Invisible fluids

- skrytý problém intenzivní medicíny

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no conflict of interest

OA Dr. Stibor B.

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přehled

1. perioperační období
2. *critical care*
3. septický šok
4. jaké krystaloidy?
5. septický šok
6. *invisible fluids* – kde se berou?

perioperační období

Conference on 'Malnutrition matters'

Symposium 3: Death by drowning
A meta-analysis of randomised controlled trials of intravenous fluid therapy in major elective open abdominal surgery: getting the balance right

Krishna K. Varadhan and Dileep N. Lobo*
Division of Gastrointestinal Surgery, Nottingham Digestive Diseases Centre, NIHR Biomedical Research Unit, Nottingham University Hospi

Proceedings of the Nutrition Society (2010), **69**, 488–498

RESEARCH Open Access

The effect of excess fluid balance on the mortality rate of surgical patients: a multicenter prospective study

João M Silva Jr[1,2,4*], Amanda Maria Ribas Rosa de Oliveira[2,3], Fernando Augusto Mendes Nogueira[1], Pedro Monferrari Monteiro Vianna[1], Marcos Cruz Pereira Filho[1], Leandro Ferreira Dias[1], Vivian Paz Leão Maia[1], Cesar de Souza Neucamp[1], Cristina Prata Amendola[3], Maria Jos

Silva *et al. Critical Care* 2013, **17**:R288

variables	*not exc.*	*exc.*	*P*
postOP organ dysfunktion	57,1	77,4	**<0,001**
cardiovascular	39,6	63,2	**<0,001**
neurological	13,2	46,2	**<0,001**
respiratory	11,6	34,3	**<0,001**
renal	19,9	20,0	0,990
coagulation	12,4	13,2	0,825
urin output in the first 24h	1.300	1.050	**0,034**
infection	25,9	41,9	**0,001**
ICU stay (days)	3,0	4,0	**<0,001**
hospital stay (days)	15,0	15,0	0,809

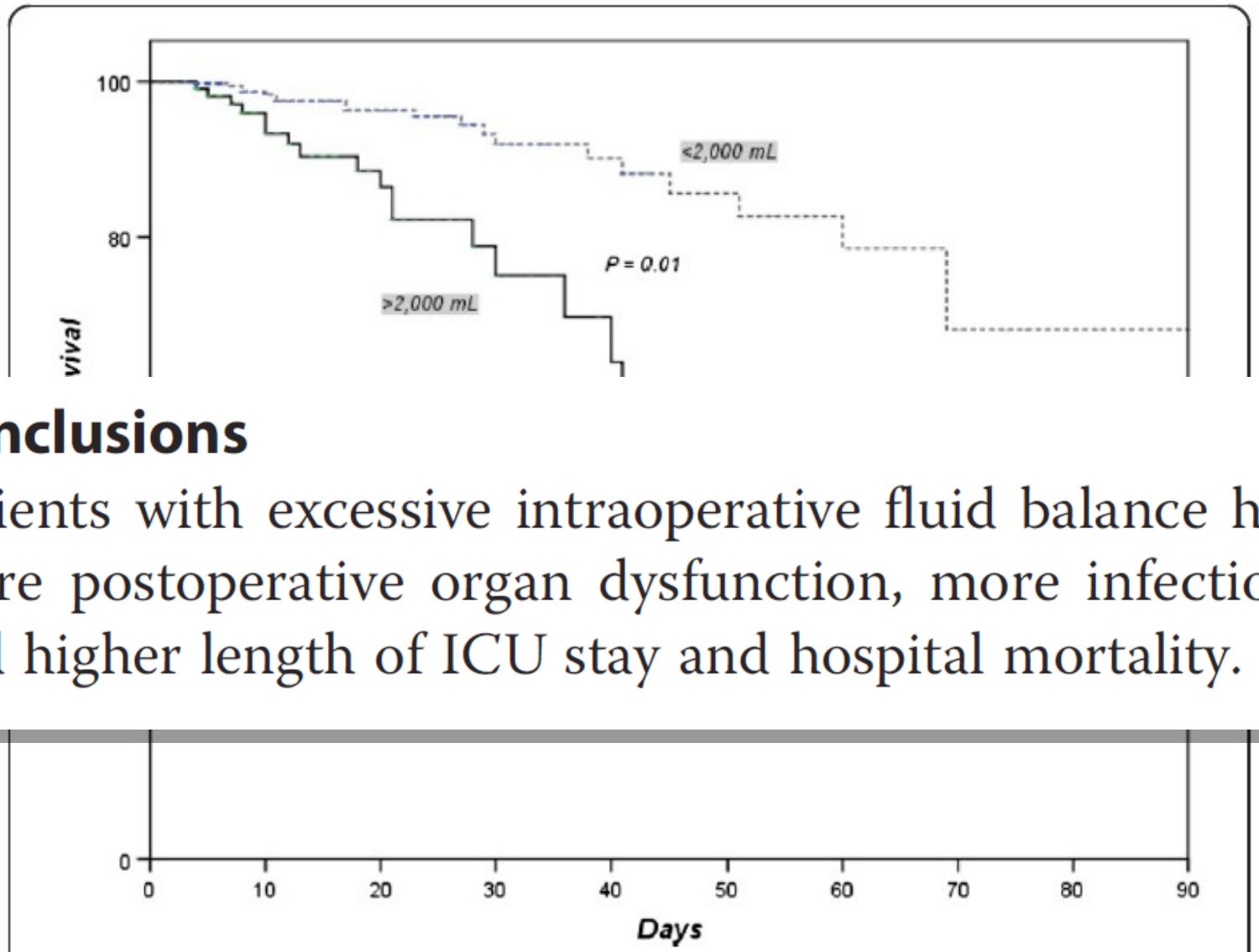


Figure 2 Kaplan-Meier curve among patients with or without excessive fluid balance up to 90 days.

Conclusions

Patients with excessive intraoperative fluid balance have more postoperative organ dysfunction, more infections, and higher length of ICU stay and hospital mortality.

critical

care

British Journ

SPECIAL AR

BJA

Four phase

al model†

E. A. Hoste[1,2], K. M

n[9], M. G. Mythen[10]

and A. D. Shaw[11] f

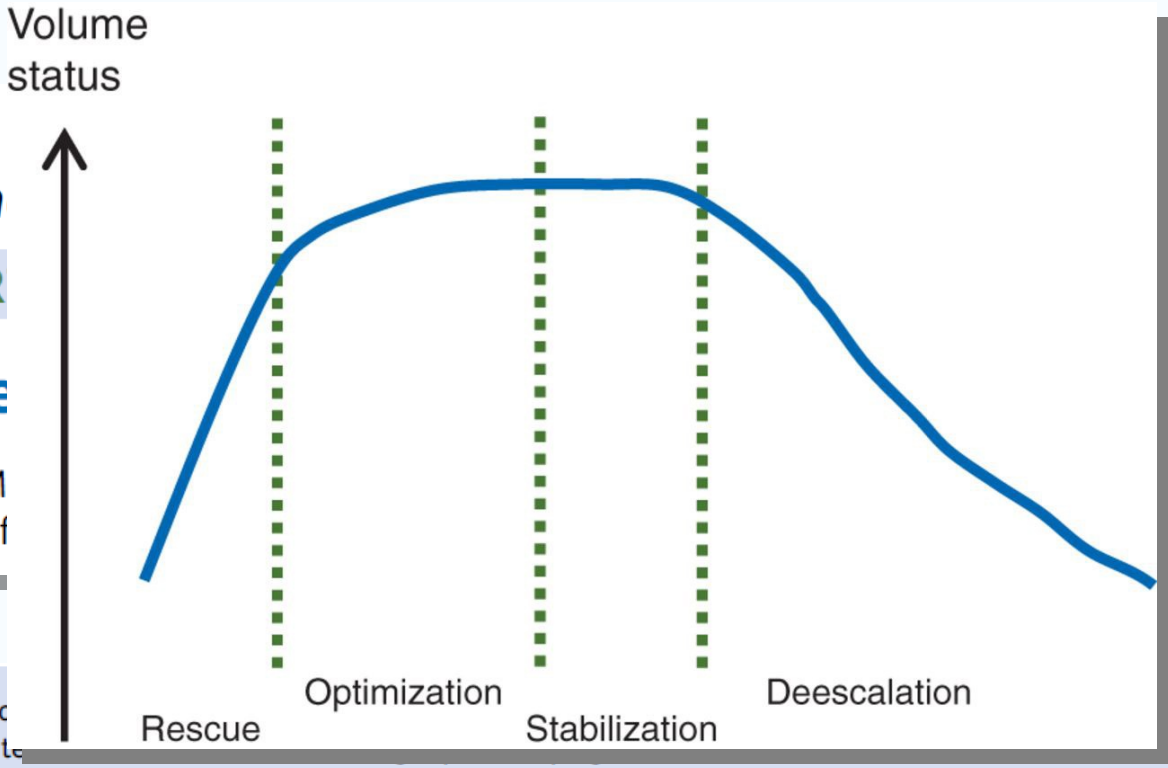


Table 1 Characteristics

A, diabetic keto acidosis; NPO, nil per os; ATN, acute

	Rescue	Optimization	Stabilization	De-escalation
Principles	Lifesaving	Organ rescue	Organ support	Organ recovery
Goals	Correct shock	Optimize and maintain tissue perfusion	Aim for zero or negative fluid balance	Mobilize fluid accumulated
Time (usual)	Minutes	Hours	Days	Days to weeks
Phenotype	Severe shock	Unstable	Stable	Recovering
Fluid therapy	Rapid boluses	Titrate fluid infusion conservative use of fluid challenges	Minimal maintenance infusion only if oral intake inadequate	Oral intake if possible Avoid unnecessary i.v. fluids
Typical clinical scenario	- Septic shock - Major trauma	- Intraoperative GDT - Burns - DKA	- NPO postoperative patient - 'Drip and suck' management of pancreatitis	- Patient on full enteral feed in recovery phase of critical illness - Recovering ATN
Amount	Guidelines, for example, SSC, pre-hospital resuscitation, trauma, burns, etc.			

RESEARCH Open Access

Fluid overload is associated with an increased risk for 90-day mortality in critically ill patients with renal replacement therapy: data from the prospective FINNAKI study

Suvi T Vaara[1*], Anna-Maija Korhonen[1], Kirsi-Maija Kaukonen[1], Sara Nisula[1], Outi Inkinen[2], Sanna Hoppu[3], Jouko J Laurila[4], Leena Mildh[1], Matti Reinikainen[5], Vesa Lund[6], Ilkka Parviainen[7] and Ville Pettilä[1,8], for The FINNAKI study group

Vaara *et al. Critical Care* 2012, **16**:R197

- **17** Finnish intensive care units
- **296** RRT-treated critically ill patients.
- **fluid overload** defined as cumulative fluid accum. **> 10%** of **BW**
- **90-day mortality** of patients with or without fluid overload was

  59.2% vs. **31.4%** (**P < 0.001**)

- **conclusions:** Patients with fluid overload at RRT initiation

jaké

krystaloidy?

Surviving Sepsis Campaign

Fluid Therapy

- **We recommend crystalloids as the fluid of choice for initial resuscitation and subsequent intravascular volume replacement in patients with sepsis and septic shock**

(Strong recommendation, moderate quality of evidence).

- **We suggest using albumin in addition to crystalloids when patients require substantial amounts of crystalloids**

(weak recommendation, low quality of evidence).

Surviving Sepsis Campaign

Initial Resuscitation

- **We recommend that in the resuscitation from sepsis-induced hypoperfusion, at least 30ml/kg of intravenous crystalloid fluid be given within the first 3 hours.**

(Strong recommendation; low quality of evidence)

- **We recommend that following initial fluid resuscitation, additional fluids be guided by frequent reassessment of hemodynamic status.**

(Best Practice Statement)

Surviving Sepsis Campaign

Caveats / Limitations of ProCESS, ARISE & Promise

- The overall management of sepsis has changed…
  - In all three studies patients had early antibiotics, > 30ml/kg of intravenous fluid prior to randomization.
- We need therefore to be very careful about over interpreting the results in areas where this paradgim is not valid.

fluid therapy?

NaCl 0,9%

krystaloidy

- nebalancované
- balancované

HAES

albumin

želatina

Cave!

Krystaloidy

	Na	Cl	K	Ca	Mg	Acetat	Laktat	Malat
NaCl 0,9%	154	154	--	--	--	--	--	--
Ringer-Lactat	131	112	5,4	1,8	--	--	28	--
Ringer-Lösung	147	156	4,0	2,2	--	--	--	--
Elomel OP	**100**	90	**18**	2,0	3,0	38	--	--
Elomel Isoton	140	108	5,0	2,5	1,5	45	--	--
Elomel Basis	**45**	**65**	**25**	--	2,5	--	--	--
KADC	**90**	**65**	**25**	1,0	1,5	--	--	23
Aqua	--	--	--	--	--	--	--	--

septický

šok

29.5.2018

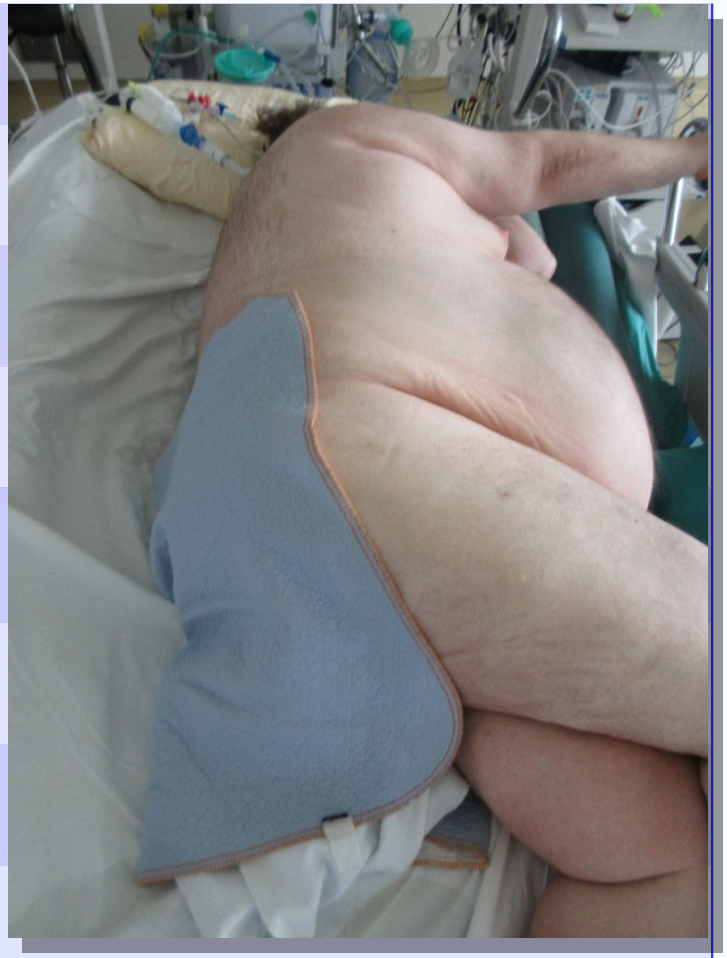
- muž, 40 let, poprvé na ICU

diagnózy

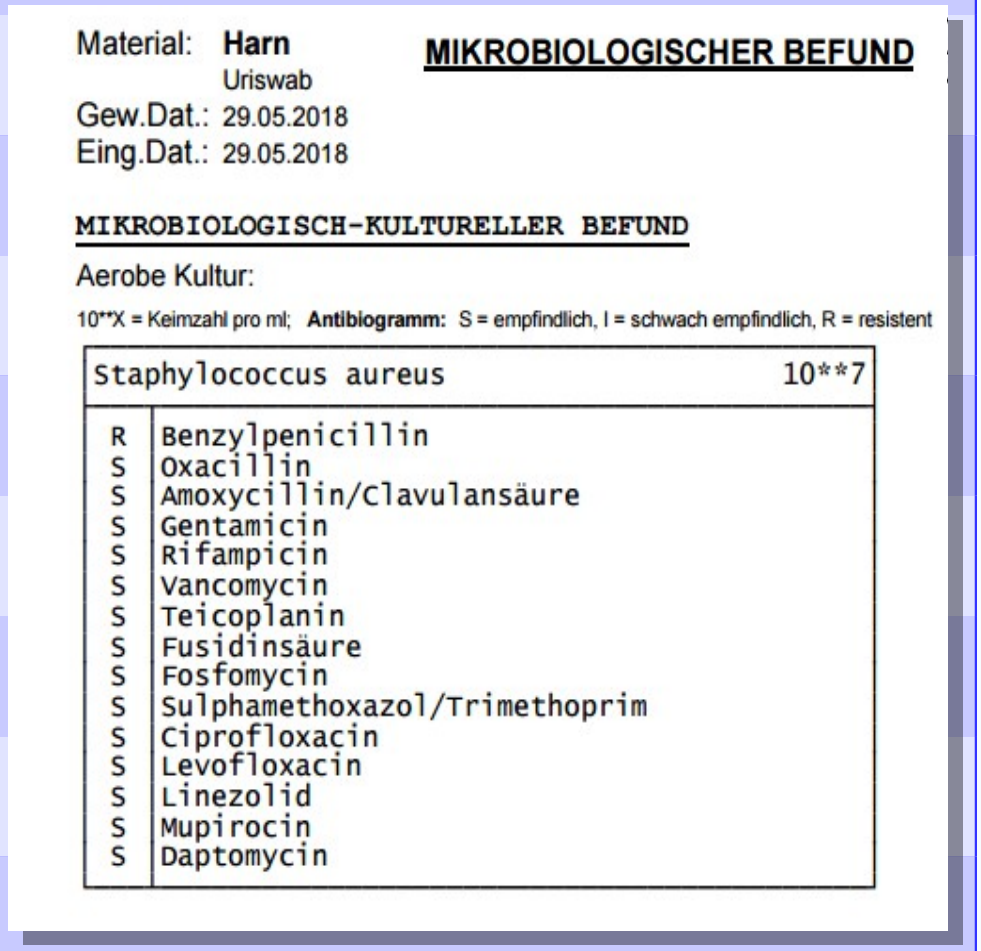
- septický šok
- erysipel levého bérce
- uroinfekt (?)

anamnéza

- Prader-Willi sy
- adipositas permagna (165 kg, 150 cm)
- NIDDM
- ….



BP	85/47 mmHg
TF	128/min
DF	22-24/min
S_pO_2	82%
CVP	+4 mmHg
p_aO_2	46 mmHg
p_aCO_2	52 mmHg
laktát	11,9
klinika	schvácený, neklidný, dušný, mramorace, anurie



Material: **Harn**
Uriswab
Gew.Dat.: 29.05.2018
Eing.Dat.: 29.05.2018

MIKROBIOLOGISCHER BEFUND

MIKROBIOLOGISCH-KULTURELLER BEFUND

Aerobe Kultur:

10**X = Keimzahl pro ml; **Antibiogramm:** S = empfindlich, I = schwach empfindlich, R = resistent

Staphylococcus aureus	10**7
R	Benzylpenicillin
S	Oxacillin
S	Amoxycillin/Clavulansäure
S	Gentamicin
S	Rifampicin
S	Vancomycin
S	Teicoplanin
S	Fusidinsäure
S	Fosfomycin
S	Sulphamethoxazol/Trimethoprim
S	Ciprofloxacin
S	Levofloxacin
S	Linezolid
S	Mupirocin
S	Daptomycin

Infektionsparameter

27.05.2018 11:33 - 06.06.2018 11:33

Variablen \ Zeit	29.05.18 15:17	30.05.18 05:38	31.05.18 05:51	01.06.18 05:26	02.06.18 05:38	03.06.18 05:32	04.06.18 05:26	05.06.18 05:47	06.06.18 05:42
PCT 0-0.5[ng/ml]	100.00	100.00	100.00	75.10	44.10	19.60	10.70	5.80	2.40
LEUKO 3.6-10.2[G/l]	24.8	100.00 Wert: >100.0	2.5	19.5	18.9	11.2	8.9	6.7	7.6
CRP -0.5[mg/dl]	9.00	30.80	35.00	29.70	15.80	7.70!	2.70	1.10	0.70
THRO 160-370[G/l]	347	366	250	189	188	211	282	305	329
KREACR 50-110[ml/min]		0.00!	24.80!	24.00!	24.70!	20.00!	23.10!	27.90!	36.00!
GFR 0-70[ml/min]	30.00!	22.00!	31.00!	40.00!	47.00!	45.00!	33.00!	21.00!	20.00!
GFR Cystatin 0-90[ml/min]	28.00	70.00	78.00	82.00	68.00	66.00	46.00	34.00	43.00
IL-6 0-7[pg/mL]	50000.0	1629.0	157.6	128.2	71.3	18.5	7.3	6.5	7.1

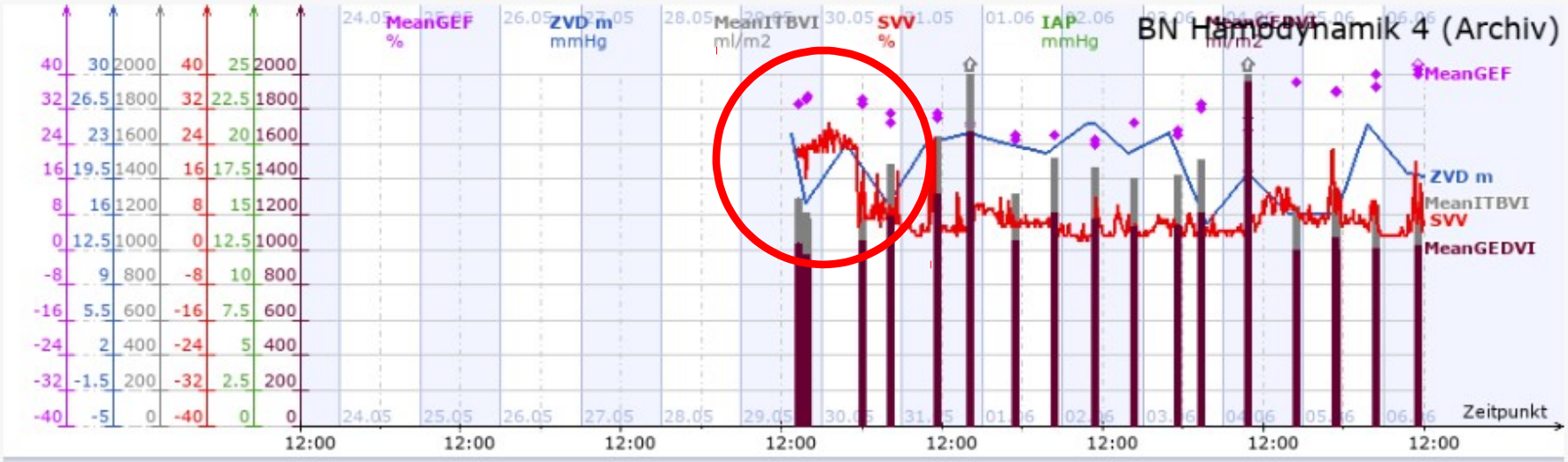
initial resuscitative therapy?

- monitorace (invazivní, semiinvazivní HD)
- tekutiny
- katecholaminy
- kortikoidy
- vše souběžně

☐ Hämodynamik

☑ Vorlast

23.05.2018 12:00 - 06.06.2018 12:00



☑ Beatmung

23.05.2018 12:00 - 06.06.2018 12:00

Bilanz

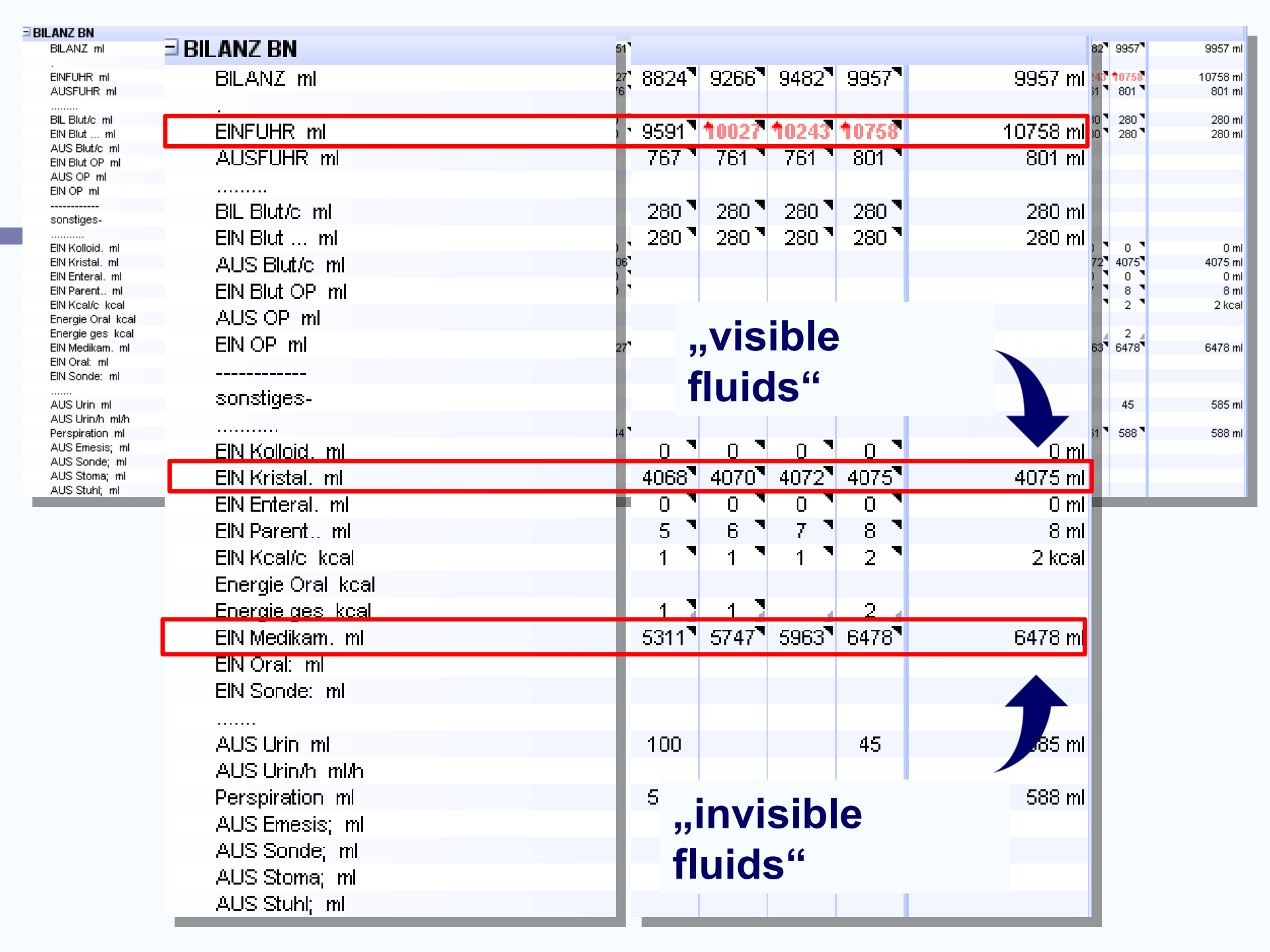
Bilanztage 06:00	15.05.18 - 16.05.18	16.05.18 - 17.05.18	17.05.18 - 18.05.18	18.05.18 - 19.05.18	19.05.18 - 20.05.18	20.05.18 - 21.05.18	21.05.18 - 22.05.18
EINFUHR [ml]	...	10758	15156	10473	7270	8076	5325
AUSFUHR [ml]	0	801	69	1447	1219	5978	7326
BILANZ [ml]	0	9957	15087	9026	6051	2098	-2001
BIL Blut/c [ml]	...	280	840	773	0	560	200
AUS Blut/c [ml]	...	...	...	...	...	...	...
EIN Blut ... [ml]	...	280	840	773	0	560	200
Perspiration [ml]	0	588	684	684	684	787	787
Drainagen							
Magensonde NASE li 16.05. AUS Sonde; [ml]		...	...	480	350	550	100
Blasendauerkatheter 16.05. AUS Urin [ml]		585	10	30	50	2	...

Einfuhr + 51 733 ml

Ausfuhr - 9 514 ml

Bilanz **+42 219** ml

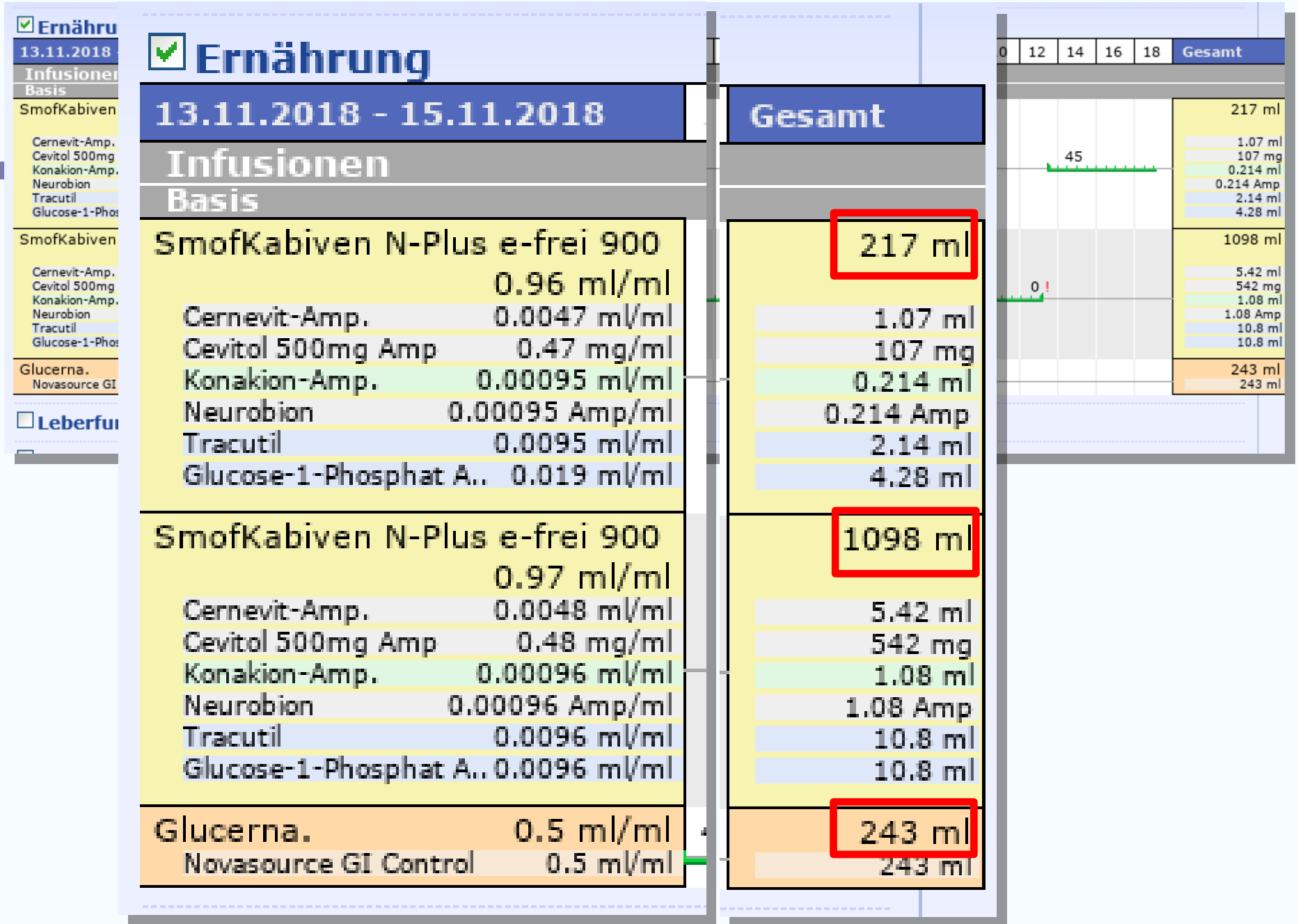
kde se berou “invisible fluids“?


BILANZ BN
BILANZ ml
EINFUHR ml
AUSFUHR ml
BIL Blut/c ml
EIN Blut ... ml
AUS Blut/c ml
EIN Blut OP ml
AUS OP ml
EIN OP ml
sonstiges-
EIN Kolloid. ml
EIN Kristal. ml
EIN Enteral. ml
EIN Parent.. ml
EIN Kcal/c kcal
Energie Oral kcal
Energie ges kcal
EIN Medikam. ml
EIN Oral: ml
EIN Sonde: ml
AUS Urin ml
AUS Urin/h ml/h
Perspiration ml
AUS Emesis; ml
AUS Sonde; ml
AUS Stoma; ml
AUS Stuhl; ml
8824 9266 9482 9957 9957 ml
9591 10027 10243 10758 10758 ml
767 761 761 801 801 ml
280 280 280 280 280 ml
280 280 280 280 280 ml
0 0 0 0 0 ml
4068 4070 4072 4075 4075 ml
0 0 0 0 0 ml
5 6 7 8 8 ml
1 1 1 2 2 kcal
1 1 2
5311 5747 5963 6478 6478 ml
100 45
5
588 ml
„visible fluids“
„invisible fluids“

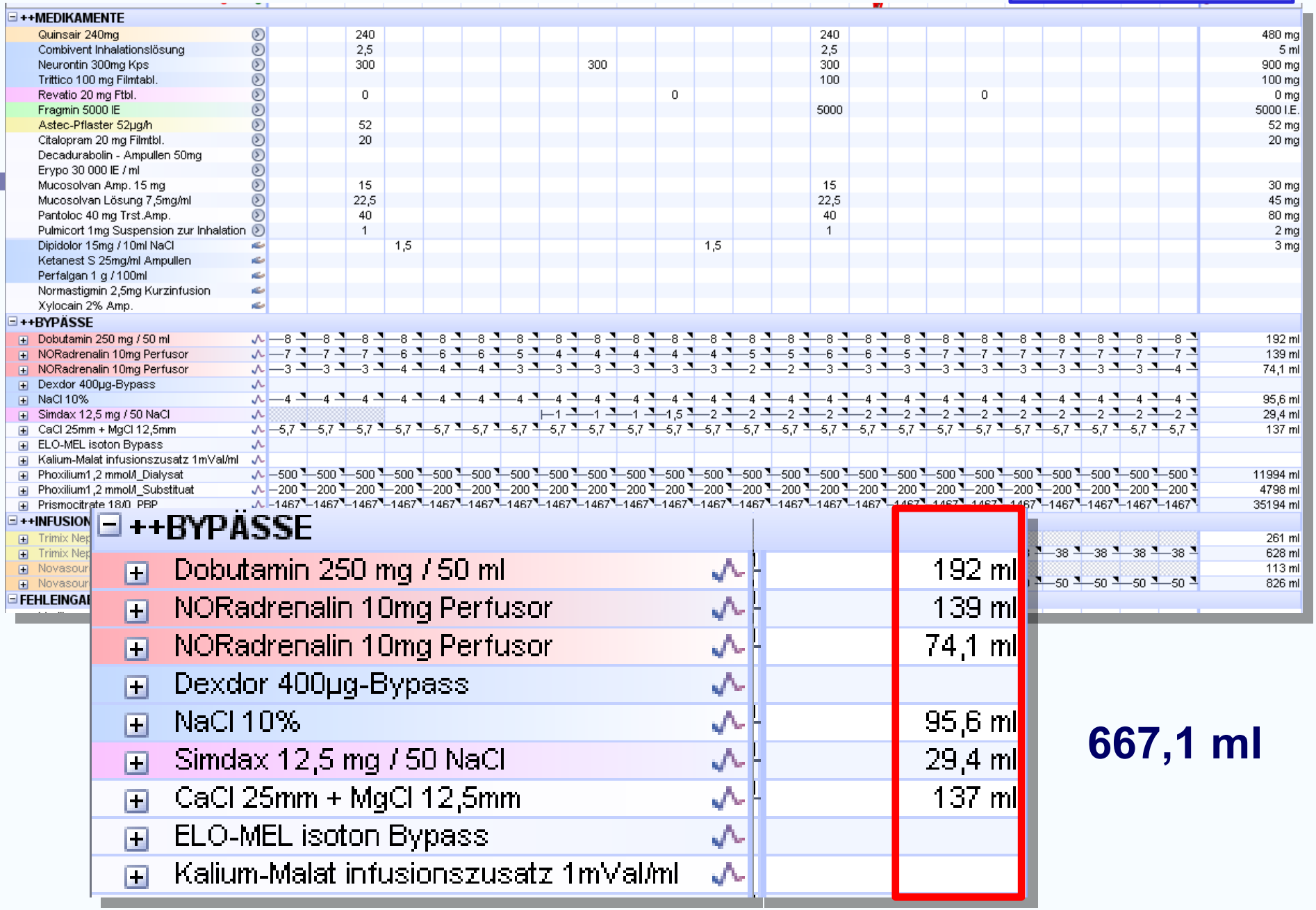
where are you from?

- medikamenty aplikované pravidelně bolusově
- medikamenty aplikované pravidelně kontinuálně
- parenterální výživa
- enterální výživa
- medikamenty aplikované nepravidelně (i vícekrát…)
- jiné techniky na ICU (CRRT, ECMO…)
- perorální příjem
- transfúzní přípravky a krevní deriváty
- …..

nutrition

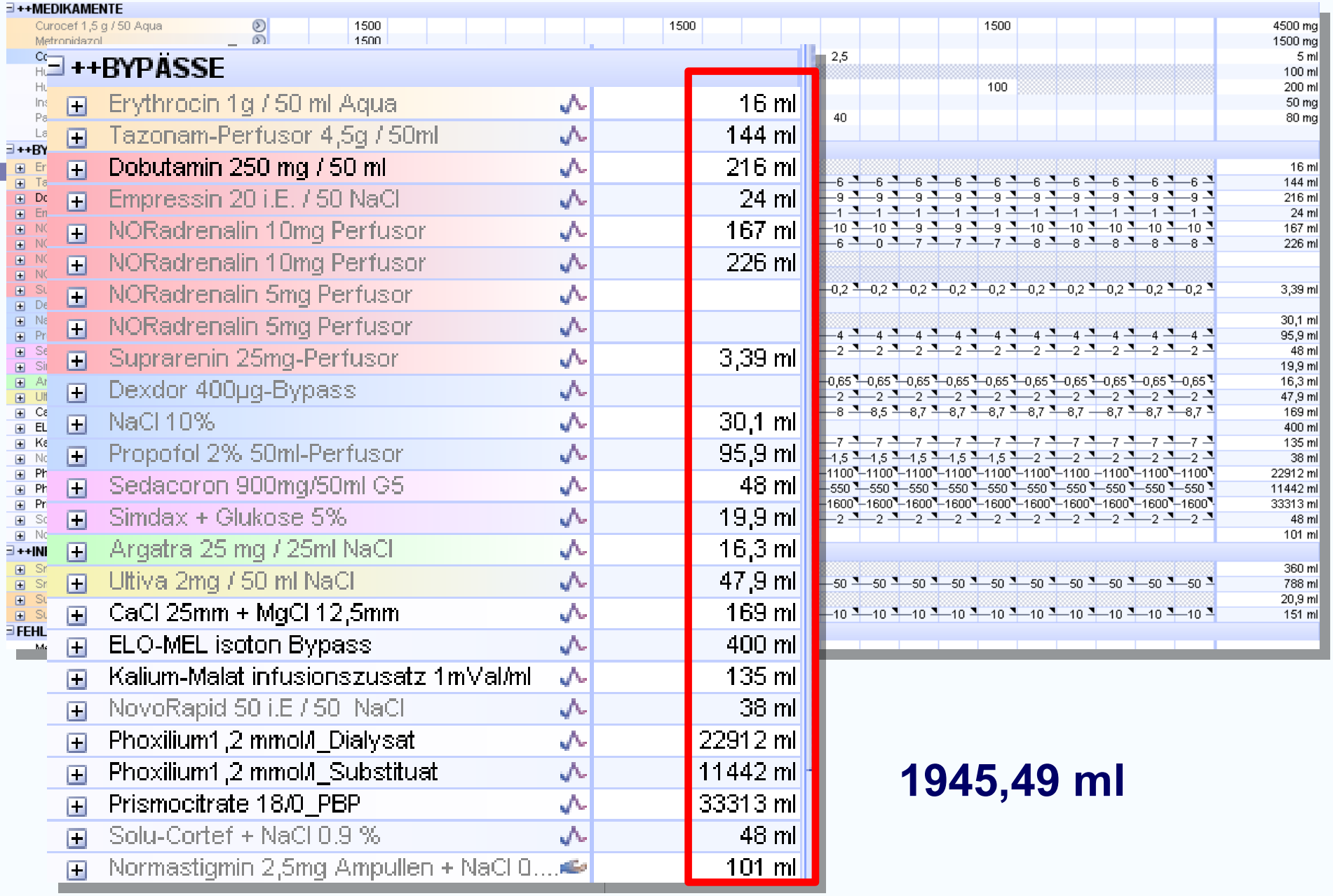

Ernährung
13.11.2018 - 15.11.2018
Gesamt
Infusionen
Basis
SmofKabiven N-Plus e-frei 900
0.96 ml/ml
217 ml
Cernevit-Amp. 0.0047 ml/ml 1.07 ml
Cevitol 500mg Amp 0.47 mg/ml 107 mg
Konakion-Amp. 0.00095 ml/ml 0.214 ml
Neurobion 0.00095 Amp/ml 0.214 Amp
Tracutil 0.0095 ml/ml 2.14 ml
Glucose-1-Phosphat A.. 0.019 ml/ml 4.28 ml
SmofKabiven N-Plus e-frei 900
0.97 ml/ml
1098 ml
Cernevit-Amp. 0.0048 ml/ml 5.42 ml
Cevitol 500mg Amp 0.48 mg/ml 542 mg
Konakion-Amp. 0.00096 ml/ml 1.08 ml
Neurobion 0.00096 Amp/ml 1.08 Amp
Tracutil 0.0096 ml/ml 10.8 ml
Glucose-1-Phosphat A.. 0.0096 ml/ml 10.8 ml
Glucerna. 0.5 ml/ml
243 ml
Novasource GI Control 0.5 ml/ml 243 ml
12
14
16
18
Gesamt
45
0 !
217 ml
1.07 ml
107 mg
0.214 ml
0.214 Amp
2.14 ml
4.28 ml
1098 ml
5.42 ml
542 mg
1.08 ml
1.08 Amp
10.8 ml
10.8 ml
243 ml
243 ml

bypass



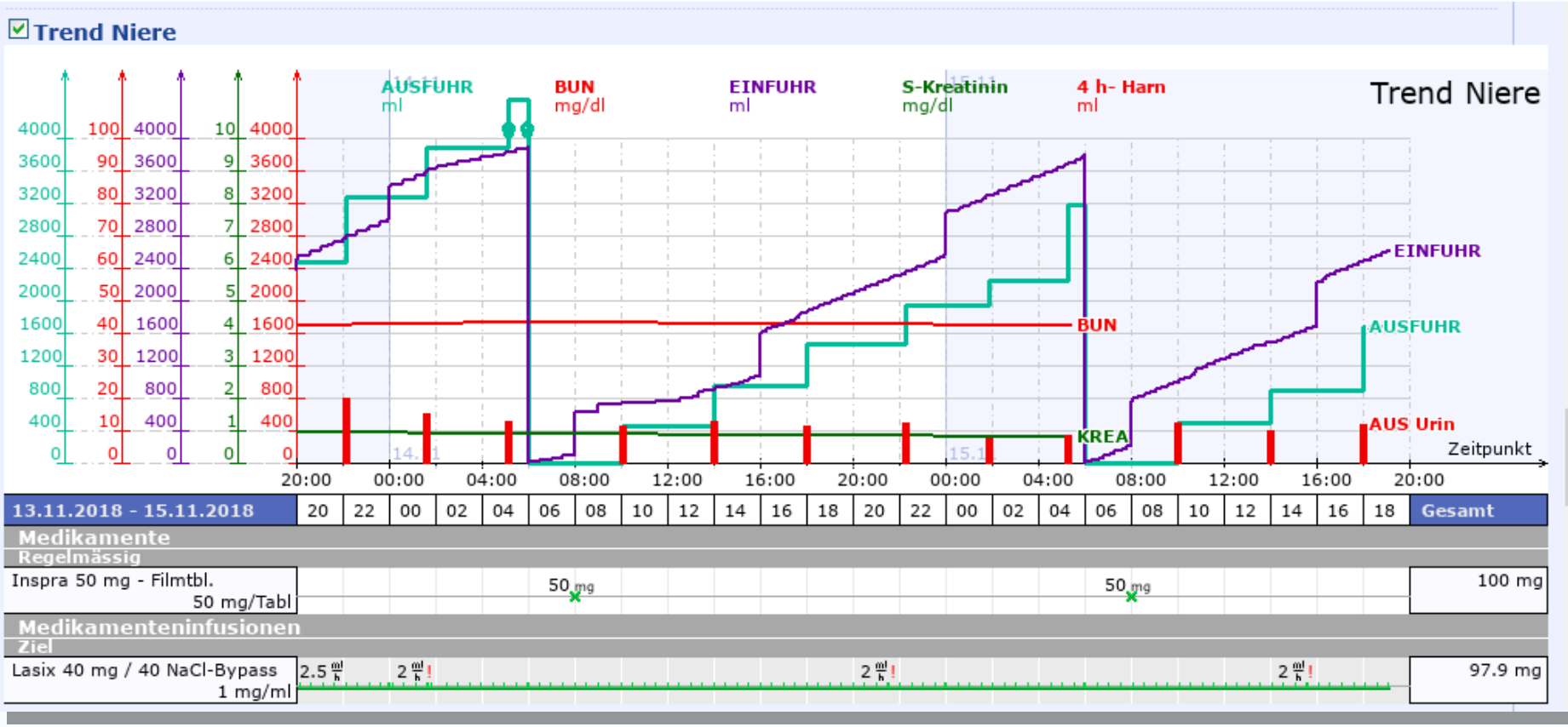
667,1 ml

bypass



1945,49 ml

monitoring!


Trend Niere
AUSFUHR
ml
BUN
mg/dl
EINFUHR
ml
S-Kreatinin
mg/dl
4 h- Harn
ml
Trend Niere
EINFUHR
BUN
AUSFUHR
KREA
AUS Urin
Zeitpunkt
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
08:00
12:00
16:00
20:00
13.11.2018 - 15.11.2018
20 22 00 02 04 06 08 10 12 14 16 18 20 22 00 02 04 06 08 10 12 14 16 18
Gesamt
Medikamente
Regelmässig
Inspra 50 mg - Filmtbl.
50 mg/Tabl
50 mg
50 mg
100 mg
Medikamenteninfusionen
Ziel
Lasix 40 mg / 40 NaCl-Bypass
1 mg/ml
2.5 ml/h
2 ml/h!
2 ml/h!
2 ml/h!
97.9 mg

Bilanz

Bilanztage 06:00	09.11.18 - 10.11.18	10.11.18 - 11.11.18	11.11.18 - 12.11.18	12.11.18 - 13.11.18	13.11.18 - 14.11.18	14.11.18 - 15.11.18	15.11.18 - 16.11.18
EINFUHR [ml]	3836	3551	5157	3559	2894	3155	1210
AUSFUHR [ml]	2312	1868	1505	1041	1611	1255	94
BILANZ [ml]	1524	1683	3652	2518	1283	1900	1116
BIL Blut/c [ml]	0	0	0	0	0	0	0
AUS Blut/c [ml]	...	...	...	...	...	...	...
EIN Blut ... [ml]	0	0	0	0	0	0	0
Perspiration [ml]	555	555	554	566	566	566	283

Drainagen

Magensonde NASE re AUS Sonde; [ml]	...	50	...	10	...	...	...
Blasendauerkatheter AUS Urin [ml]	5	...	...	...	10	...	...
Ex-Eintrittstelle 05.11.18 ABDOMEN li/unten AUS Verlust [ml]	750	400	180	...	...	...	...
Ex-Eintrittstelle ZVK Leiste links AUS Verlust [ml]	175	85	40	...	...	...	...
Stoma ABDOMEN re AUS Stoma; [ml]	100	50	50	...	150	50	...

with permission


…děkuji Vám za pozornost