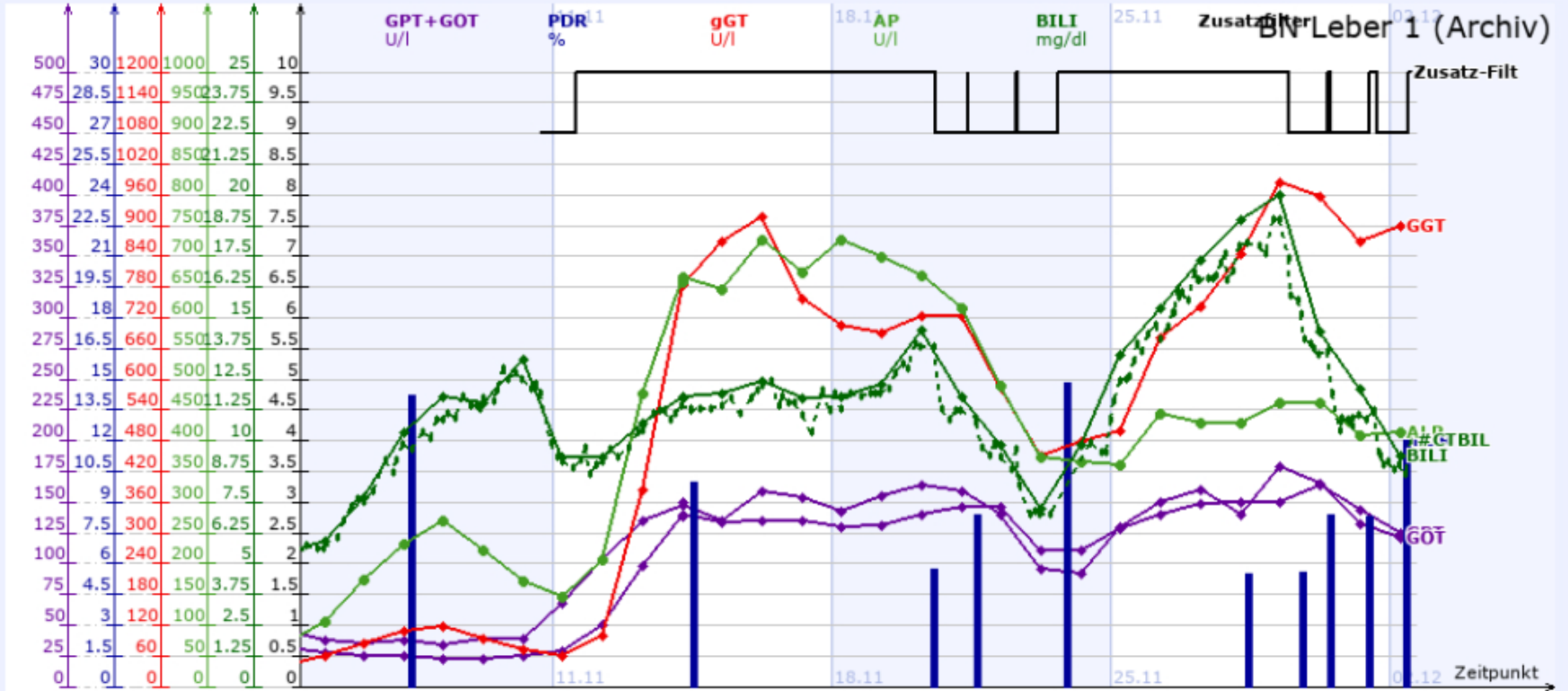
Cytosorb



crush syndrom

Leber2

04.11.2017 15:00 - 02.12.2017 15:00



liver failure - bridging

**High dose coupled plasma filtration and adsorption in septic shock patients.
Results of the COMPACT-2: A multicentre, adaptive, randomised clinical trial.**

Garbero E, Livigni S, Ferrari F, Finazzi S, Langer M, Malacarne P, et al.

Intensive Care Medicine 2021; 47:1303-1311

Cytokine adsorption in severe, refractory septic shock.

Wendel Garcia PD, Hilty MP, Held U, Kleinert EM, Maggiorini M.

Intensive Care Medicine 2021; 47:1334-1336

Adjuvant therapeutic plasma exchange in septic shock.

David S, Bode C, Putensen C, Welte T, Stahl K.

Intensive Care Medicine 2021; 47:352-354

Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021

KEY WORDS: adults; evidence-based medicine; guidelines; sepsis; septic shock

INTRODUCTION

Sepsis is life-threatening organ dysfunction caused by a dysregulated host response to infection (1). Sepsis and septic shock are major healthcare problems, impacting millions of people around the world each year and killing between one in three and one in six of those it affects (2–4). Early identification and appropriate management in the initial hours after the development of sepsis improve outcomes.

The recommendations in this document are intended to provide guidance for the clinician caring for adult patients with sepsis or septic shock in the hospital setting. Recommendations from these guidelines cannot re-

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Blood Purification

Recommendations

59. For adults with sepsis or septic shock, we **suggest against** using polymyxin B hemoperfusion.
Weak recommendation; low quality of evidence.
60. There is insufficient evidence to make a recommendation on the use of other blood purification techniques.

Further research is needed to determine the effect of various blood purification techniques on patient outcomes.

the most important unanswered questions

Point-1: Which patient would benefit the most from cytokine removal?

Point-2: When to start cytokine removal therapy in sepsis?

Point-3: How long should cytokine removal therapy last and how long should it be continued?

Point-6: Which biomarker should be the most appropriate to look at cytokine removal therapy in patients with septic shock?



CHRONIK

ÖSTERREICH

09.06.2020

Kinderwunsch-Klinik: Tödlicher Keim statt Schwangerschaft



Austrian Perspective



...děkuji Vám za pozornost