

Krátký „case report“ ... (předávka služby)



Krátký „case report“ ... (předávka služby)



- ... pacient v septickém šoku
- ... TK 80/40, HR 120/min/reg.,
kape NOR, kapou tekutiny ...
- ... stav volémie ??

Krátký „case report“ ... (předávka služby)

... pacient v septickém šoku

... TK 80/40, HR 120/min/reg.,
kape NOR, kapou tekutiny ...

(soudě podle výroku: *je hypovolemický „jak prase“, chybí mu alespoň 5 litrů. DOLEJTE HO!*)

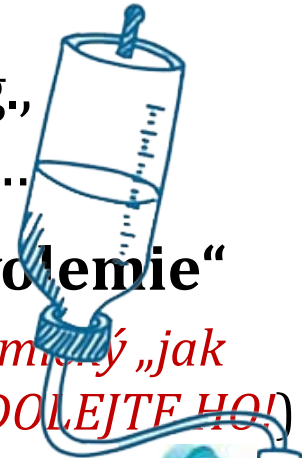
Krátký „case report“ ... (předávka služby)

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(soudě podle výroku: *je hypovolemický „jak prase“, chybí mu alespoň 5 litrů. DOLEJTE HO!*)



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(soudě podle výroku: *je hypovolemický „jak prase“, chybí mu alespoň 5 litrů. DOLEJTE HO!*)

Answ: *„určitě víc jak 10 litrů/min“*

$$CI = 4.7 \text{ L/min/m}^2$$

Krátký „case report“ ... (předávka služby)

... pacient v septickém šoku

$$CI = 4.7 \text{ L/min/m}^2$$

Potřebuje takový pacient agresivní
tekutinovou resuscitaci ?

No!

$$DO_2I = 728 \text{ ml/min/m}^2$$

... intervence s cílem $DO_2I > 600 \text{ ml/min/m}^2$ nezlepšují prognózu a mohou být rizikové ...

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ELEVATION OF SYSTEMIC OXYGEN DELIVERY IN CRITICALLY ILL PATIENTS

1717

ELEVATION OF SYSTEMIC OXYGEN DELIVERY IN THE TREATMENT OF CRITICALLY ILL PATIENTS

MICHELLE A. HAYES, F.R.C.A., ANDREW C. TIMMINS, F.R.C.A., ERNEST H.S. YAU, F.R.C.A., MARK PALAZZO, F.R.C.A., CHARLES J. HINDS, F.R.C.A., AND DAVID WATSON, F.R.C.A.

Abstract Background. Elevation of systemic oxygen delivery and consumption has been associated with an improved outcome in critically ill patients. We conducted a randomized trial to determine whether boosting oxygen delivery by infusing the inotropic agent dobutamine would improve the outcome in a diverse group of such patients.

Methods. On the basis of previously published recommendations, we established the following goals: a cardiac index above 4.5 liters per minute per square meter of body-surface area, oxygen delivery above 600 ml per minute per square meter, and oxygen consumption above 170 ml per minute per square meter. If these goals were not achieved with volume expansion alone, patients were randomly assigned to a treatment or control group. The treatment group received intravenous dobutamine (5 to 200 μg per kilogram of body weight per minute) until all three goals had been achieved. Dobutamine was administered to the control group only if the cardiac index was below 2.8 liters per minute per square meter.

Results. A total of 109 patients were studied. In nine

patients the therapeutic goals were achieved with volume expansion alone; all nine patients survived to leave the hospital. Fifty patients were randomly assigned to the treatment group, and 50 to the control group. During treatment, there were no differences between the two groups in mean arterial pressure or oxygen consumption, despite a significantly higher cardiac index and level of oxygen delivery in the treatment group ($P < 0.05$). Although the predicted risk of death during hospitalization was 34 percent for both groups, the in-hospital mortality was lower in the control group (34 percent) than in the treatment group (54 percent) ($P = 0.04$; 95 percent confidence interval, 0.9 to 39.1 percent).

Conclusions. The use of dobutamine to boost the cardiac index and systemic oxygen delivery failed to improve the outcome in this heterogeneous group of critically ill patients. Contrary to what might have been expected, our results suggest that in some cases aggressive efforts to increase oxygen consumption may have been detrimental. (N Engl J Med 1994;330:1717-22.)

DESPITE improvements in resuscitation and supportive care, one or more vital organs fail in a large proportion of patients with acute, life-threatening illnesses.¹ It has been proposed that organ damage in critical illness is due to inadequate oxygen delivery, often exacerbated by a level of tissue oxygen extraction that fails to satisfy metabolic demands.² Consequently, some investigators have recommended that in patients at high risk who are undergoing surgery, the cardiac index and the delivery and consumption of oxygen be increased to levels that have previously been identified as the median maximal values in survivors (cardiac index, over 4.5 liters per minute per square meter of body-

septic shock,⁷⁻⁹ as well as in heterogeneous groups of critically ill patients.¹⁰

Some researchers, however, remain skeptical.¹¹ Provided volume replacement is optimal, it remains unclear whether achievement of these target values simply indicates an adequate physiologic reserve and therefore a better outcome. Although the prognosis is very good for patients in whom oxygen delivery and consumption reach the target levels in response to intravenous fluids alone or only moderate inotropic support, in a substantial number of patients it proves impossible to increase oxygen consumption despite aggressive inotropic support.¹² In such patients the outcome is poor,¹² and the use of high doses of ino-



... 30 let
„mrtvá strategie“

Hayes et al. *N Engl J Med* **1994**,
330:1717-22

... intervence s cílem $DO_2I > 600 \text{ ml/min/m}^2$ nezlepšují prognózu a můžou být rizikové ...

PAPER

Supranormal Trauma Resuscitation Causes More Cases of Abdominal Compartment Syndrome

Zsolt Balogh, MD; Bruce A. McKinley, PhD; Christine S. Cocanour, MD; Rosemary A. Kozar, MD, PhD; Alicia Valdivia, RN; R. Matthew Sailors, PhD; Frederick A. Moore, MD

Arch Surg. 2003;138:637-42

Hypothesis: Normal resuscitation (oxygen delivery index $[DO_2I] \geq 500 \text{ mL/min per square meter}$), compared with supranormal trauma resuscitation ($DO_2I \geq 600 \text{ mL/min per square meter}$), requires less crystalloid volume, thus decreasing the incidence of intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS).

Design: Retrospective analysis of a prospective database.

Setting: Twenty-bed intensive care unit (ICU) in a regional level I trauma center.

Patients: Patients with major trauma (injury severity score >15 , initial base deficit $\geq 6 \text{ mEq/L}$, or need for ≥ 6 units of packed red blood cells in the first 12 hours) or age 65 years or older with any 2 of the previous criteria.

Interventions: Shock/trauma resuscitation protocol: pulmonary artery catheter, gastric tonometry, urinary bladder pressure measurements, lactated Ringer infusion, packed red blood cell transfusion, and moderate inotropic support, as needed, in that sequence, to attain and maintain a DO_2I greater than or equal to $600 \text{ mL/min per m}^2$ (16 months, ending January 1, 2001, $n=85$) or a DO_2I greater than or equal to $500 \text{ mL/min per square meter}$ (16 months, ending January 1, 2001, $n=71$) for the first

Main Outcome Measures: Lactated Ringer infusion volume (liters) at ICU admission, gastric partial carbon dioxide minus end-tidal carbon dioxide (GAP_{CO_2}), IAH (urinary bladder pressure measurements $>20 \text{ mm Hg}$), ACS (urinary bladder pressure measurements $>25 \text{ mm Hg}$ with organ dysfunction), multiple organ failure, and mortality.

Results: Demographics, injury severity, and shock severity parameters were similar in both groups. The supranormal resuscitation group required more lactated Ringer infusion volume in the first 24 hours in the ICU (mean \pm SD, 13 ± 2 vs $7 \pm 1 \text{ L}$; $P<.05$) and had higher GAP_{CO_2} (16 ± 2 vs $7 \pm 1 \text{ mm Hg}$; $P<.05$). In the supranormal group, IAH (42% vs 20%; $P<.05$) and ACS (16% vs 8%; $P<.05$) were more frequent. The conventional trauma outcomes, such as multiple organ failure (22% vs 9%; $P<.05$) and mortality (27% vs 11%; $P<.05$) were less favorable in the supranormal resuscitation group.

Conclusion: Supranormal resuscitation, compared with normal resuscitation, was associated with more lactated Ringer infusion, decreased intestinal perfusion (higher GAP_{CO_2}), and an increased incidence of IAH, ACS, multiple organ failure, and death.



... 30 let
„mrtvá strategie“

Hayes et al. *N Engl J Med* **1994**,
330:1717-22

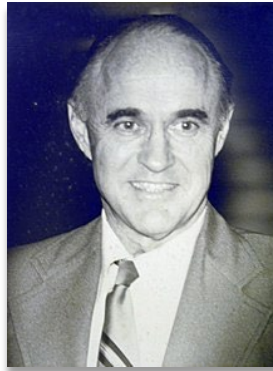
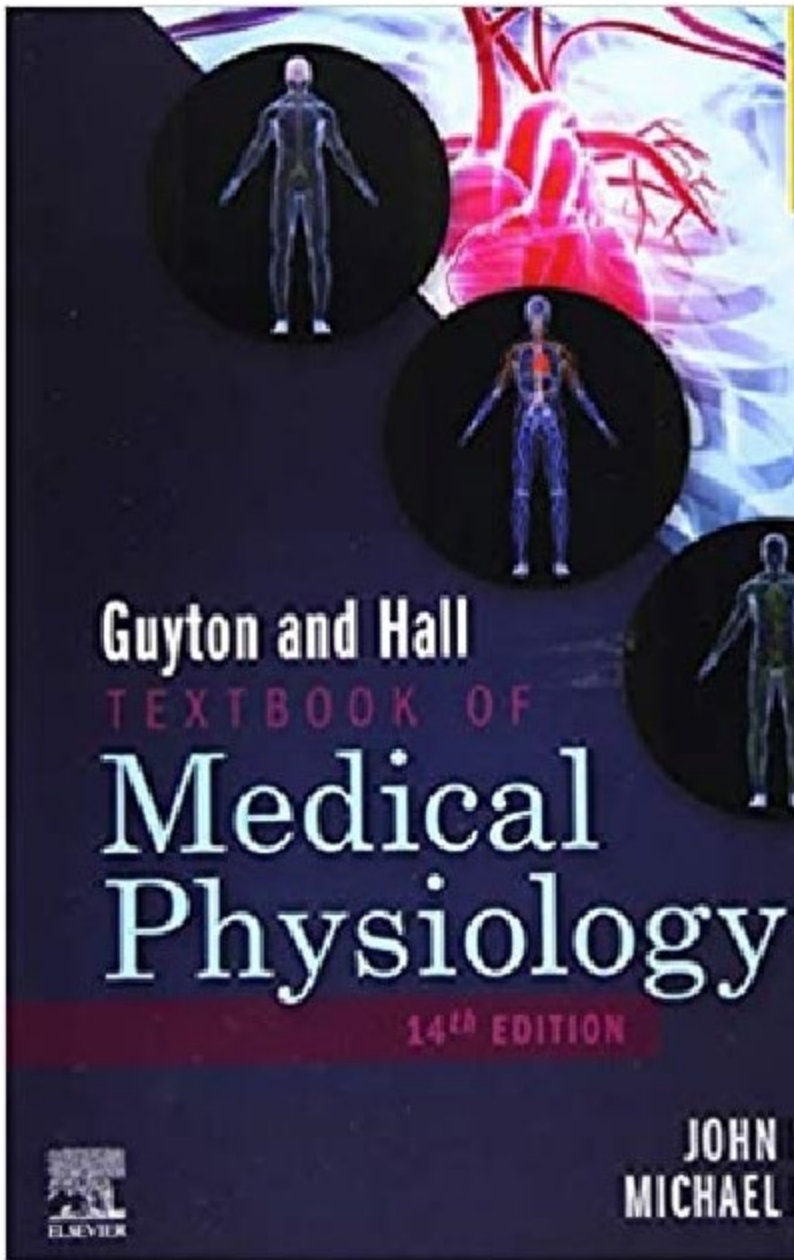
Krátký „case report“ ... (předávka služby)

... pacient v septickém šoku

$$CI = 4.7 \text{ L/min/m}^2$$

Závěr ECHO: „**těžká hypovolemie**“
(soudě podle výroku: „*vleze do něho alespoň 5 litrů tekutin*“)

Proč ECHO signalizuje hypovolemii??



Arthur Clifton Guyton
(1919-2003)

Henderson et al. *Critical Care* 2010, 14:243
<http://ccforum.com/content/14/6/243>



REVIEW

Clinical review: Guyton - the role of mean circulatory filling pressure and right atrial pressure in controlling cardiac output

William R Henderson¹, Donald E G Griesdale², Keith R Walley² and A William Sheel³

Magder *Critical Care* 2012, 16:236
<http://ccforum.com/content/16/5/236>

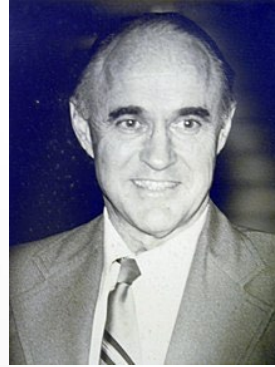


REVIEW

Bench-to-bedside review: An approach to hemodynamic monitoring - Guyton at the bedside

Sheldon Magder*

Krátký „case report“ ... (předávka služby)



Arthur Clifton Guyton
(1919-2003)

- ... srdce je hnacím motorem venózního návratu (*= vytváří gradient pro VN snižováním tlaku před pravou síní*)
- ... vazodilatace při septickém šoku výrazně snižuje gradient pro VN snížením arte-

Pouze kombinace **kolabujících venózních struktur**
a nízkého minutového objemu srdce (!!!)
signalizují HYPOVOLEMII

- ... venózní struktury před pravým srdcem kolabují a **TOTO ECHO vidí**

Phenotyping is ...



AR ANNUAL
REVIEWS

Annu Rev Med. 2023
27;74:457-471

Annual Review of Medicine

Biological Phenotyping in Sepsis and Acute Respiratory Distress Syndrome

Pratik Sinha,¹ Nuala J. Meyer,² and Carolyn S. Calfee³

¹Division of Clinical & Translational Research and Division of Critical Care, Department of Anesthesia, Washington University, St. Louis, Missouri, USA; email: p.sinha@wustl.edu

²Division of Pulmonary, Allergy, and Critical Care Medicine; Center for Translational Lung Biology; and Lung Biology Institute, University of Pennsylvania Perelman School of Medicine, Philadelphia, Pennsylvania, USA

³Division of Pulmonary, Critical Care, Allergy & Sleep Medicine, Department of Medicine, University of California San Francisco, San Francisco, California, USA

Phenotyping is ...



Hemodynamic Profiles of Shock in Patients With COVID-19

Steven M. Hollenberg et al. *Am J Cardiol* 2021, 15;153:135-139

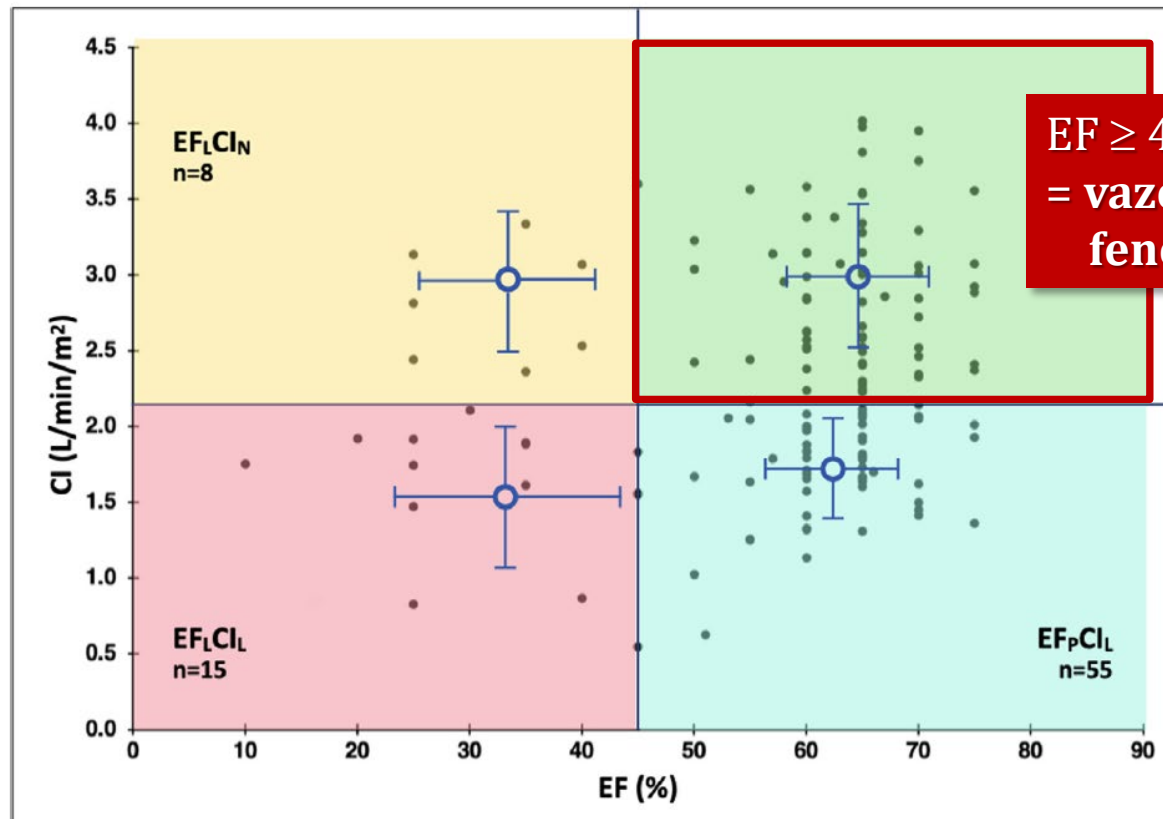
- pacienti se **septickým šokem a COVID-19 pneumonií** (*situace zvykle z důvodu bakteriální superinfekce*)
- podle **LVEF** (cutoff 45%) a **Cardiac index** (cutoff 2.2 L/min/m²) lze rozeznat 4 „logické“ hemodynamické fenotypy ... +
... které navíc umožňují **cílenou léčebnou intervenci**

Phenotyping is ...



Hemodynamic Profiles of Shock in Patients With COVID-19

Steven M. Hollenberg et al. *Am J Cardiol* 2021, 15;153:135-139



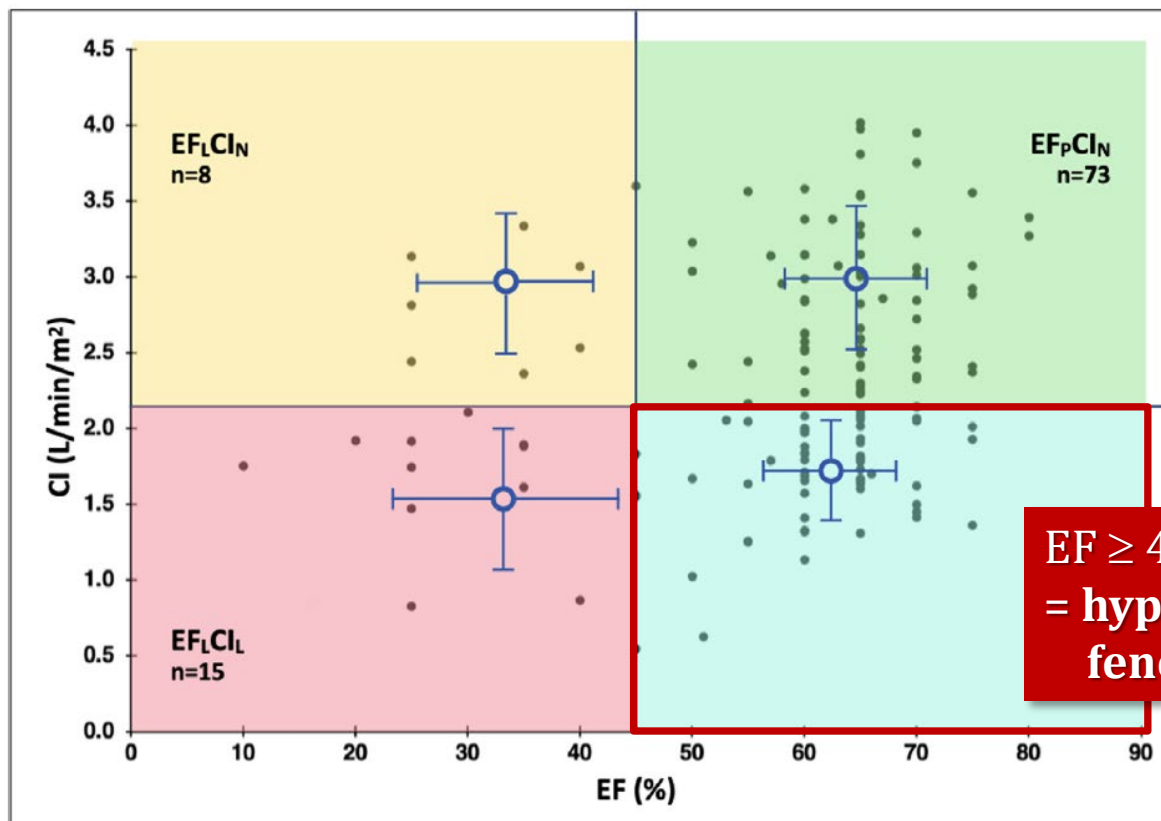
**EF ≥ 45%, CI ≥ 2.2
= vazodilatační
fenotyp SŠ**

Phenotyping is **COOL!** ...



Hemodynamic Profiles of Shock in Patients With COVID-19

Steven M. Hollenberg et al. *Am J Cardiol* 2021, 15;153:135-139



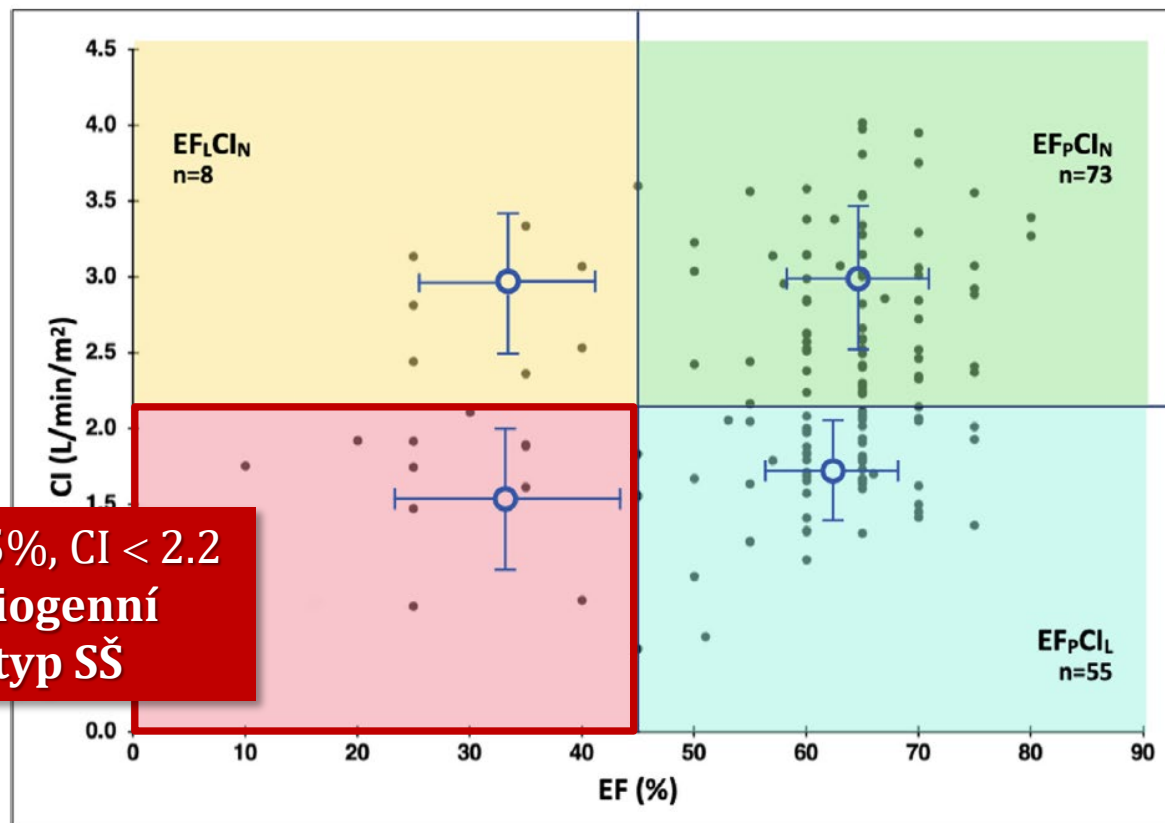
**EF ≥ 45%, CI < 2.2
= hypovolemic
phenotype SŠ**

Phenotyping is ...



Hemodynamic Profiles of Shock in Patients With COVID-19

Steven M. Hollenberg et al. *Am J Cardiol* 2021, 15;153:135-139



EF < 45%, CI < 2.2
= kardiogenní
fenotyp SŠ

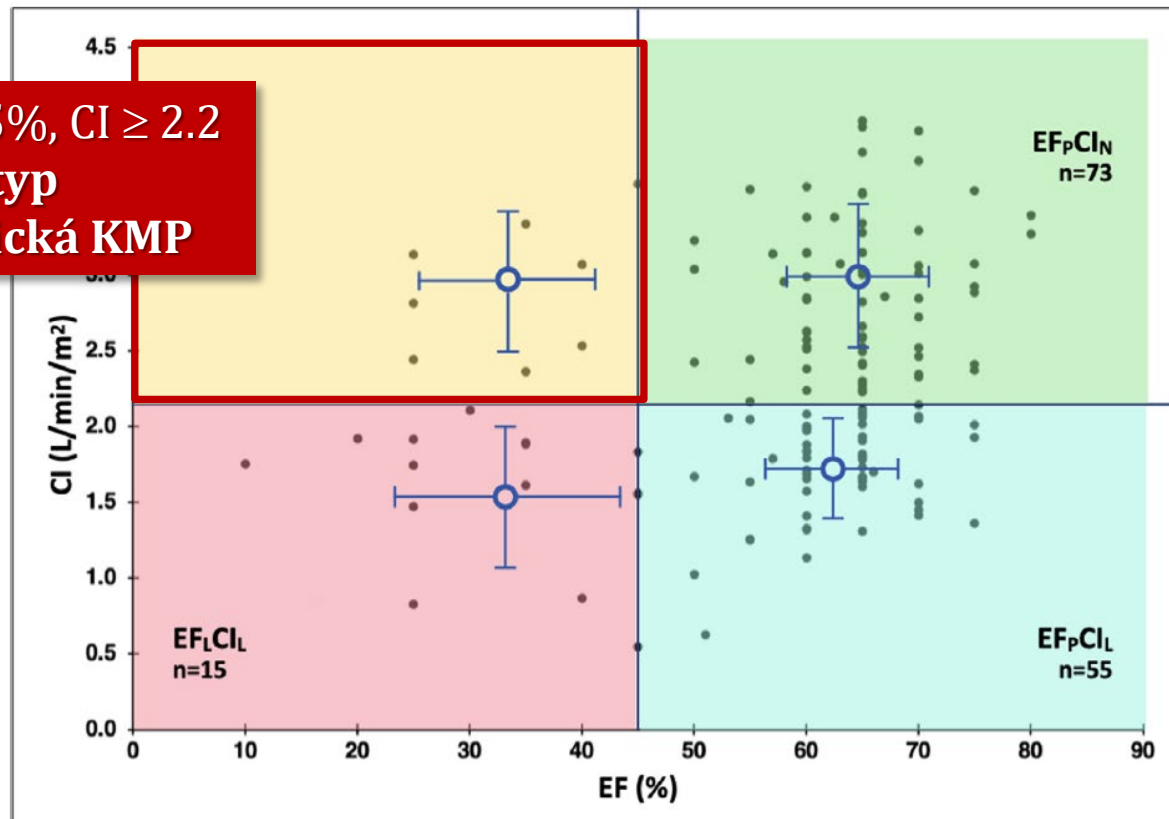
Phenotyping is ...



Hemodynamic Profiles of Shock in Patients With COVID-19

Steven M. Hollenberg et al. *Am J Cardiol* 2021, 15;153:135-139

**EF < 45%, CI ≥ 2.2
= fenotyp
septická KMP**



Phenotyping is ...



ONLINE SPECIAL ARTICLE

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

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

Laura Evans¹

Andrew Rhodes²

Waleed Alhazzani³

Massimo Antonelli⁴

... **důvod:** „guidelines“ popisují **intervenci jenom u jednoho hemodynamického fenotypu septického šoku a to:**

HYPOVOLEMICKÉHO