Resuscitace septického šoku

- 30 ml/kg nebo vasopresory nebo obojí?

OA Dr. Stibor B.

ICU, Landesklinikum Baden bei Wien, Austria

no conflict of interest

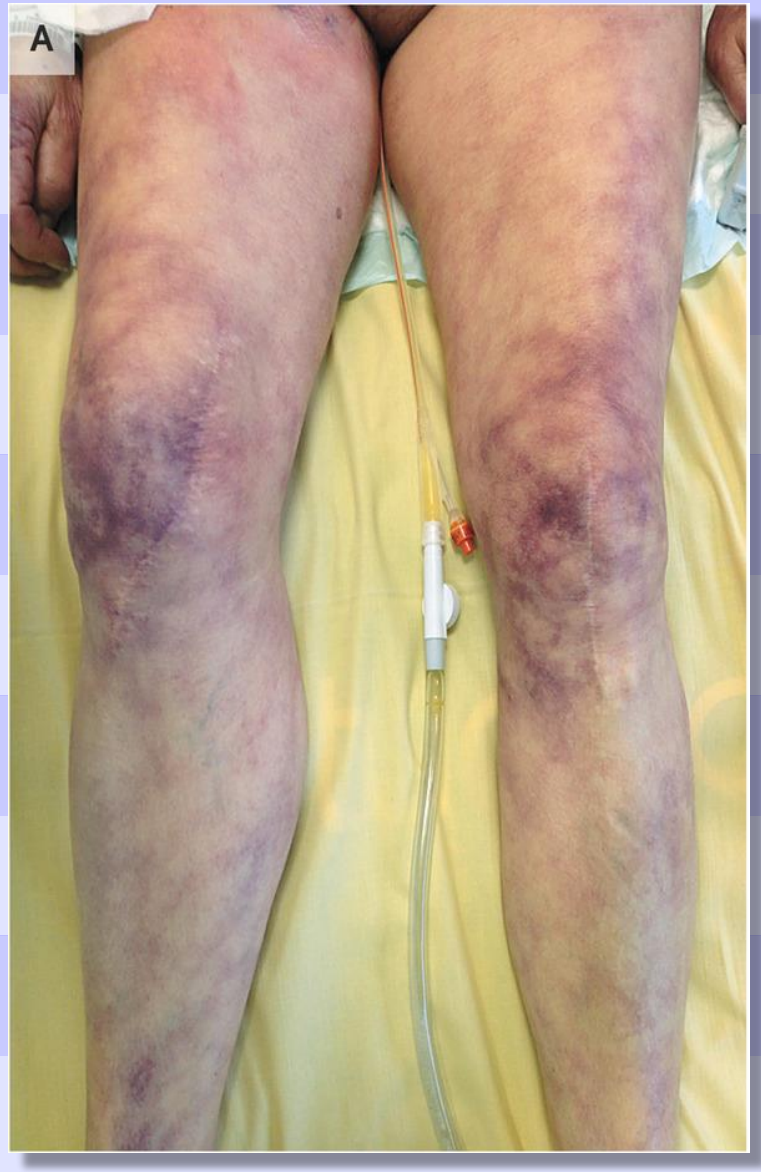
OA Dr. Stibor B.

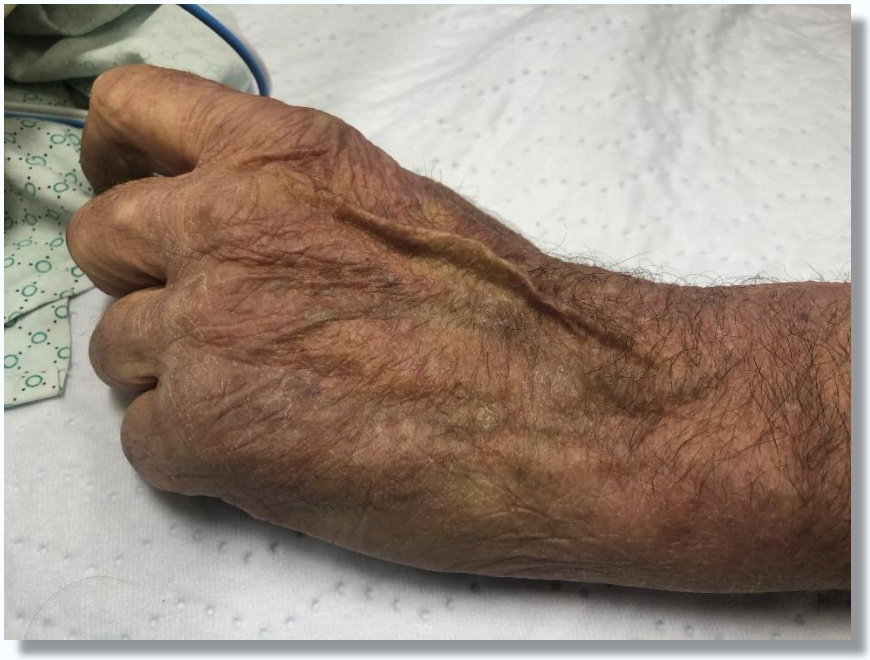
ICU, Landesklinikum Baden bei Wien, Austria

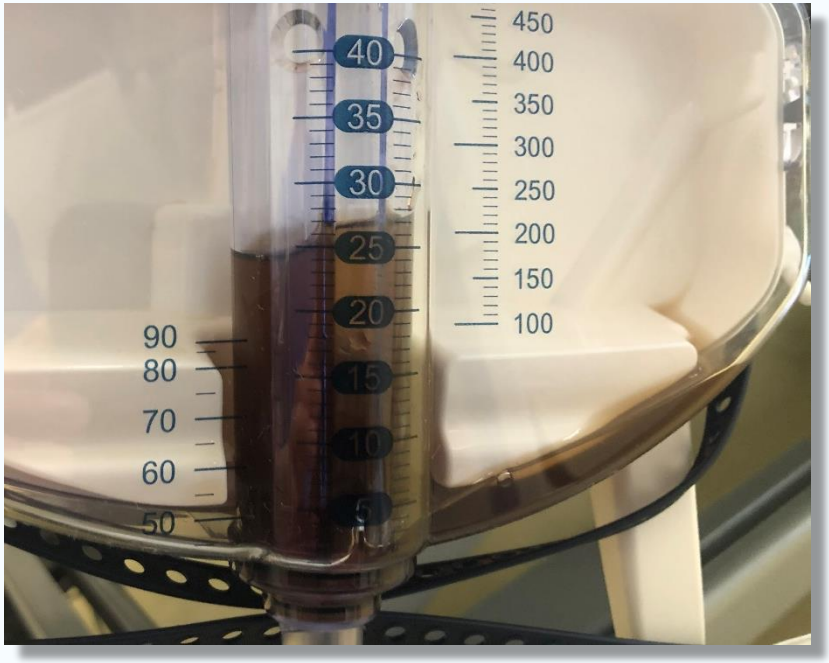
přehled

1. úvod
2. 30 ml/kg?
3. *guidelines*
4. jaké tekutiny
5. vasopresory
6. *timing*
7. pragmatický přístup

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



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60
50


Einzelmess.
Pat-Nr
Unbekannt
Patientenalter
Erw
NBP mmHg
Sys
160
90
70
Dia
90
50
47
MTT
110
70
(56)


Infektionsparameter
27.05.2018 11:33 - 06.06.2018 11:33
Zeit
Variablen
29.05.18
15:17
30.05.18
05:38
PCT 0-0.5[ng/ml]
100.00
100.00
LEUKO 3.6-10.2[G/l]
24.8
CRP -0.5[mg/dl]
9.00
30.80
THRO 160-370[G/l]
347
366
KREACR 50-110[ml/min]
0.00!
GFR 0-70[ml/min]
30.00!
22.00!
GFR Cystatin 0-90[ml/min]
28.00
70.00
IL-6 0-7[pg/mL]
50000.0
1629.0
100.00
Wert: >100.0

initial resuscitative therapy?

- monitorace (invazivní, semiinvazivní HD)
- tekutiny
- katecholaminy
- kortikoidy
- antibiotika
- sanace fokusu
- laktátová clerance
- …

tekutiny:

30 ml/kg?

Intensive Care Med (2004) 30:536–555
DOI 10.1007/s00134-004-2210-z

SPECIAL ARTICLE

R. Phillip Dellinger
Jean M. Carlet
Henry Masur
Herwig Gerlach
Thierry Calandra
Jonathan Cohen
Juan Gea-Banacloche
Didier Keh
John C. Marshall
Margaret M. Parker
Graham Ramsay
Janice L. Zimmerman
Jean-Louis Vincent
M. M. Levy

Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock

Dellinger; Critical Care Med 2004;32:858

The NEW ENGLAND JOURNAL of MEDICINE

EARLY GOAL-DIRECTED THERAPY IN THE TREATMENT OF SEVERE SEPSIS AND SEPTIC SHOCK

EMANUEL RIVERS, M.D., M.P.H., BRYANT NGUYEN, M.D., SUZANNE HAVSTAD, M.A., JULIE RESSLER, B.S., ALEXANDRIA MUZZIN, B.S., BERNHARD KNOBLICH, M.D., EDWARD PETERSON, PH.D., AND MICHAEL TOMLANOVICH, M.D., FOR THE EARLY GOAL-DIRECTED THERAPY COLLABORATIVE GROUP*

ABSTRACT

Background Goal-directed therapy has been used for severe sepsis and septic shock in the intensive care unit. This approach involves adjustments of cardiac preload, afterload, and contractility to balance oxygen delivery with oxygen demand. The purpose of this study was to evaluate the efficacy of early goal-directed therapy before admission to the intensive care unit.

Methods We randomly assigned patients who arrived at an urban emergency department with severe

THE systemic inflammatory response syndrome can be self-limited or can progress to severe sepsis and septic shock.[1] Along this continuum, circulatory abnormalities (intravascular volume depletion, peripheral vasodilatation, myocardial depression, and increased metabolism) lead to an imbalance between systemic oxygen delivery and oxygen demand, resulting in global tissue hypoxia or shock.[2] An indicator of serious illness, global tissue

Rivers E; N Engl J Med 2001;345:1368

EGDT, Rivers

- **263** pts
- *„crystalloid-fluid challenge of 20 to 30 ml/kg over 30 min“*
- **EGDT** protokol: CVP>8mmHg, $S_{cv}O_2$>70%, …
- bolus **500 ml** krystaloidů á **30 min**
- po **6 h:** EDGT **5 l**, standard care **3,5 l**

- *studie **ARISE**, **ProCESS**, **ProMISe** a jejich metaanalýza (velké multicentrické RCT)*

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.

Surviving Sepsis Campaign

Initial Resuscitation

2016

- **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)

guidelines?

Surviving Sepsis Campaign

Society of Critical Care Medicine

The Intensive Care Professionals

Recommendations 2021	Recommendation Strength and Quality of Evidence	Changes From 2016 Recommendations
INITIAL RESUSCITATION		
4. Sepsis and septic shock are medical emergencies, and we recommend that treatment and resuscitation begin immediately.	***Best practice statement***	
5. For patients with sepsis induced hypoperfusion or septic shock we suggest that at least 30 mL/kg of IV crystalloid fluid should be given within the first 3 hr of resuscitation.	**Weak**, *low quality of evidence*	**DOWNGRADE** from ***Strong***, low quality of evidence "We **recommend** that in the initial resuscitation from sepsis-induced hypoperfusion, at least 30 mL/kg of IV crystalloid fluid be given within the first 3 hr"
6. For adults with sepsis or septic shock, we suggest using dynamic measures to guide fluid resuscitation, over physical examination, or static parameters alone.	***Weak,*** *very low quality of evidence*	
7. For adults with sepsis or septic shock, we suggest guiding resuscitation to decrease serum lactate in patients with elevated lactate level, over not using serum lactate.	***Weak,*** *low quality of evidence*	
8. For adults with septic shock, we suggest using capillary refill time to guide resuscitation as an adjunct to other measures of perfusion.	***Weak,*** *low quality of evidence*	***NEW***

ORIGINAL ARTICLE

Time to Treatment and Mortality during Mandated Emergency Care for Sepsis

Christopher W. Seymour, M.D., Foster Gesten, M.D., Hallie C. Prescott, M.D., Marcus E. Friedrich, M.D., Theodore J. Iwashyna, M.D., Ph.D., Gary S. Phillips, M.A.S., Stanley Lemeshow, Ph.D., Tiffany Osborn, M.D., M.P.H., Kathleen M. Terry, Ph.D., and Mitchell M. Levy, M.D.

ABSTRACT

BACKGROUND

In 2013, New York began requiring hospitals to follow protocols for the early identification and treatment of sepsis. However, there is controversy about whether more rapid treatment of sepsis improves outcomes in patients.

METHODS

We studied data from patients with sepsis and septic shock that were reported to the New York State Department of Health from April 1, 2014, to June 30, 2016. Patients had a sepsis protocol initiated within 6 hours after arrival in the emergency department and had all items in a 3-hour bundle of care for patients with sepsis (i.e., blood cultures, broad-spectrum antibiotic agents, and lactate measurement) completed within 12 hours. Multilevel models were used to assess the associations between the time until completion of the 3-hour bundle and risk-adjusted mortality. We also examined the times to the administration of antibiotics and to the completion of an initial bolus of intravenous fluid.

RESULTS

Among 49,331 patients at 149 hospitals, 40,696 (82.5%) had the 3-hour bundle completed within 3 hours. The median time to completion of the 3-hour bundle was 1.30 hours (interquartile range, 0.65 to 2.35), the median time to the administration of antibiotics was 0.95 hours (interquartile range, 0.35 to 1.95), and the median time to completion of the fluid bolus was 2.56 hours (interquartile range, 1.33 to 4.20). Among patients who had the 3-hour bundle completed within 12 hours, a longer time to the completion of the bundle was associated with higher risk-adjusted in-hospital mortality (odds ratio, 1.04 per hour; 95% confidence interval [CI], 1.02 to 1.05; P<0.001), as was a longer time to the administration of antibiotics (odds ratio, 1.04 per hour; 95% CI, 1.03 to 1.06; P<0.001) but not a longer time to the completion of a bolus of intravenous fluids (odds ratio, 1.01 per hour; 95% CI, 0.99 to 1.02; P=0.21).

CONCLUSIONS

More rapid completion of a 3-hour bundle of sepsis care and rapid administration of antibiotics, but not rapid completion of an initial bolus of intravenous fluids, were associated with lower risk-adjusted in-hospital mortality. (Funded by the National Institutes of Health and others.)

Seymour CW; N Engl J Med 2017;376:2235

ORIGINAL

Fluid administration in severe sepsis and septic shock, patterns and outcomes: an analysis of a large national database

Paul E. Marik[1*], Walter T. Linde-Zwirble[2], Edward A. Bittner[3], Jennifer Sahatjian[4] and Douglas Hansell[3,4]

- the association between the **volume** of fluid administered and patient **mortality** (23.513 pts in USA)
- the mean amount of fluid administered **4,4 L** is **less** than that recommended by the SSC **guidelines**
- in patients receiving high volume (**5** to ≥**9** L), the mortality ↑ by **2.3%** for each additional litre above 5 L *(p = 0.0003)*
- total hospital cost increased by **$999** for each litre of fluid above 5 L (p = 0.005).

Marik PE; Intensive Care Med 2017;43:625

jaké

tekutiny?

Recommendations 2021	Recommendation Strength and Quality of Evidence	Changes From 2016 Recommendations
HEMODYNAMIC MANAGEMENT		
32. For adults with sepsis or septic shock, we recommend using crystalloids as first-line fluid for resuscitation.	***Strong,*** *moderate-quality evidence*	
33. For adults with sepsis or septic shock, we suggest using balanced crystalloids instead of normal saline for resuscitation.	***Weak,*** *low quality of evidence*	**CHANGED from *weak recommendation***, *low quality of evidence.* "We suggest using either balanced crystalloids or saline for fluid resuscitation of patients with sepsis or septic shock"
34. For adults with sepsis or septic shock, we suggest using albumin in patients who received large volumes of crystalloids.	***Weak,*** *moderate-quality evidence*	
35. For adults with sepsis or septic shock, we recommend against using starches for resuscitation.	***Strong,*** *high-quality evidence*	
36. For adults with sepsis and septic shock, we suggest against using gelatin for resuscitation.	***Weak,*** *moderate-quality evidence*	**UPGRADE from *weak recommendation***, *low quality of evidence* **"**We suggest using crystalloids over gelatins when resuscitating patients with sepsis or septic shock."

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	--	--	--	--	--	--	--	--

katecholaminy

Vasoactive agents

Recommendations

37. For adults with septic shock, we **recommend** using norepinephrine as the first-line agent over other vasopressors. *Strong recommendation*

Dopamine. H*igh quality evidence*
Vasopressin. Moderate-quality evidence
Epinephrine. Low-quality evidence
Selepressin. *Low-quality evidence*
Angiotensin II. *Very low-quality evidence*

Remark

In settings where norepinephrine is not available, epinephrine or dopamine can be used as an alternative, but we encourage efforts to improve the availability of norepinephrine. Special attention should be given to patients at risk for arrhythmias when using dopamine and epinephrine

38. For adults with septic shock on norepinephrine with inadequate MAP levels, we **suggest** adding vasopressin instead of escalating the dose of norepinephrine

Weak recommendation, moderate-quality evidence

Remark

In our practice, vasopressin is usually started when the dose of norepinephrine is in the range of 0.25–0.5 μg/kg/min

39. For adults with septic shock and inadequate MAP levels despite norepinephrine and vasopressin, we **suggest** adding epinephrine

Weak recommendation, low-quality evidence

40. For adults with septic shock, we **suggest against** using terlipressin

Weak recommendation, low quality of evidence

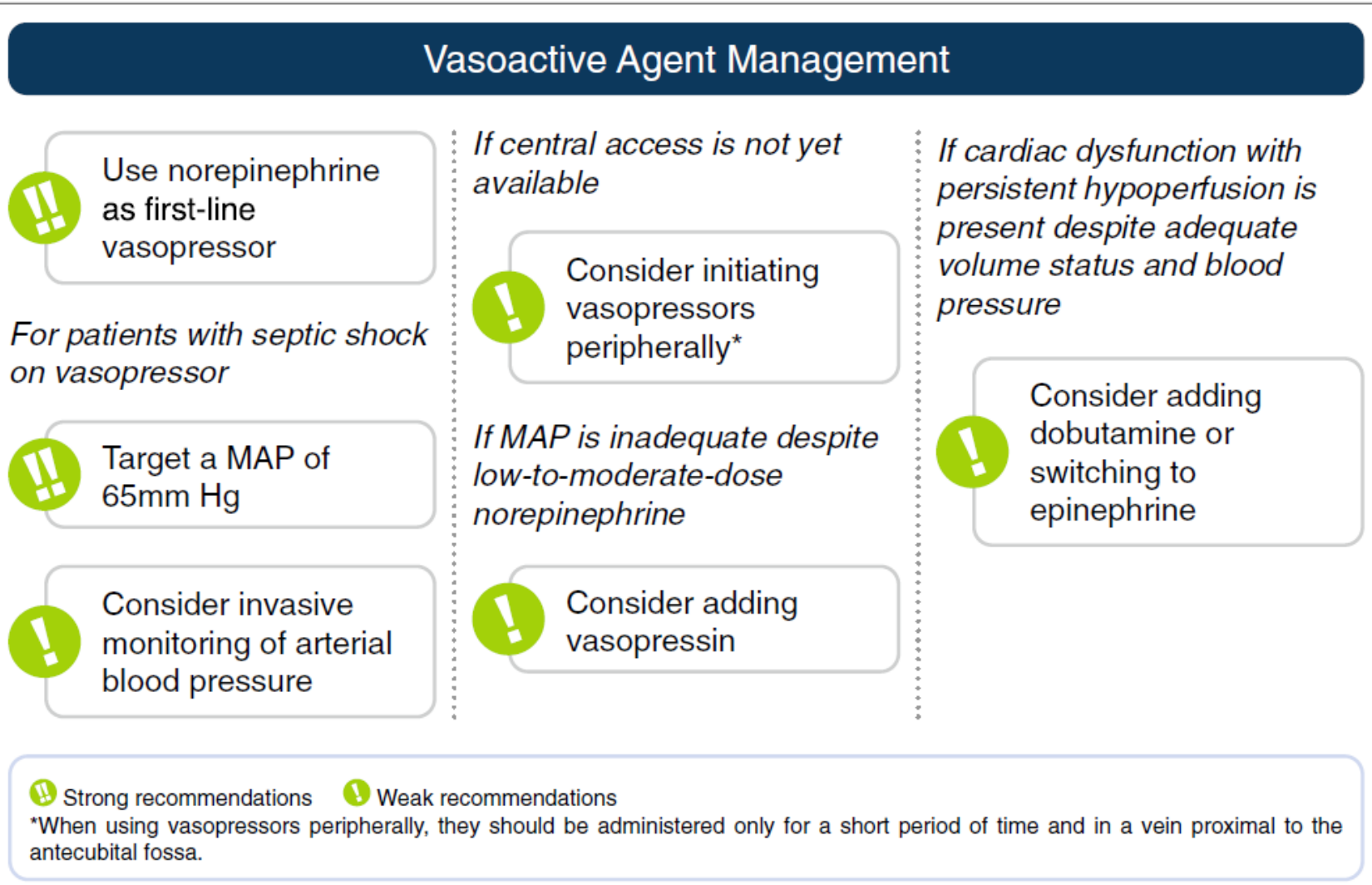

Fig. 2 Summary of vasoactive agents recommendations

timing?

Surviving Sepsis Campaign, 2004-2021

- 2004: fluids and vasopressors in 6 hours bundle
- 2012: fluids in 3 hours, vasopressors in 6 hours bundle
- 2018: fluids and vasopressors in 1 hours bundle*
- 2021: no bundles

1. Measure lactate level.*
2. Obtain blood cultures before administering antibiotics.
3. Administer broad-spectrum antibiotics.
4. Begin rapid administration of 30 mL/kg crystalloid for hypotension or lactate ≥ 4 mmol/L.
5. Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure ≥ 65 mm Hg.

* Remeasure lactate if initial lactate elevated (> 2 mmol/L).

vasopresory early vs late?

early start of vasopressors,
without **completing** the initial **fluid** loading
(within **1 hour**)

might it **impact** clinical
outcomes in **septic shock**?

Vasopressor initiation within 1 hour of fluid loading is associated with increased mortality in septic shock patients: Analysis of national registry data.

Yeo HJ, Lee YS, Kim TH, Jang JH, Lee HB, Oh DK, Park MH, Lim CM, et al.

Crit Care Med 2022; 50:e351-e36

Objectives: To investigate whether administration of a vasopressor within 1 hour of first fluid loading affected mortality and organ dysfunction in septic shock patients.

Patients: Patients with septic shock (n = 415) were classified into early and late groups according to whether the vasopressor was initiated within 1 hour of the first resuscitative fluid load. Early (n = 149) patients were 1:1 propensity matched to late (n = 149) patients.

Measurement and main results: The median time from the initial fluid bolus to vasopressor was shorter in the early group (0.3 vs 2.3 hr). There was no significant difference in the fluid bolus volume within 6 hours (33.2 vs 35.9 mL/kg) between the groups. The Sequential Organ Failure Assessment score and lactate level on day 3 in the ICU were significantly higher in the early group than that in the late group (Sequential Organ Failure Assessment, 9.2 vs 7.7; lactate level, 2.8 vs 1.7 mmol/L). In multivariate Cox regression analyses, early vasopressor use was associated with a significant increase in the risk of 28-day mortality (hazard ratio, 1.83; 95% CI, 1.26-2.65).

Conclusions: Vasopressor initiation within 1 hour of fluid loading was associated with higher 28-day mortality in patients with septic shock.

Vasopressor initiation within 1 hour of fluid loading is associated with increased mortality in septic shock patients: Analysis of national registry data.

Yeo HJ, Lee YS, Kim TH, Jang JH, Lee HB, Oh DK, Park MH, Lim CM, et al.

Crit Care Med 2022; 50:e351-e36

- Jižní Korea; multicentrický ***Sepsis Register***
- 149 pts vs 149 pts
- vasopressors **early** vs **late** (within **1 hour**)
- *vasopressors:* **0,3 h** early vs **3,3 h** late
- *fluids amount*: **33 ml/kg** early vs **38 ml/kg** late
- *28d mortality:* **48%** early vs **34%** late
- *hospital mortality:* **52%** early vs **40%** late

Ospina-Tascón *et al. Critical Care* (2020) 24:52
https://doi.org/10.1186/s13054-020-2756-3

Critical Care

RESEARCH Open Access

Effects of very early start of norepinephrine in patients with septic shock: a propensity score-based analysis

Gustavo A. Ospina-Tascón[1,2*], Glenn Hernandez[3], Ingrid Alvarez[1], Luis E. Calderón-Tapia[1], Ramiro Manzano-Nunez[1], Alvaro I. Sánchez-Ortiz[1], Egardo Quiñones[1], Juan E. Ruiz-Yucuma[1], José L. Aldana[1,2], Jean-Louis Teboul[4], Alexandre Biasi Cavalcanti[5], Daniel De Backer[6] and Jan Bakker[3,7,8,9]

Abstract

Background: Optimal timing for the start of vasopressors (VP) in septic shock has not been widely studied since it is assumed that fluids must be administered in advance. We sought to evaluate whether a very early start of VP, even without completing the initial fluid loading, might impact clinical outcomes in septic shock.

Methods: A total of 337 patients with sepsis requiring VP support for at least 6 h were initially selected from a prospectively collected database in a 90-bed mixed-ICU during a 24-month period. They were classified into very-early (VE-VPs) or delayed vasopressor start (D-VPs) categories according to whether norepinephrine was initiated or not within/before the next hour of the first resuscitative fluid load. Then, VE-VPs ($n = 93$) patients were 1:1 propensity matched to D-VPs ($n = 93$) based on age; source of admission (emergency room, general wards, intensive care unit); chronic and acute comorbidities; and lactate, heart rate, systolic, and diastolic pressure at vasopressor start. A risk-adjusted Cox proportional hazard model was fitted to assess the association between VE-VPs and day 28 mortality. Finally, a sensitivity analysis was performed also including those patients requiring VP support for less than 6 h.

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- 93 pts vs 93 pts
- ***fluids*** *at VP start*: **0 ml** early vs **1500 ml** late *(p<0,001)*
- ***fluids*** *8 hours*: **1100 ml** early vs **2600 ml** late *(p<0,001)*
- ***28d mortality****:* **18%** early vs **39%** late *(p<0,001)*
- no significant increase in ARF and/or RRT requirements

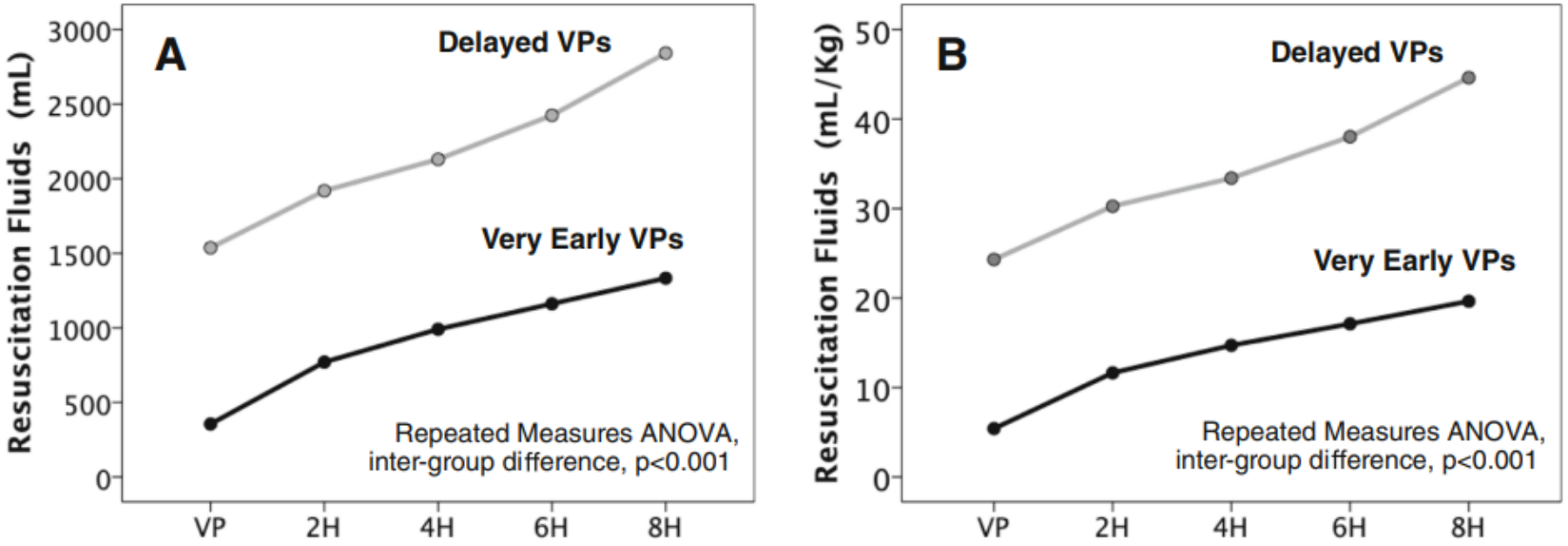
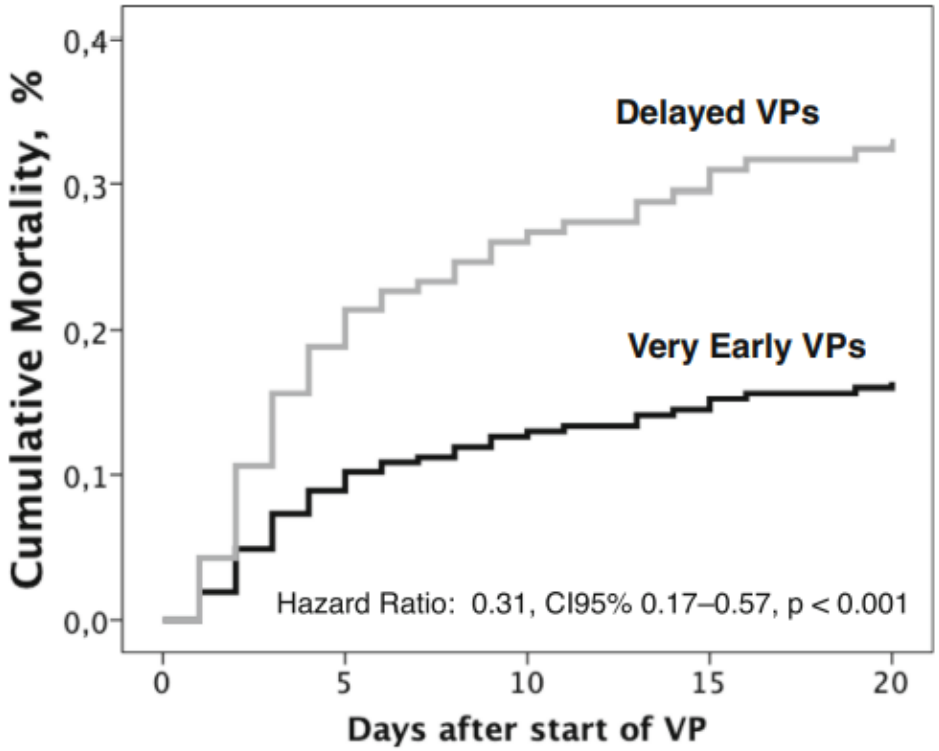


Fig. 1 Cumulative resuscitation fluids for very early- (VE-VPs) and delayed-vasopressor support (D-VPs). **a** Cummulative resuscitation fluids (in mL) at the start of vasopressor, 2,4, 6, and 8 h after. **b** Cummulative resuscitation fluids (in mL/kg) at the start of vasopressor, 2,4, 6, and 8 h after. Very early VPs, vasopressor support initiated before or within the next hour of the first fluid resuscitation (FRLoad). Delayed VPs, vasopressor support initiated > 1 h of the first fluid resuscitation (FRLoad). VPs, start of vasopressor support



VE-VPs	93	80	78	78	76
D-VPs	93	70	63	57	56

Fig. 2 Cox proportional hazard model for risk of death at day 28 for very early- (VE-VPs) and delayed-vasopressor support (D-VPs). The Cox proportional hazards model was adjusted by SOFA score at day 1, the presence of hyperlactatemia (septic shock according to Sepsis 3.0 definition), delay time of antibiotic administration, and the net fluid balance at 24 h. Very early VPs, vasopressor support initiated before or within the next hour of the first fluid resuscitation (FRLoad). Delayed VPs, vasopressor support initiated > 1 h of the first fluid resuscitation (FRLoad). VPs, start of vasopressor support

Ospina-Tascón *et al. Critical Care* (2020) 24:52
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Critical Care

RESEARCH Open Access

Effects of very early start of norepinephrine in patients with septic shock: a propensity score-based analysis

Gustavo A. Ospina-Tascón[1,2*], Glenn Hernandez[3], Ingrid Alvarez[1], Luis E. Calderón-Tapia[1], Ramiro Manzano-Nunez[1], Alvaro I. Sánchez-Ortiz[1], Egardo Quiñones[1], Juan E. Ruiz-Yucuma[1], José L. Aldana[1,2], Jean-Louis Teboul[4], Alexandre Biasi Cavalcanti[5], Daniel De Backer[6] and Jan Bakker[3,7,8,9]

Results: Patients subjected to VE-VPs received significantly less resuscitation fluids at vasopressor starting (0[0–510] vs. 1500[650–2300] mL, $p < 0.001$) and during the first 8 h of resuscitation (1100[500–1900] vs. 2600[1600–3800] mL, $p < 0.001$), with no significant increase in acute renal failure and/or renal replacement therapy requirements. VE-VPs was related with significant lower net fluid balances 8 and 24 h after VPs. VE-VPs was also associated with a significant reduction in the risk of death compared to D-VPs (HR 0.31, CI95% 0.17–0.57, $p < 0.001$) at day 28. Such association was maintained after including patients receiving vasopressors for < 6 h.

Conclusion: A very early start of vasopressor support seems to be safe, might limit the amount of fluids to resuscitate septic shock, and could lead to better clinical outcomes.

Keywords: Septic shock, Norepinephrine, Vasopressor support, Clinical outcomes

RESEARCH Open Access

Early norepinephrine for patients with septic shock: an updated systematic review and meta-analysis with trial sequential analysis

Rui Shi[1,2†], Rayan Braïk[2†], Xavier Monnet[2,3], Wan-Jie Gu[4], Gustavo Ospina-Tascon[5,6], Chairat Permpikul[7], Maxime Djebbour[2], Alice Soumare[2], Vincent Agaleridis[2] and Christopher Lai[2,3*]

Abstract

Background The optimal timing for initiating norepinephrine in septic shock is debated. This updated systematic review and meta-analysis aimed to evaluate the impact of early versus delayed norepinephrine initiation on mortality and clinical outcomes in adults with septic shock.

RESEARCH Open Access

Early norepinephrine for patients with septic shock: an updated systematic review and meta-analysis with trial sequential analysis

Rui Shi[1,2†], Rayan Braïk[2†], Xavier Monnet[2,3], Wan-Jie Gu[4], Gustavo Ospina-Tascon[5,6], Chairat Permpikul[7], Maxime Djebbour[2], Alice Soumare[2], Vincent Agaleridis[2] and Christopher Lai[2,3*]

Results Ten studies (two RCT, three PSM and five observational studies) involving 4767 patients were included. Early norepinephrine significantly reduced mortality in RCT (OR 0.49, 95%CI 0.25–0.96; $I^2=45\%$, $p=0.04$), pooled RCT and PSM (OR 0.65, 95%CI 0.42–0.99; $I^2=74\%$, $p=0.05$), and observational studies (OR 0.71, 95%CI 0.54–0.94; $I^2=66\%$). The trial sequential analysis indicated more data are needed. Subgroup analyses showed reduced mortality with early norepinephrine when lactate was ≤ 3mmol/L and administered within 1 h. Secondary outcomes showed a reduced fluid volume at 6h (RCT + PSM: mean difference −502 mL, 95%CI −899 to −106; $I^2=91\%$, $p=0.01$), faster MAP target achievement (RCT + PSM: mean difference −1.30h, 95%CI −1.75 to −0.85; $I^2=0\%$, $p<0.01$), more mechanical ventilation-free days (RCT + PSM: mean difference 3.99 days, 95%CI 2.42–5.57; $I^2=32\%$, $p<0.01$) and smaller cumulative norepinephrine dose (Observational: mean difference −3.44 mcg/kg, 95%CI -6.13 to -0.76; $I^2=0\%$, p=0.01) in the early initiation group compare to the non-early initiation group.

Conclusion Early norepinephrine introduction in septic shock is associated with reduced mortality, decreased fluid volume administered at 6 h, faster time to achieve MAP target and more mechanical ventilation-free days. However, the trial sequential analysis indicates that further RCT are still needed to confirm these findings.

Shi et al. Critical Care 2025.29:182

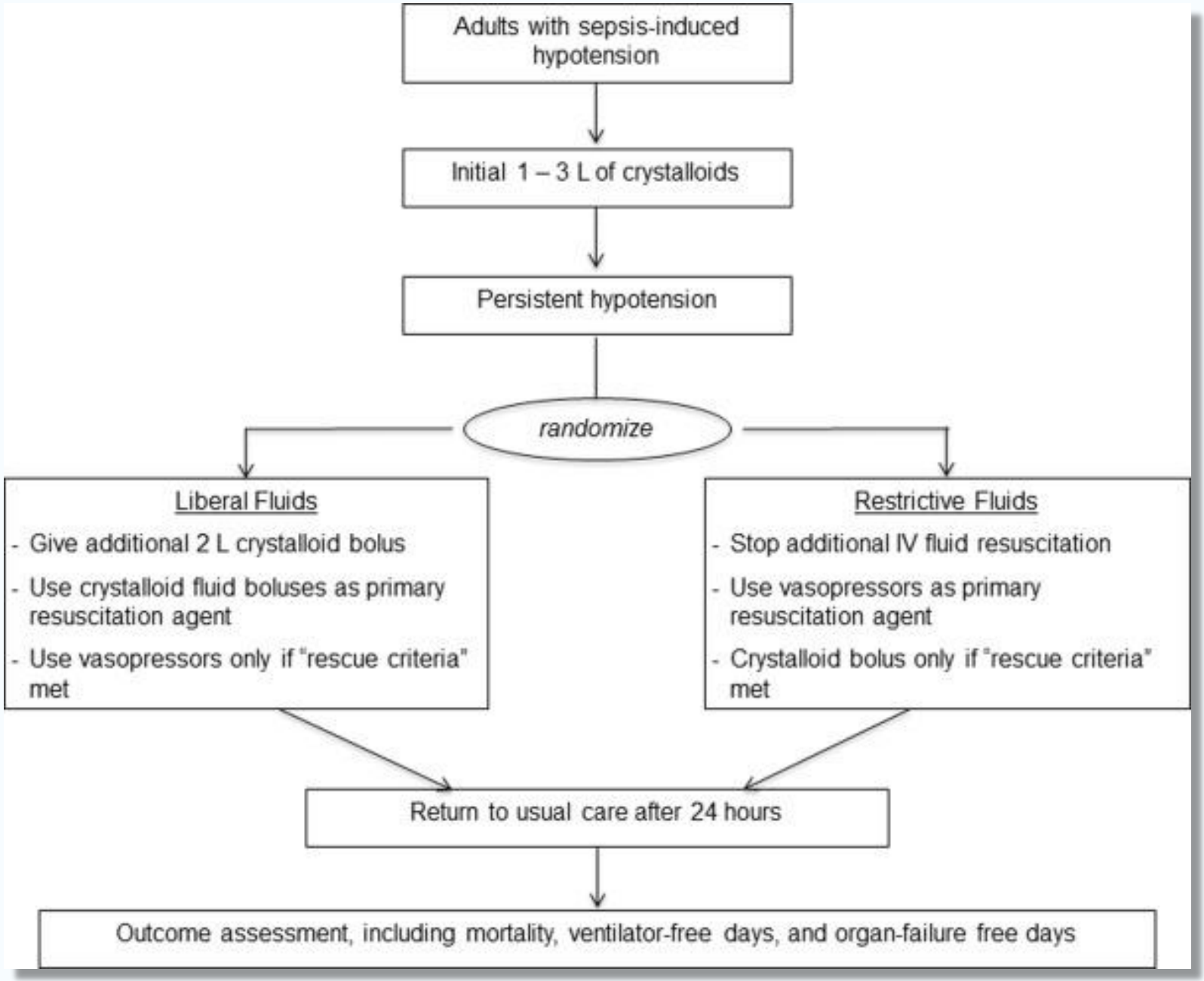
NIH U.S. National Library of Medicine
ClinicalTrials.gov

NCT03434028

Crystalloid Liberal or Vasopressors Early Resuscitation in Sepsis **(CLOVERS)**

- multi-center, prospective, randomized non-blinded interventional trial of **fluid treatment strategies** in the first **24 hours** with sepsis-induced **hypotension**
- **restrictive** fluids strategy (**vasopressors first** followed by rescue fluids) compared to:
- **liberal** fluid strategy (**fluids first** followed by rescue vasopressors)
- ends **early** (after 1.566 from 2.320 patients)
- **no significant** difference in 90-day **mortality**

Self WH; Ann Emerg Med 2018;72:457


Adults with sepsis-induced hypotension
Initial 1 – 3 L of crystalloids
Persistent hypotension
randomize
Liberal Fluids
- Give additional 2 L crystalloid bolus
- Use crystalloid fluid boluses as primary resuscitation agent
- Use vasopressors only if "rescue criteria" met
Restrictive Fluids
- Stop additional IV fluid resuscitation
- Use vasopressors as primary resuscitation agent
- Crystalloid bolus only if "rescue criteria" met
Return to usual care after 24 hours
Outcome assessment, including mortality, ventilator-free days, and organ-failure free days

Randomized Controlled Trial > Arch Med Res. 2019 Aug;50(6):325-332.
doi: 10.1016/j.arcmed.2019.10.003. Epub 2019 Oct 31.

Early Use of Norepinephrine Improves Survival in Septic Shock: Earlier than Early

Mohamed A Elbouhy [1], Mohamed Soliman [2], Aymen Gaber [2], Khaled M Taema [3], Ahmed Abdel-Aziz [2]

Clinical Trial > Am J Respir Crit Care Med. 2019 May 1;199(9):1097-1105.
doi: 10.1164/rccm.201806-1034OC.

Early Use of Norepinephrine in Septic Shock Resuscitation (CENSER). A Randomized Trial

Chairat Permpikul [1], Surat Tongyoo [1], Tanuwong Viarasilpa [1], Thavinee Trainarongsakul [1], Tipa Chakorn [2], Suthipol Udompanturak [3]

NIH U.S. National Library of Medicine

ClinicalTrials.gov

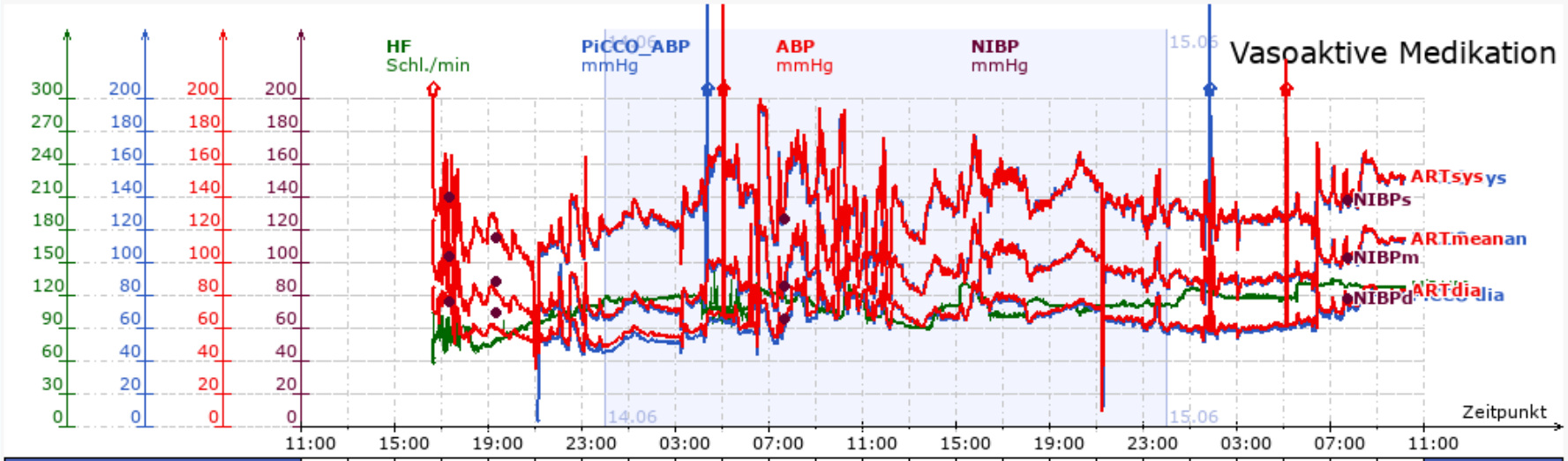
(ARISE FLUIDS) Australasian Resuscitation In Sepsis Evaluation: FLUid or Vasopressors In Emergency Department Sepsis NCT04569942 *Dec 2025*

(EVIS) Early Vasopressors in Sepsis NCT05179499 *Aug 2025*

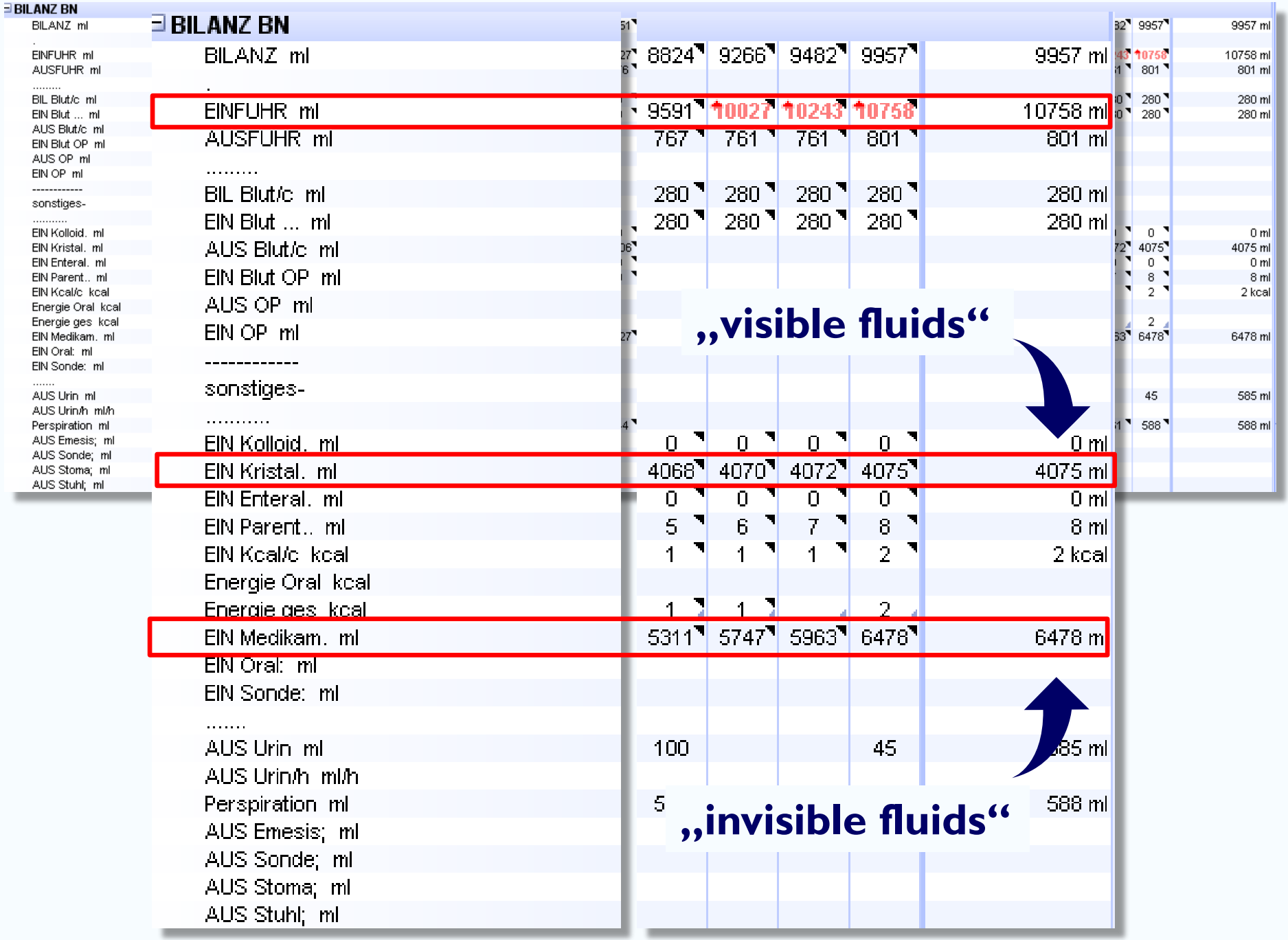
(FRESHLY) Restricted or Liberal Fluid for Haemodynamic Resuscitation in Sepsis NCT05453565 *Jun 2025*

pragmatický přístup

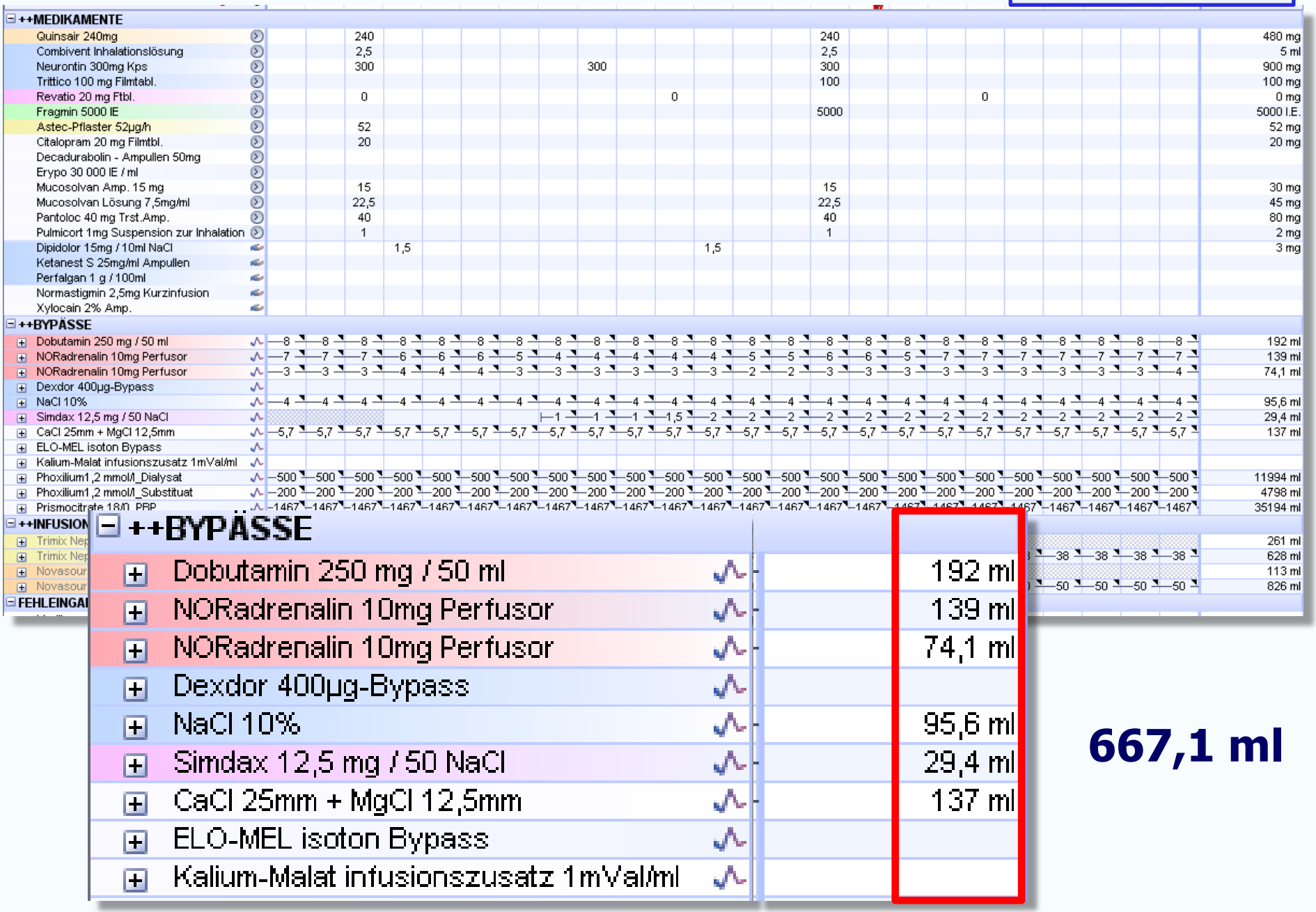
Vasoaktive Medikation



13.06.2018 - 15.06.2018	11	13	15	17	19	21	23	01	03	05	07	09	11	13	15	17	19	21	23	01	03	05	07	09	Gesamt
Medikamente																									
Regelmässig																									
Solu-Cortef 1 mg/ml NaCl 0.9 % 1 ml/ml						100																			100 mg 100 ml
Medikamenteninfusionen																									
Ziel																									
Dobutamin 250 mg / 50 ml 5 mg/ml Perfusor							4 !						4 !						4 !						691 mg
Empressin 20 i.E. / 50 NaCl 0.4 I.E./ml Perfusor							1 !						1.5 !		1 !										14.6 I.E.
NORadrenalin 5mg Perfusor 0.1 mg/ml Perfusor										4 !	4.5 !	1 !	2.5 !		2 !		1.5 !			1.5 !					5.81 mg [µg/kg/min]
										0.09	0.101	0.018	0.045		0.036		0.027			0.027					
NORadrenalin 5mg Perfusor 0.1 mg/ml Perfusor				4 !	6 !	7 !	11 !	13 !	12 !	5 !	4 !	1 !	1 !	2 !	1.5 !					1.5 !		1.5 !			17.2 mg [µg/kg/min]
				0.09	0.135	0.158	0.248	0.293	0.27	0.113	0.09	0.018	0.018	0.036	0.027					0.027		0.027			
Simdax 0.23 mg/ml Glukose 5% 0.91 ml/ml 12,5mg/50ml						1 !	1.5 !	2											2 !					2 !	15.6 mg 62.3 ml [µg/kg/min]
						0.051	0.077	0.102											0.081					0.081	
Solu-Cortef 4 mg/ml NaCl 0.9 % 1 ml/ml Perfusor						2																			285 mg 71.2 ml


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
„visible fluids“
„invisible fluids“

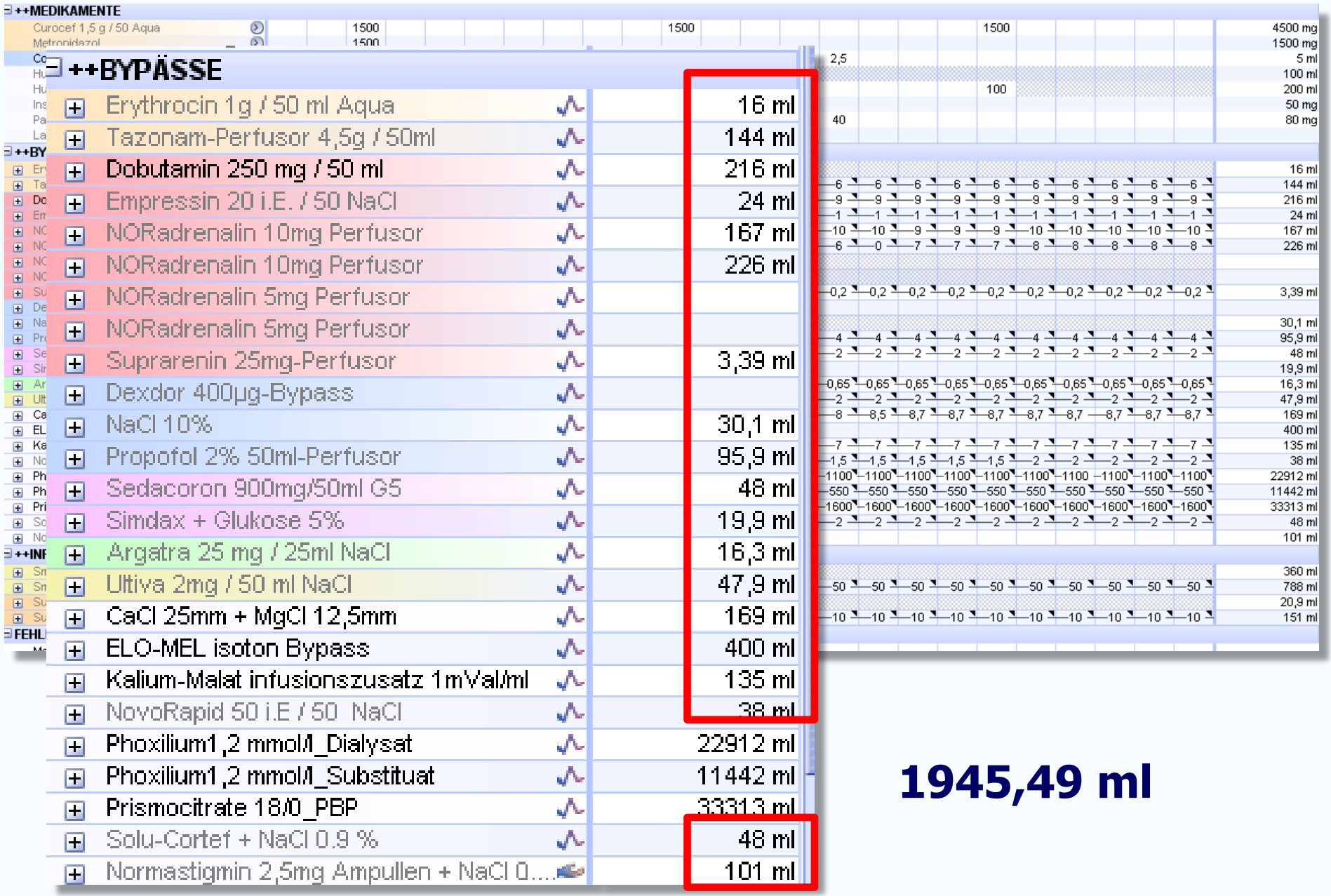
bypass



++BYPÄSSE
Dobutamin 250 mg / 50 ml 192 ml
NORadrenalin 10mg Perfusor 139 ml
NORadrenalin 10mg Perfusor 74,1 ml
Dexdor 400µg-Bypass
NaCl 10% 95,6 ml
Simdax 12,5 mg / 50 NaCl 29,4 ml
CaCl 25mm + MgCl 12,5mm 137 ml
ELO-MEL isoton Bypass
Kalium-Malat infusionszusatz 1mVal/ml

667,1 ml

bypass



1945,49 ml

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**

British Journ

BJA

SPECIAL AR

Four phase … al model†

E. A. Hoste[1,2], K. M … [9], M. G. Mythen[10] and A. D. Shaw[11] f…

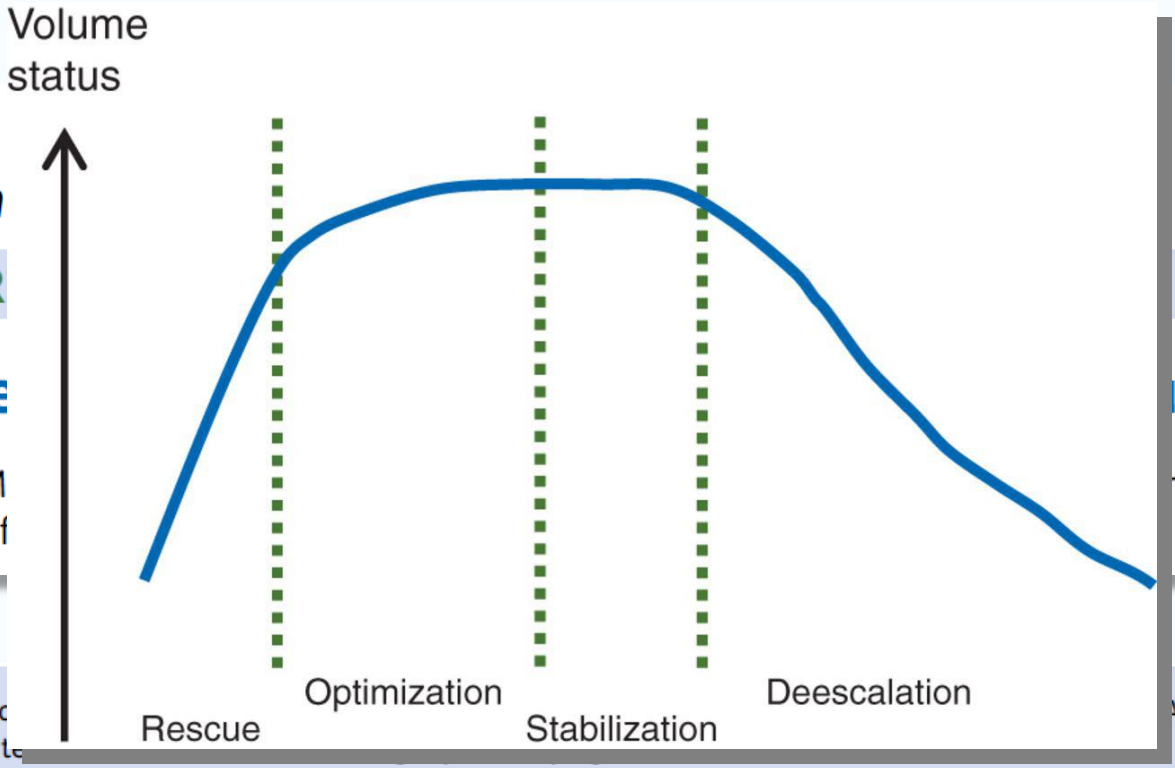


Table 1 Characteristics … A, diabetic keto acidosis; NPO, nil per os; ATN, acute …

	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.			

☐ **Prismaflex Citrat 7T**

☑ **Bilanz neu (Vorschlag)**

Bilanztage 06:00	19.06.21 - 20.06.21	18.06.21 - 19.06.21	17.06.21 - 18.06.21	16.06.21 - 17.06.21	15.06.21 - 16.06.21	14.06.21 - 15.06.21	13.06.21 - 14.06.21
EINFUHR [ml]	1098	4275	5913	2798	6515	...	...
AUSFUHR [ml]	1200	7500	8900	2100	750	...	...
BILANZ [ml]	-102	-3225	-2987	698	5765	...	...
AUS Urin ges [ml]	1200	7500	8900	2100	750	...	...
AUS Blut/c [ml]	...	...	...	...	...	...	...
EIN Blut ... [ml]	0	0	0	0	0	...	...
BIL Blut/c [ml]	0	0	0	0	0	...	...
Perspiration [ml]	93	556	556	556	308	...	...
Drainagen							

Einfuhr + 20 599 ml

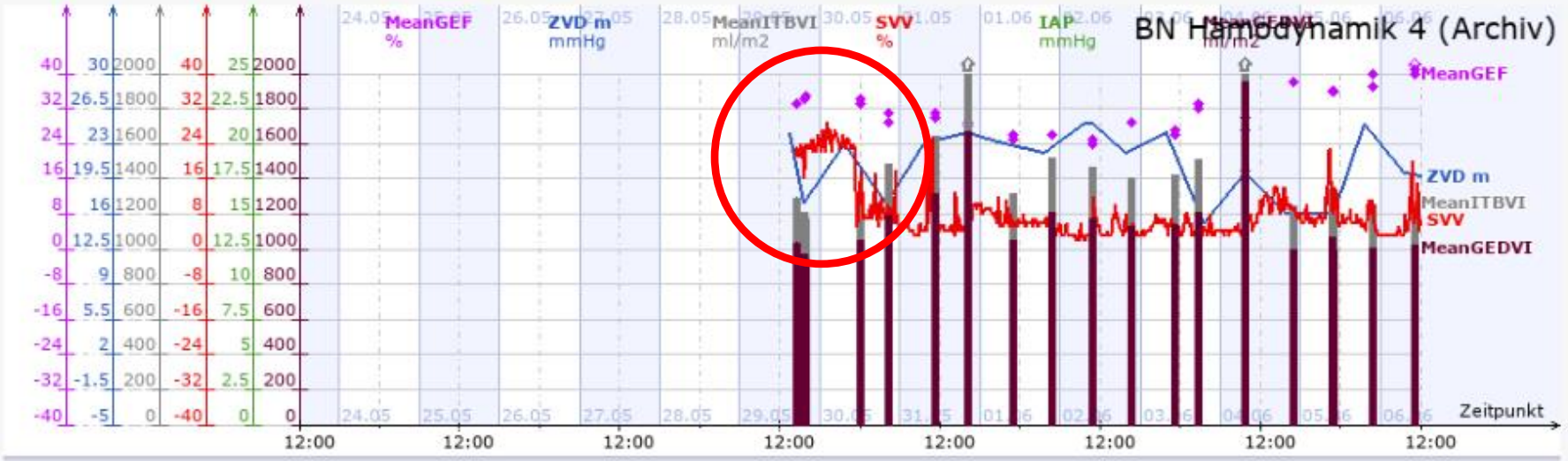
Ausfuhr - 20 450 ml

Bilanz + 151 ml

Hämodynamik

Vorlast

23.05.2018 12:00 - 06.06.2018 12:00



Beatmung

23.05.2018 12:00 - 06.06.2018 12:00

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


...děkuji Vám za pozornost