1948

1959

Anaesthesiology & Intensive Medicine

doc. MUDr. Jozef Firment, PhD.

Košice, Tuesday, September 10th 2019

Co-funded by the Erasmus+ Programme of the European Union

PAVOL JOZEF ŠAFÁRIK UNIVERSITY IN KOŠICE

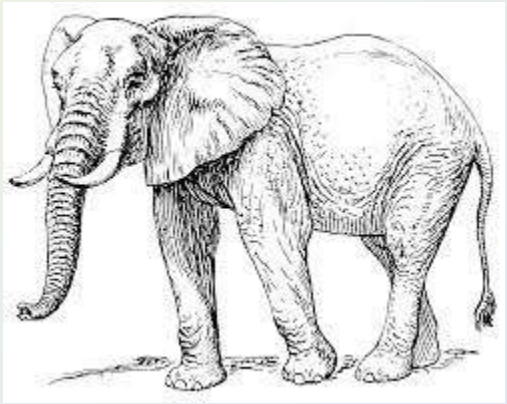
Faculty of Medicine

UNIVERZITA PAVLA JOZEFA ŠAFÁRIKA V KOŠICIACH
1959 - 2019

Logo – vital signs

ANAESTHESIOLOGY & INTENSIVE CARE MEDICINE
COMPONENTS OF THE SUBJECT

1. Anaesthesiology
2. Intensive (Critical) Care Medicine
3. (Pre-hospital) Emergency Care, Acute Medicine, First Aid
4. Algesiology



prof.. MD. PhD. F.A.C.C.

William Ganz

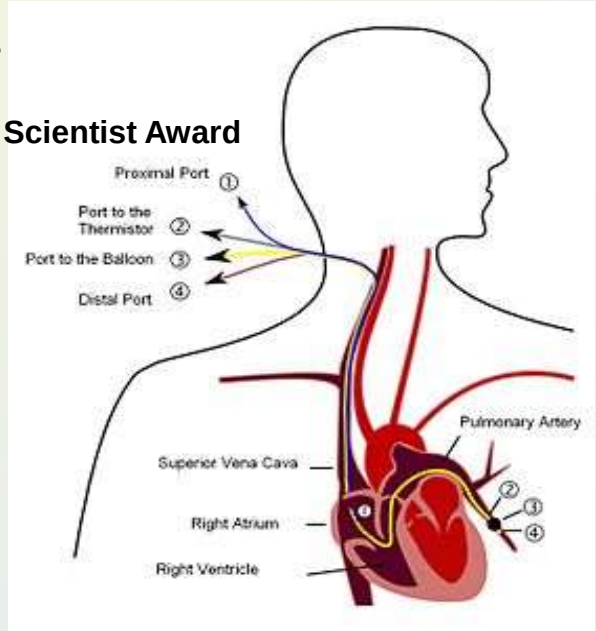
*7.1.1919 **Košice** - †10.11.2009 Los Angeles

1937 Košice, school-leaving exam gymnasium

- **1947 Prague UK graduation MD.**
- **1947 – 1966 U.C.L.A.**
- **1951 internal medicine Bulovka Prague**

1970 introduced to clin. praxis - Swan S-G catheter

- **1970 ass. professor**
- **1972 professor**
- **1992 Distinguished Scientist Award**



Swan HJC, Ganz W, Forrester J, Marcus H, Diamond G, Chonette D. Catheterization of the heart in man with use of a flowdirected balloon-tipped catheter.
N Engl J Med 1970; 283:447-51.

Kadlic's medal year 2013

21 Congress SSAIM Piešťany May 21st 2013

MUDr. Rudolf Klima – establisher of the 1st ICU ward in Czechoslovakia February 1st 1966

- February 1st 1966 – 53 years
  Establishment of the First Department of ICU in Czechoslovakia (Košice, R 43)

UNDERGRADUATE EDUCATION

Subjects that teach by our Clinic

	Study Year	Programme	Language
First Aid	1	GM	Slovak
First Aid	1	GM	Engl
First Aid	2	DM	Slovak
First Aid	2	DM	Engl
Anaesthesiology & Intensive Medicine	5	GM	Slovak
Anaesthesiology & Intensive Medicine	5	GM	Engl
Anaesthesiology	5	DM	Slovak
Anaesthesiology	5	DM	Engl
Algesiology - Compulsory Elective Course	5	GM	Slovak
Algesiology - Compulsory Elective Course	5	GM	Engl

CURRICULUM A+IM GM

- **5th** study Year
- **Block** study (2 weeks daily lectures & practices, 1 week for exams)
- Credit **test** (40 questions, one–the best answer)
- **Practical** exam CPR (2’ BLS, electronical control & results)
- **Oral** Exam

Anaesthesiology and Intensive Medicine

Study program: **5. GM** Summer term 2019

Lectures

13. 02. 2019

Date	Lecture Room	Lecture thesis
11. 02. 2019 Mon 9:45 - 11:15	P3	Introduction to A&IM. Instructions for exam organisation. Remarkable Moments from History of A&ICM. Indications for Admission to ICU. Vital Function Failure. Airway management. *(Lecturer: Jozef Firment, MD. PhD.)*
12. 02. 2019 Tue 12:30 – 14:00	PB	Pre-anaesthetic Evaluation & Preparation before Anaesthesia Premedication. Risk of Anaesthesia. Anaesthetic Chart *(Lecturer: Jozef Firment, MD. PhD.)*
18. 02. 2019 Mon 8:00 - 9:30	P3	General anaesthesia. Inhalational Anaesthesia. Intravenous Anaesthesia. Sedation Post-Anaesthesia Care in Recovery Room *(Lecturer: Jozef Firment, MD. PhD.)*
19. 02. 2019 Tue 16:00 - 17:30	PB	Regional anaesthesia. Neuraxial Technics of Regional Anaesthesia. Peripheral Neural Blocks. Local Anaesthetics Pharmacology. Toxic Reaction Treatment. Anaesthesia for Day-Case Surgery. Acute & Chronic Pain Treatment *(Lecturer: Jozef Firment, MD. PhD.)*
20. 02. 2019 Wed 16:00 - 17:30	PB	Patient Monitoring During Anaesthesia & ICU Vascular Accesses. Indications. Complication. CVP measurement (Lecturer: Jozef Firment, MD. PhD.)
21. 02. 2019 Thu 12:30 - 14:00	PB	Acute Poisoning - First Aid. Elimination methods. Acute Kidney Injury. Renal Replacement Therapy Specificity of Paediatric Anaesthesia Specificity of Obstetric Anaesthesia & Analgesia *(Lecturer: Jozef Firment, MD. PhD.)*
22. 02. 2019 Fri 9:45 - 11:15	P3	Comatose Patient Care. Traumatic Brain Injury. Brain Oedema. Management of Intracranial Pressure Brain Death. Organ Donation. Transplant Programme. Differential Diagnosis of Coma & Qualitative Cerebral Functions Disturbances (Lecturer: Jozef Firment, MD. PhD.)
25. 02. 2019 Mon 9:45 - 11:15	P3	What is emergency medicine. *(Lecturer: Štefan Trenkler, MD. PhD.)*
26. 02. 2019 Tue 08:00 - 09:30	PB	Anaesthesia in Trauma Injuries. Patient Management with Multiple Injuries. Specificity of Cardiac anaesthesia Cardiovascular & Respiratory Complications in General Anaesthesia *(Lecturer: Jozef Firment, MD. PhD.)*
27. 02. 2019 Wed 14:15 - 15:45	PB	Cardiopulmonary resuscitation. (Lecturer: Vladimír Hudák, MD., PhD.)
28. 02. 2019 Thu 16:00 - 17:30	PB	Shock – Pathophysiology & Principals of Treatment Cardiogenic Shock. Acute Myocardial Infarction. Hypovolemic Shock. Life-threatening Haemorrhage. Haemorrhagic Shock. Obstructive Shock. Pneumothorax. (Lecturer: Jozef Firment, MD. PhD.)
01. 03. 2019 Fri 08:00 - 09:30	P3	Distributive Shock. Anaphylactic Shock. Systemic Inflammatory Response Syndrome. Sepsis. Septic Shock. Multiorgan failure *(Lecturer: Jozef Firment, MD. PhD.)*
05. 03. 2019 Tue 15:00 - 16:30	PB	Oxygen Therapy & Inspiratory Gas Preparation Acute Respiratory Insufficiency. Principles of artificial Lung Ventilation Acute Respiratory Distress Syndrome. *(Lecturer: Jozef Firment, MD. PhD.)*
05. 03. 2019 Tue 16:45 – 18:15	PB	Parenteral & Enteral Nutrition. Acid-Base Balance & Fluids Disturbances. *(Lecturer: Vladimír Hudák, MD. PhD.)*
11. 03. 2019 Mon 16:45	AULA	CONTROL TEST

A CPR & First Aid 5th study year

1. CPR, Chain of Survival
2. Cardiac Arrest and Life-threatening Arrhythmias
3. Airway Management without Airway Devices
4. Basic Life Support - Adults
5. Basic & Advanced Life Support - Newborns, Infants & Children
6. Advanced Life Support Adults
7. Airway Management with Airway Devices
8. Drugs for CPR & Routes of Drugs Administration
9. Defibrillation, cardioversion, cardiostimulation
10. First Aid in Near-drowning
11. First Aid in Electrical Current Injury
12. First Aid in Burn Trauma
13. First Aid in Hyper- Hypothermia
14. Cardiac Arrest in Pregnancy
15. First Aid in Anaphylaxis
16. Acute Poisoning - First Aid, Elimination methods, Support
17. Specificity of In-hospital Cardiac Arrest, Rapid Response Teams
18. Pre-hospital & In-hospital Transport of critically ill
19. Ethical & Legal Issues of CPR & Intensive Care
20. Emergency Services – Organisation, Personal & Technical Equipment

B Anaesthesiology 5th study year

1. Pre-anaesthetic Evaluation & Preparation before Anaesthesia
2. Premedication. Risk of Anaesthesia, Anaesthetic Chart
3. Patient Monitoring During Anaesthesia
4. Vascular Accesses, Indications, Complication, CVP measurement
5. Inhalational Anaesthesia
6. Intravenous Anaesthesia, Sedation
7. Neuraxial Technics of Regional Anaesthesia
8. Peripheral Neural Blocks
9. Local Anaesthetics Pharmacology, Toxic Reaction Treatment
10. Anaesthesia for Day-Case Surgery
11. Specificity of Paediatric Anaesthesia
12. Specificity of Obstetric Anaesthesia & Analgesia
13. Anaesthesia in Trauma Injuries
14. Specificity of Cardioanaesthesia
15. Cardiovascular Complications in General Anaesthesia
16. Respiratory Complications in General Anaesthesia
17. Acute Pain Treatment
18. Chronic Pain Treatment
19. Post-Anaesthesia Care in Recovery Room
20. 10 Remarkable Moments from History of A&ICM

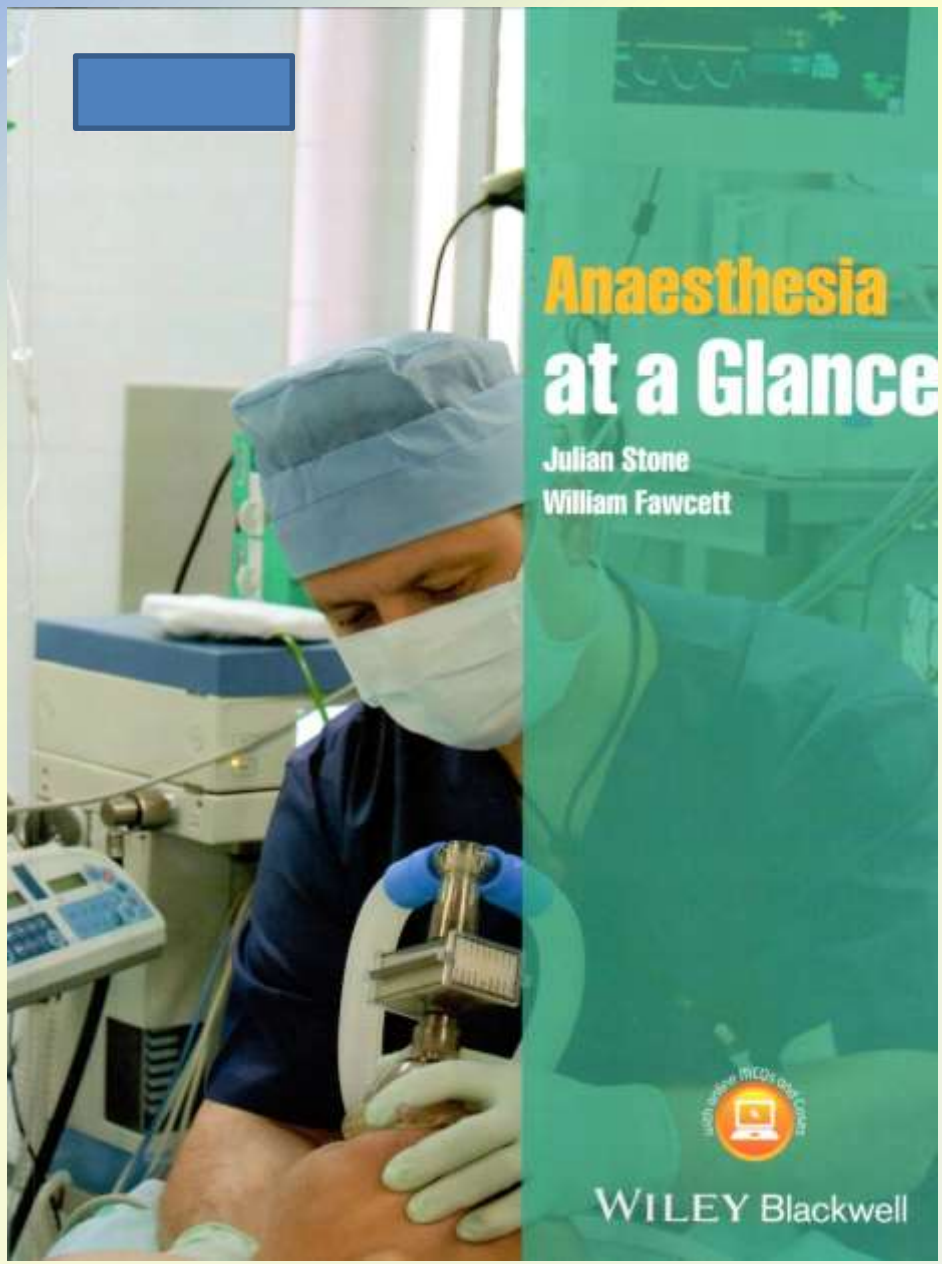
C Intensive Care Medicine

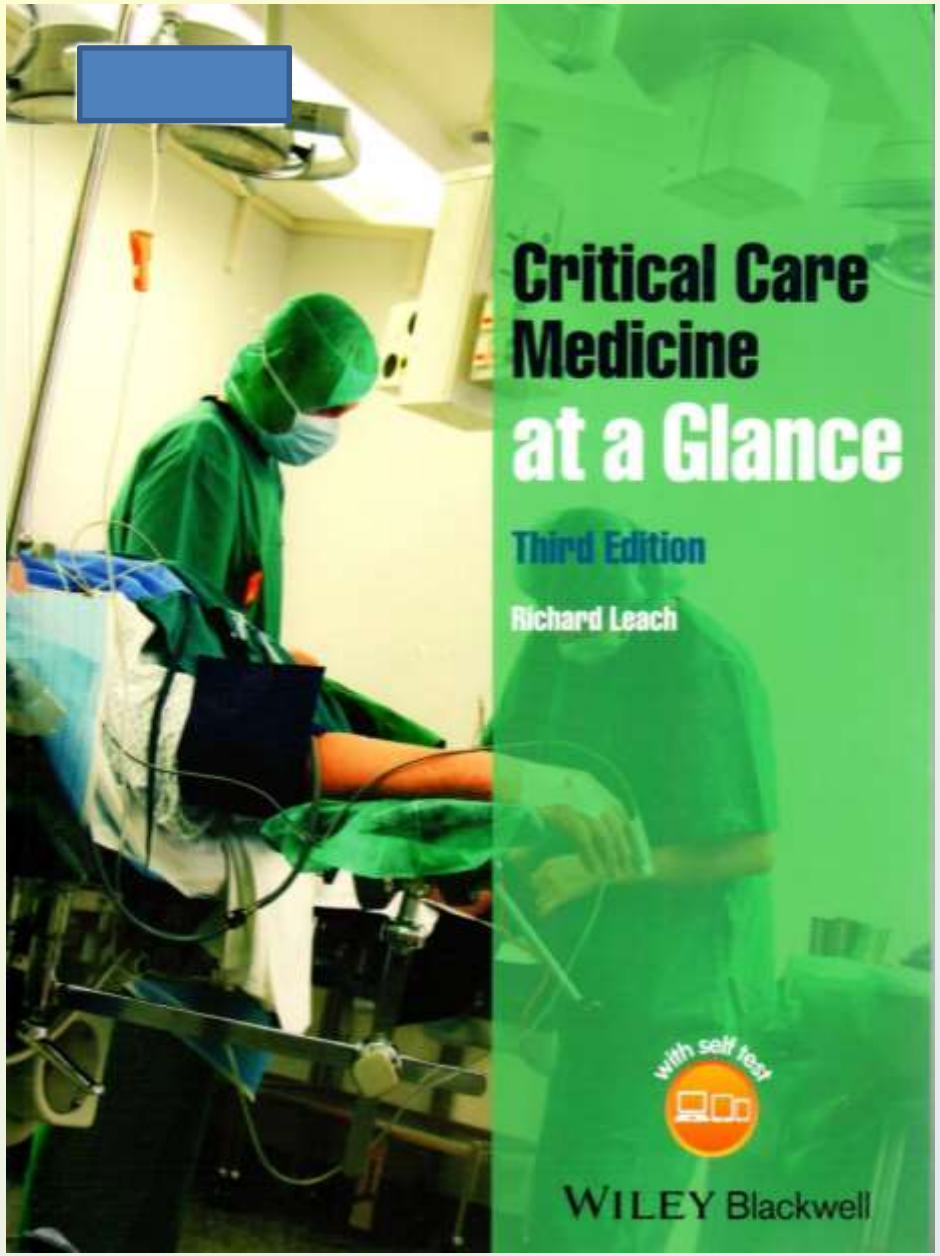
1. Indications for Admission to ICU, Vital Function Failure
2. Shock – Pathophysiology & Principals of Treatment
3. Cardiogenic Shock. Causes, Diagnosis, Treatment. Acute Myocardial Infarction.
4. Hypovolemic Shock. Causes, Diagnosis, Treatment.
5. Distributive Shock. Causes, Diagnosis, Treatment. Anaphylactic Shock. Septic Shock
6. Obstructive Shock. Causes, Diagnosis, Treatment. Acute Lung Injury
7. Oxygen Therapy & Inspiratory Gas Preparation
8. Acute Respiratory Insufficiency, Principles of artificial Lung Ventilation
9. Artificial Lung Ventilation
10. Systemic Inflammatory Response Syndrome, Sepsis
11. Differential Diagnosis of Coma & Qualitative Cerebral functions Disturbances
12. Comatose Patient Care
13. Traumatic Brain Injury. Brain Oedema, Management of Intracranial Pressure
14. Brain Death. Organ Donation. Transplant Programme.
15. Acid-Base Balance & Fluids Disturbances.
16. Blood Loses Supplementation, Infusion Therapy.
17. Life-threatening Haemorrhage. Haemorrhagic Shock.
18. Patient Management with Multiple Injuries.
19. Parenteral & Enteral Nutrition.
20. Acute Kidney Injury, Elimination Methods

Study textbooks

NEW in 2019 !

In Slovak





1st ed 2013 88 pp

3rd ed 2014 172 pp

PRACTICALS A&IM 5th study year

1. Anaesthesiology working place, ICU.
2. Airway equipment. Endotracheal intubation
3. CPR Phantom Training
4. Pre-anaesthetic assessment and premedication
5. Drugs in anaesthetic praxis
6. Spinal anaesthesia, Epidural anaesthesia, Peripheral neural blocks
7. Anaesthetic apparatus
8. Equipment for Monitoring
9. ....

PAVOL JOZEF ŠAFÁRIK UNIVERSITY IN KOŠICE

Faculty of Medicine

Simulators & Equipment

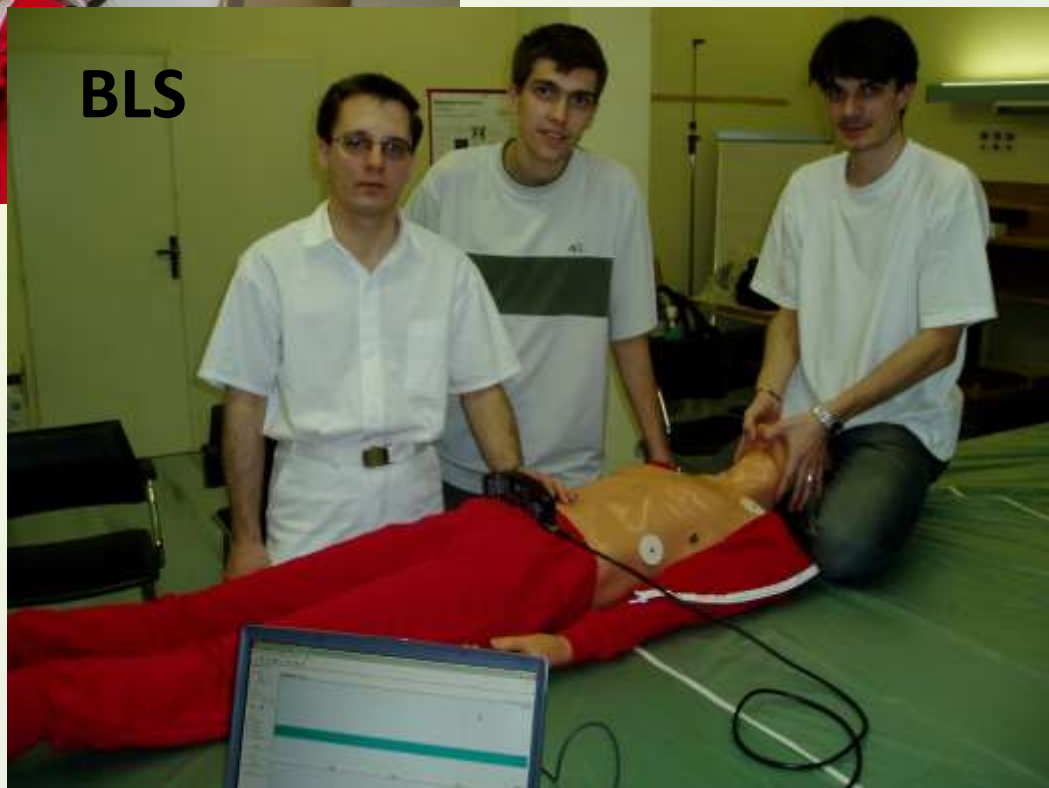
SimMan

Practicals

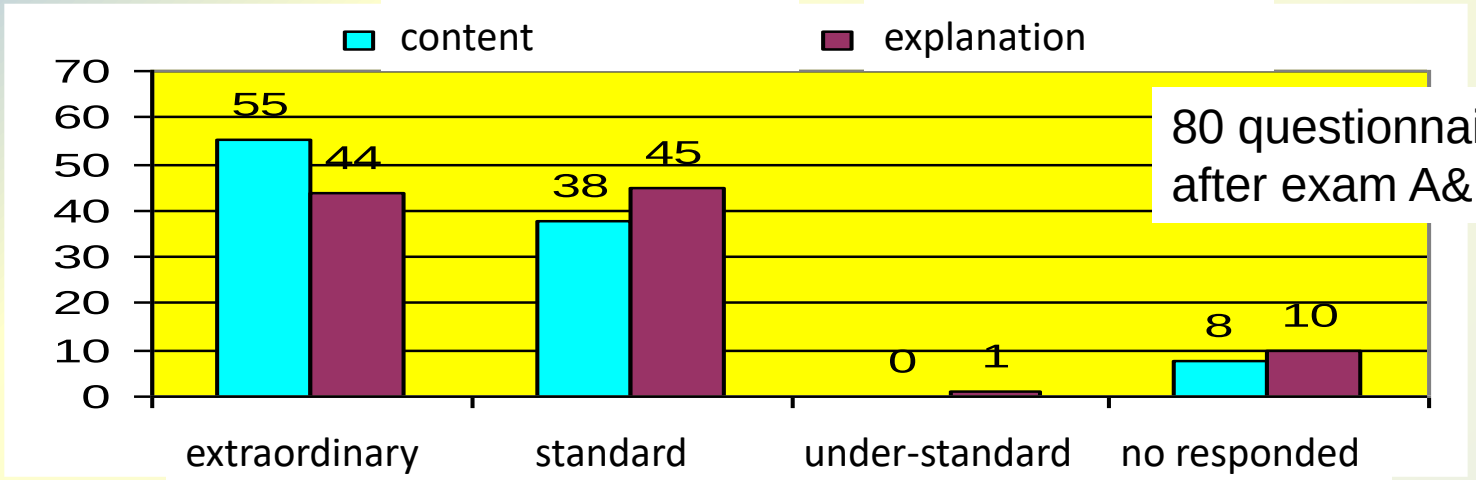
AIRWAY MANAGEMENT

AED

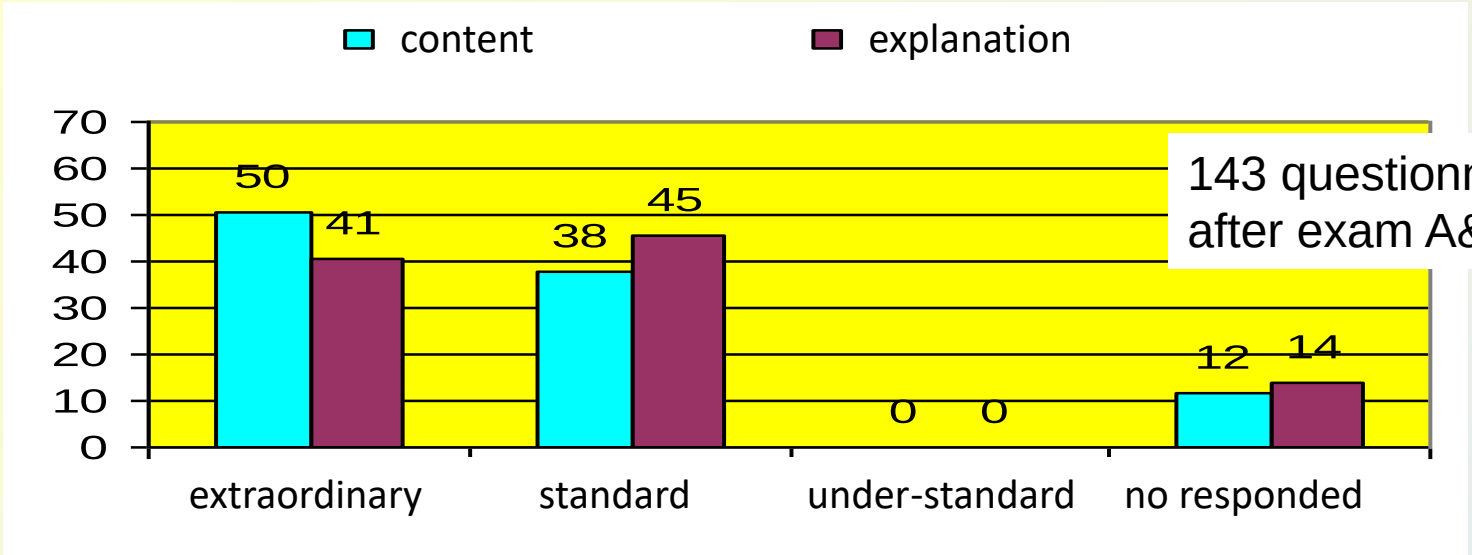
BLS



Students Evaluation of Lectures

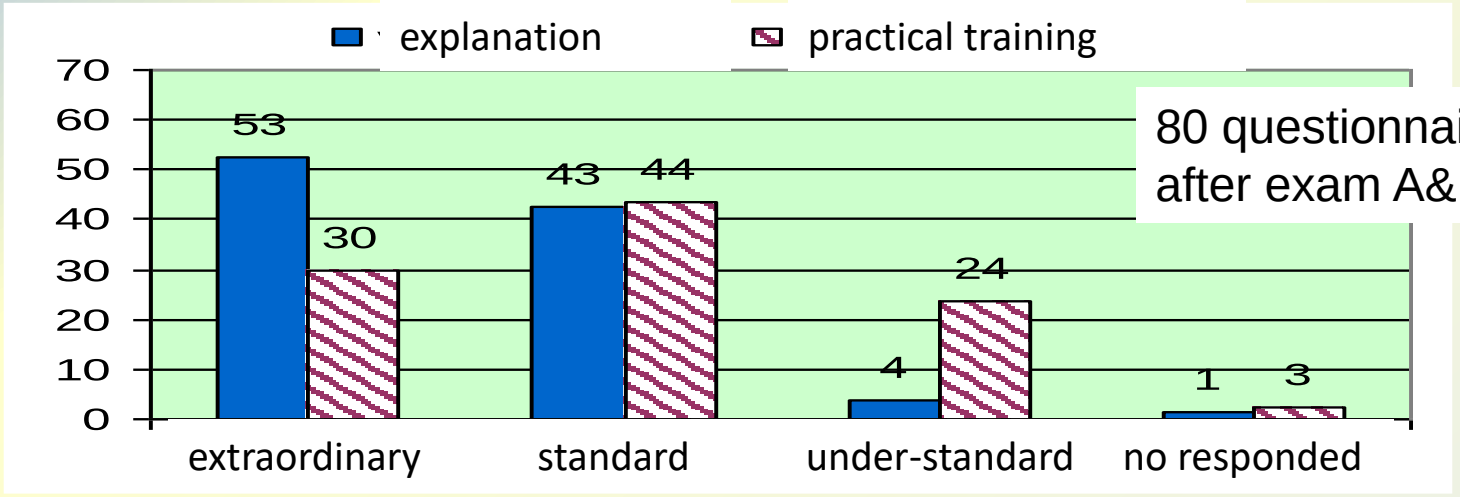


80 questionnaires (44%) after exam A&IM

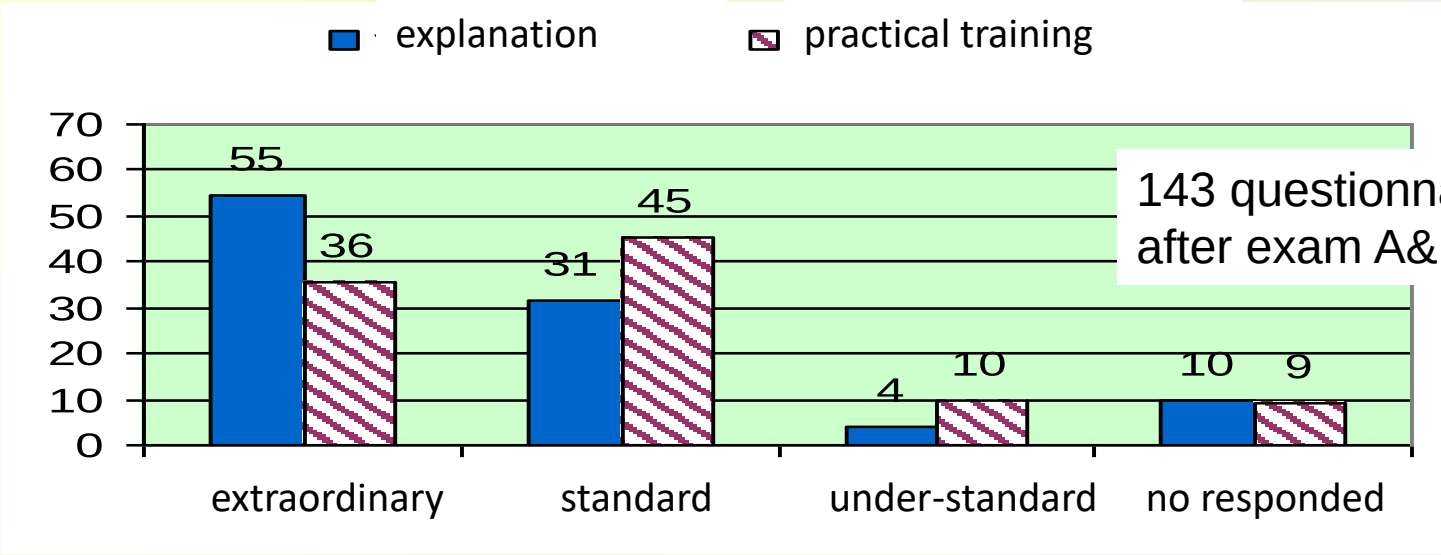


143 questionnaires (84%) after exam A&IM

Students Evaluation of Practicals



80 questionnaires (44%)
after exam A&IM



143 questionnaires (84%)
after exam A&IM

POSTGRADUATE EDUCATION

Postgraduate Study

Univerzita Pavla Jozefa Šafárika v Košiciach
Lekárska fakulta

Trieda SNP 1
040 11 Košice
Slovenská republika

Dekanát:
Telefón/Fax: (+421 55) 642 81 51
e-mail: tajomnik@lf.upjs.sk

Študijné oddelenie:
Telefón/Fax: (+421 55) 789 49 29
e-mail: studijne@lf.upjs.sk

PR manažér:
Telefón: (+421 55) 234 3220
Mobil: 0905 344 299
e-mail: jaroslava.oravcova@upjs.sk

Asociácia Učiteľov a Študentov Lekárskych Fakúlt

Študenti, kontrolujte a hodnoťte výučbu!

Prehľad akreditovaných špecializačných študijných programov

Zdravotnícke povolanie lekár

25 specialisations in GM

Anestéziológia a intenzívna medicína
Cievna chirurgia
Dermatovenerológia
Diabetológia, poruchy látkovej premeny a výživy
Endokrinológia
Fyziatria, balneológia a liečebná rehabilitácia
Fyziatria, balneológia a liečebná rehabilitácia – platné od 14.8.2014
Gastroenterologická chirurgia
Gynekológia a pôrodníctvo
Chirurgia
Infektológia
Kardiológia
Maxilofaciálna chirurgia
Neurochirurgia
Neurológia
Otorinolaryngológia
Pediatria
Pediatria – Špecializačné štúdium podľa zmeneného minimálneho štandardu je možné realizovať u študentov, ktorých vzdelávacie ustanovizeň bude zaraďovať **od 1. októbra 2014** v zmysle § 70 ods. 7 nariadenia vlády č. 296/2010 Z. z.
Pediatrická reumatológia
Pneumológia a ftizeológia
Pracovné lekárstvo
Rádiológia
Ultrazvuk v gynekológii a pôrodníctve
Úrazová chirurgia
Urológia
Vnútorné lekárstvo
Všeobecné lekárstvo - Náplň programu platné pre študentov ŠŠ zaradených do odboru v období od: 20.8.2008 – 20.8.2013
Všeobecné lekárstvo (pre lekárov zaradených do špecializačného odboru všeobecné lekárstvo po 24.2.2014)
Všeobecné lekárstvo - Špecializačné štúdium podľa zmeneného minimálneho štandardu je možné realizovať u študentov, ktorých vzdelávacie ustanovizeň bude zaraďovať **od 1. októbra 2014** v zmysle § 70 ods. 7 nariadenia vlády č. 296/2010 Z. z.

Pre zdravotnícke povolanie lekár a zubný lekár

Zdravotnícky manažment a financovanie

management in Health Care

Zdravotnícke povolanie zubný lekár

3 specialisations in DM

Čeľustná ortopédia
Detské zubné lekárstvo
Maxilofaciálna chirurgia

Zdravotnícke povolanie sestra

2 specialisations in Nursing

Anestéziológia a intenzívna starostlivosť
Intenzívna ošetrovateľská starostlivosť o dospelých

Zdravotnícke povolanie fyzioterapeut

1 specialisations in Physiotherapy

Fyzioterapia porúch CNS

Posledná aktualizácia: 10.10.2014

Univerzitný kalendár akcií
25. 02. 2015
Udelenie čestného titulu „doctor honoris causa"

Fakultný kalendár akcií
19. 02 2015
Obhajoby dizertačnej práce
- MUDr. Jana Pobehová
- MUDr Ahmad Gharaibeh, MPH

04. 03. 2015
Verejné habilitačné prednášky
- RNDr. Ladislav Guller, CSc.
- PharmDr. Zdenko Pirník, PhD.

ŠPECIALIZAČNÝ ŠTUDIJNÝ PROGRAM PRE ŠPECIALIZAČNÝ ODBOR ANESTÉZIOLÓGIA A INTENZÍVNA MEDICÍNA

a) Charakteristika špecializačného odboru a dĺžka trvania špecializačného štúdia

Anestéziológia a intenzívna medicína je interdisciplinárnym a základným odborom v liečebno-preventívnej starostlivosti, ktorý skúma a poskytuje anestetickú, resuscitačnú a intenzívnu starostlivosť a liečbu. Pri poskytovaní anestetickej starostlivosti a pri aplikácii princípov intenzívnej medicíny spolupracuje s operačnými a neoperačnými odbormi.
Anestetickou starostlivosťou sa zabezpečuje bezbolestné vykonávanie diagnostických a liečebných výkonov operačnej a neoperačnej povahy.
Intenzívna medicína zabezpečuje starostlivosť a liečbu kriticky chorých, u ktorých hrozí zlyhanie, zlyháva alebo zlyhala funkcia jedného alebo viacerých orgánových systémov.
Odbor anestéziológia a intenzívna medicína sa tiež podieľa na organizačnom a prevádzkovom zabezpečovaní urgentnej prednemocničnej a nemocničnej starostlivosti.
Odbor anestéziológia a intenzívna medicína sa podieľa aj na riešení problematiky chronickej a neznesiteľnej bolesti v rozsahu určenom koncepciou odboru algeziológia.

Dĺžka trvania špecializačného štúdia je 5 rokov

b) Určenie stupňa vzdelania

Podmienkou na zaradenie do špecializačného štúdia v špecializačnom odbore anestéziológia a intenzívna medicína je úspešné absolvovanie vysokoškolského doktorského štúdia v odbore všeobecné lekárstvo (MUDr.).

Prijatie na štúdium

Na štúdium možno prijať absolventa medicíny, ktorý ovláda slovom i písmom slovenský jazyk a môže vykonávať činnosť lekára v Slovenskej republike.

c) Rozsah teoretických vedomostí, praktických zručností a skúseností potrebných na výkon špecializovaných pracovných činností

Teoretická príprava
Teoretická príprava školencov má kreditový charakter, ktorý je rozoberaný v ďalšom texte. Naplnenie rozsahu teoretických vedomostí, ktorý je uvedený nižšie, bude vyžadovať pravidelné samostatné štúdium a účasť školenca na:

- odborných seminároch KAIM
- odborných podujatiach usporiadaných KAIM (workshopy)
- odborných podujatiach usporiadaných SLS alebo SLK
- na akreditovaných postgraduálnych školiacich akciách, odborných konferenciách a kongresoch.

Personálne sa na teoretickej príprave budú podieľať lektori z UPJŠ LF a školitelia z KAIM.

Study Programme in Specialisation A&IM

since 2010 in Košice

http://www.lf.upjs.sk/studium/specializacne/anesteziologia_a_intenzivna_medicina.pdf

Postgraduate Study – Workshops Critical Situations Training

- **Inhalational Anaesthesia**

- **CEEA** (Committee for European Education in Anaesthesiology) in Košice since 2009 yearly, Six Courses Programme /6 years

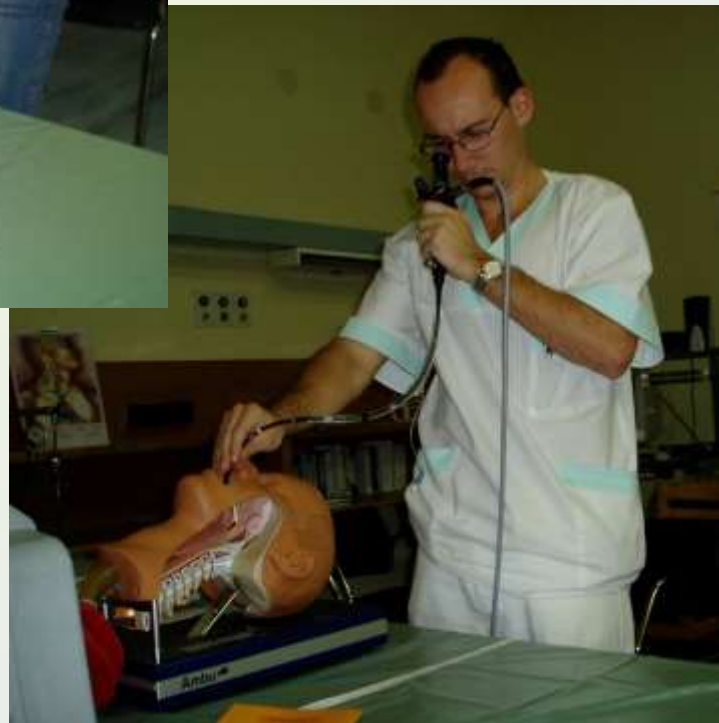
Regional Anaesthesia on Anatomical Institute – yearly since 1998 (22.9.2017 ESRA East EU Congress in Košice)

Postgraduate Study – Workshops Critical Situations Training

- **First Aid** for Paramedics EMS
- **Difficult Airway** Management Workshop = European Airway Management Society for Anaesthesiologists
- …

Difficult Airway Management Workshop

Difficult Airway Society



The First in Slovakia!

Our own USG since 20090424

Intraosseal (drilling) approach

Since 20091201

Intra-hospital Red Line

since 1997 up to 2016: 2323

since 2016 EU Nr: 2222

Intensive Care Med
DOI 10.1007/s00134-017-4683-6

Rhodes, A., Evans, L.E., Alhazzani, W. et al. Intensive Care Med (2017). doi:10.1007/s00134-017-4683-6

CONFERENCE REPORTS AND EXPERT PANEL

Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016

Andrew Rhodes[1*], Laura E. Evans[2], Waleed Alhazzani[3], Mitchell M. Levy[4], Massimo Antonelli[5], Ricard Ferrer[6], Anand Kumar[7], Jonathan E. Sevransky[8], Charles L. Sprung[9], Mark E. Nunnally[7], Bram Rochwerg[3], Gordon D. Rubenfeld[10], Derek C. Angus[11], Djillali Annane[12], Richard J. Beale[13], Geoffrey J. Bellinghan[14], Gordon R. Bernard[15], Jean-Daniel Chiche[16], Craig Coopersmith[8], Daniel P. De Backer[17], Craig J. French[18], Seitaro Fujishima[19], Herwig Gerlach[20], Jorge Luis Hidalgo[21], Steven M. Hollenberg[22], Alan E. Jones[23], Dilip R. Karnad[24], Ruth M. Kleinpell[25], Younsuk Koh[26], Thiago Costa Lisboa[27], Flavia R. Machado[28], John J. Marini[29], John C. Marshall[30], John E. Mazuski[31], Lauralyn A. McIntyre[32], Anthony S. McLean[33], Sangeeta Mehta[34], Rui P. Moreno[35], John Myburgh[36], Paolo Navalesi[37], Osamu Nishida[38], Tiffany M. Osborn[39], Anders Perner[40], Colleen M. Plunkett[25], Marco Ranieri[41], Christa A. Schorr[42], Maureen A. Seckel[43], Christopher W. Seymour[42], Lisa Shieh[43], Khalid A. Shukri[44], Steven Q. Simpson[45], Mervyn Singer[46], B. Taylor Thompson[47], Sean R. Townsend[48], Thomas Van der Poll[49], Jean-Louis Vincent[50], W. Joost Wiersinga[49], Janice L. Zimmerman[51] and R. Phillip Dellinger[22]

Issued 2017 - NEW!

Abstract

Objective: To provide an update to "Surviving Sepsis Campaign Guidelines for Management of Sepsis and Septic Shock: 2012".

Design: A consensus committee of 55 international experts representing 25 international organizations was convened. Nominal groups were assembled at key international meetings (for those committee members attending the conference). A formal conflict-of-interest (COI) policy was developed at the onset of the process and enforced throughout. A stand-alone meeting was held for all panel members in December 2015. Teleconferences and electronic-based discussion among subgroups and among the entire committee served as an integral part of the development.

Methods: The panel consisted of five sections: hemodynamics, infection, adjunctive therapies, metabolic, and ventilation. Population, intervention, comparison, and outcomes (PICO) questions were reviewed and updated as needed, and evidence profiles were generated. Each subgroup generated a list of questions, searched for best available evidence, and then followed the principles of the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system to assess the quality of evidence from high to very low, and to formulate recommendations as strong or weak, or best practice statement when applicable.

*Correspondence: andrewrhodes@sthurt.nhs.uk
St. George's Hospital, London, England, UK
Full author information is available at the end of the article

This article is being simultaneously published in Critical Care Medicine (DOI: 10.1097/CCM.0000000000002255) and Intensive Care Medicine.

Springer

Processed:
assoc. prof. Jozef Firment, MD., PhD.
I. KAIM UNLP & UPJŠ Faculty of Medicine, Košice

Results: The Surviving Sepsis Guideline panel provided 93 statements on early management and resuscitation of patients with sepsis or septic shock. Overall, 32 were strong recommendations, 39 were weak recommendations, and 18 were best-practice statements. No recommendation was provided for four questions.

Conclusions: Substantial agreement exists among a large cohort of international experts regarding many strong recommendations for the best care of patients with sepsis. Although a significant number of aspects of care have relatively weak support, evidence-based recommendations regarding the acute management of sepsis and septic shock are the foundation of improved outcomes for these critically ill patients with high mortality.

Keywords: Evidence-based medicine, Grading of Recommendations Assessment, Development, and Evaluation criteria, Guidelines, Infection, Sepsis, Sepsis bundles, Sepsis syndrome, Septic shock, Surviving Sepsis Campaign

Sepsis – definition !!!

- **Sepsis** is now defined as **life-threatening organ dysfunction** caused by a **dysregulated host response to infection**

- **Septic shock** is a **subset** of sepsis with
  - **circulatory** and
  - **cellular/metabolic dysfunction**

  associated with a higher risk of **mortality**.

Rhodes, A., Evans, L.E., Alhazzani, W. et al. Intensive Care Med (2017). doi:10.1007/s00134-017-4683-6
Singer M et al: The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3) JAMA. 2016;315(8):801-810.

SOFA-score

Points	1	2	3	4
Glasgow Coma Score	13–14	10–12	6–9	<6
Oxygenation index MAP (mmHg)	<400	<300	<200	<100
Catecholamine doses (µg/kg/min)	<70	Dopamine <5 or Dobutamine (whatever dose)	Dopamine >5 or Adrenaline <0.1 or Noradrenaline <0.1	Dopamine >15 or Adrenaline >0.1 or Noradrenaline >0.1
Blood creatinine (µmol/L) or diuresis (ml/L)	110–170	171–299	300–440 or <500	>440 or <200
Platelets (10^9/L)	<150	<100	<50	<20
Blood bilirubin (µmol/L)	20–32	33–101	102–204	>204

Vincent JL, et al. Intensive Care Med 1996; 22: 707-710.

qSOFA (Quick SOFA) criteria

H Systolic blood pressure <100 mmHg **H**ypotension

A **A**ltered mentation

T Respiratory rate >22/min **T**achypnea

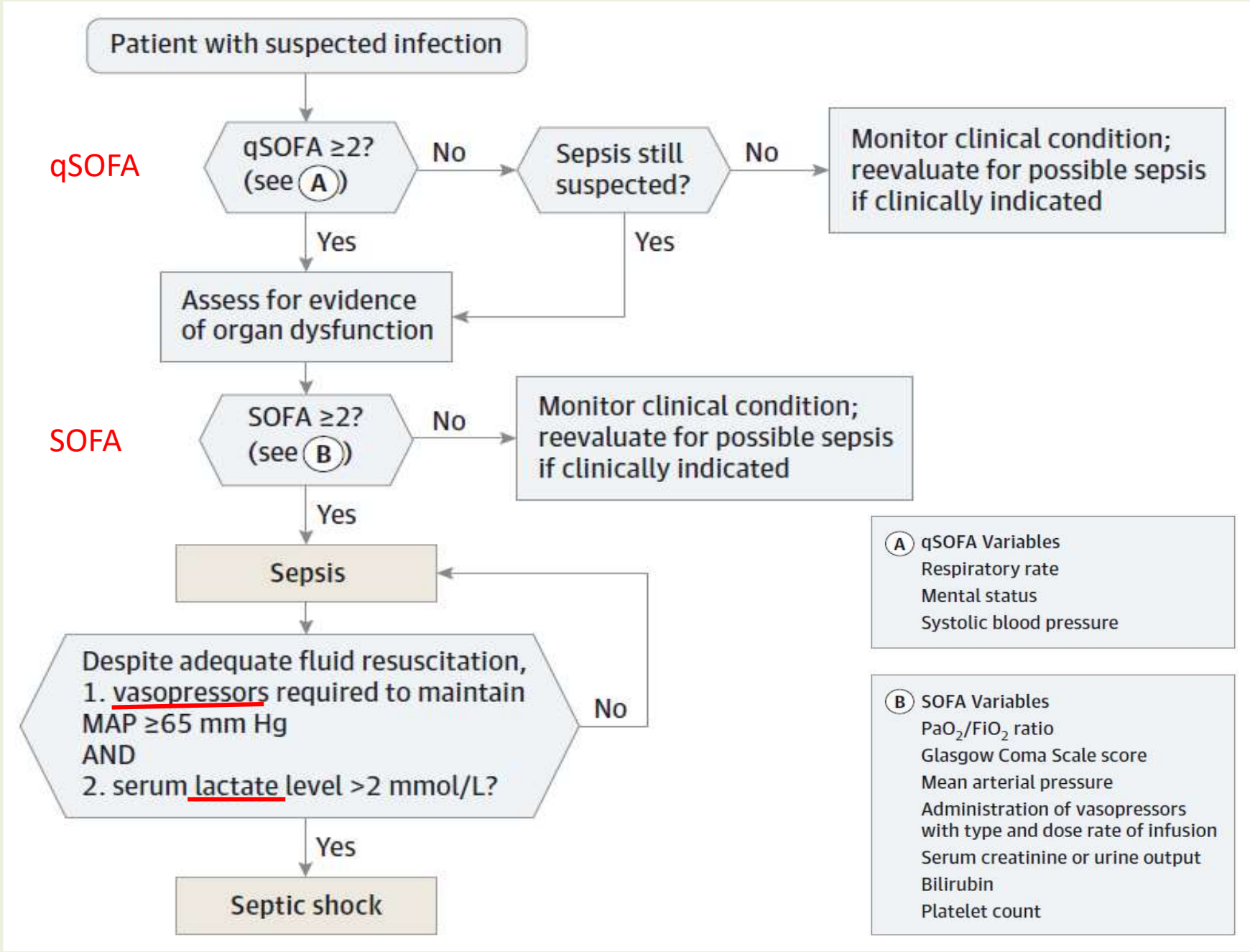
Singer M et al: The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3) JAMA. 2016;315(8):801-810.

New definitions...

	OLD	NEW
SEPSIS	SIRS + Suspected Infection	**SUSPECTED/DOCUMENTED INFECTION** + **H A T** **2 or 3 on qSOFA** (HAT): Hypotension (SBP ≤100 mmHg) AMS (GCS ≤13) Tachypnea (≥22/min) OR Rise in SOFA score by 2 or more
SEVERE SEPSIS	Sepsis + SBP <90 mmHg or MAP < 65 mmHg lactate > 2.0 mmol/L INR >1.5 or a PTT >60 s Bilirubin >34 µmol/L Urine output <0.5 mL/kg/h for 2 h Creatinine >177 µmol/L Platelets <100 ×109/L SpO2 <90% on room air	
SEPTIC SHOCK	SEPSIS + HYPOTENSION after adequate fluid resuscitation	**SEPSIS** + **VASOPRESSORS needed for MAP >65 mmHg** + **LACTATE >2 mmol/L** after adequate fluid resuscitation

Singer M, Deutschman CS, Seymour CW, et al: The Sepsis Definitions Task Force The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). *JAMA*. 2016;315(8):801-810.

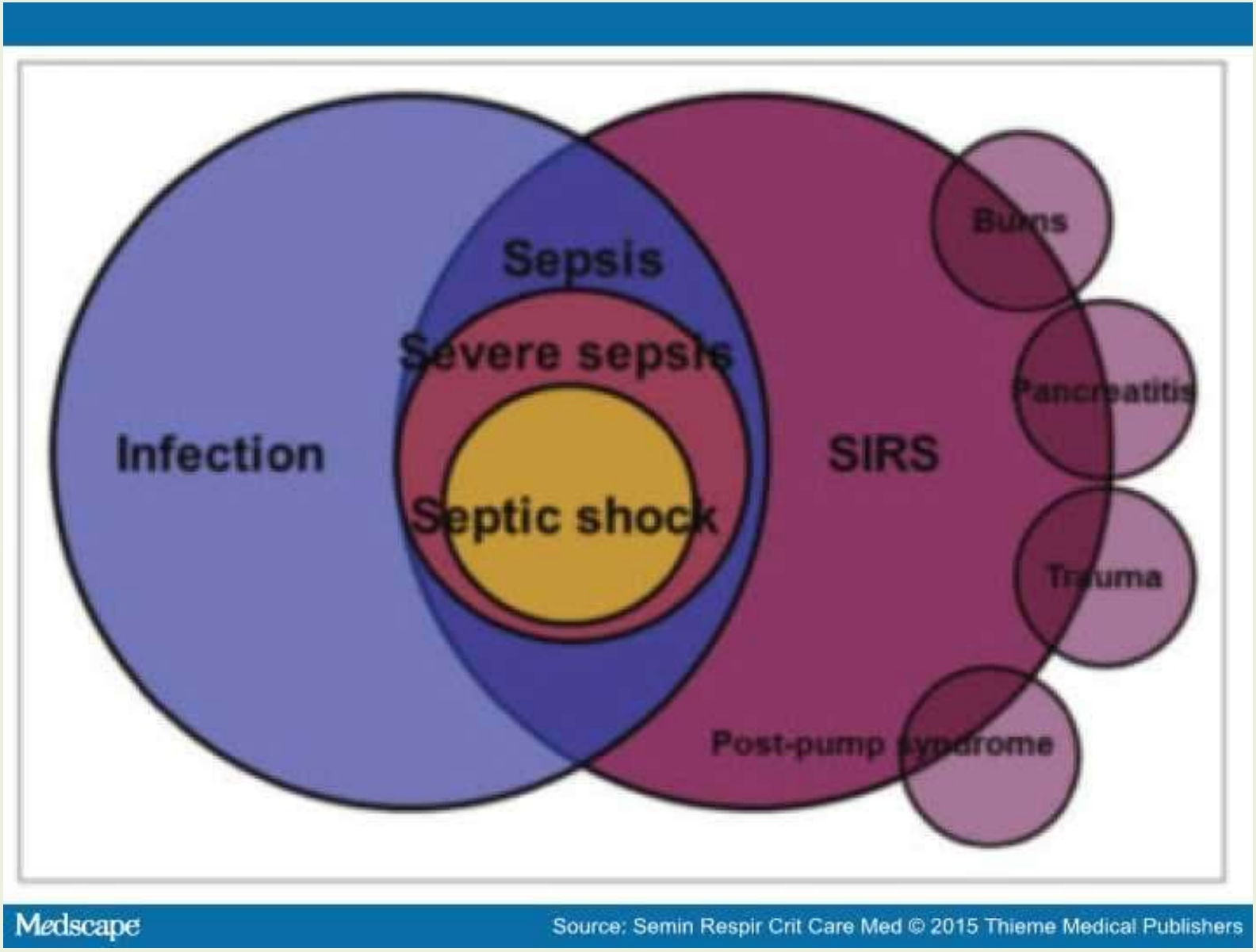
Clinical Criteria Identifying Patients With Sepsis and Septic Shock



CLINICAL SYNDROMES - OLD

- **SIRS** = fever + leukocytosis
- **Sepsis** = SIRS + infection
- ~~**Severe sepsis**~~ = sepsis + MODS (MSOF)
- **Septic shock** = severe sepsis + refractory hypotension

Kerr G. E.: Some current concepts and strategies in critical care. PGA55



http://www.medscape.com/viewarticle/839504_11?nlid=78644_530

Best practice statements (BPSs)

- A number of best practice statements (**BPSs**) appear throughout the document;
- these statements represent **ungraded strong recommendations** and are used under strict criteria.
- A BPS **would be appropriate**, for example, when the **benefit or harm is unequivocal**, but the evidence is **hard** to summarize or assess using **GRADE methodology**.

Comparison of 2016 grading terminology with previous 2012 alphanumeric descriptors

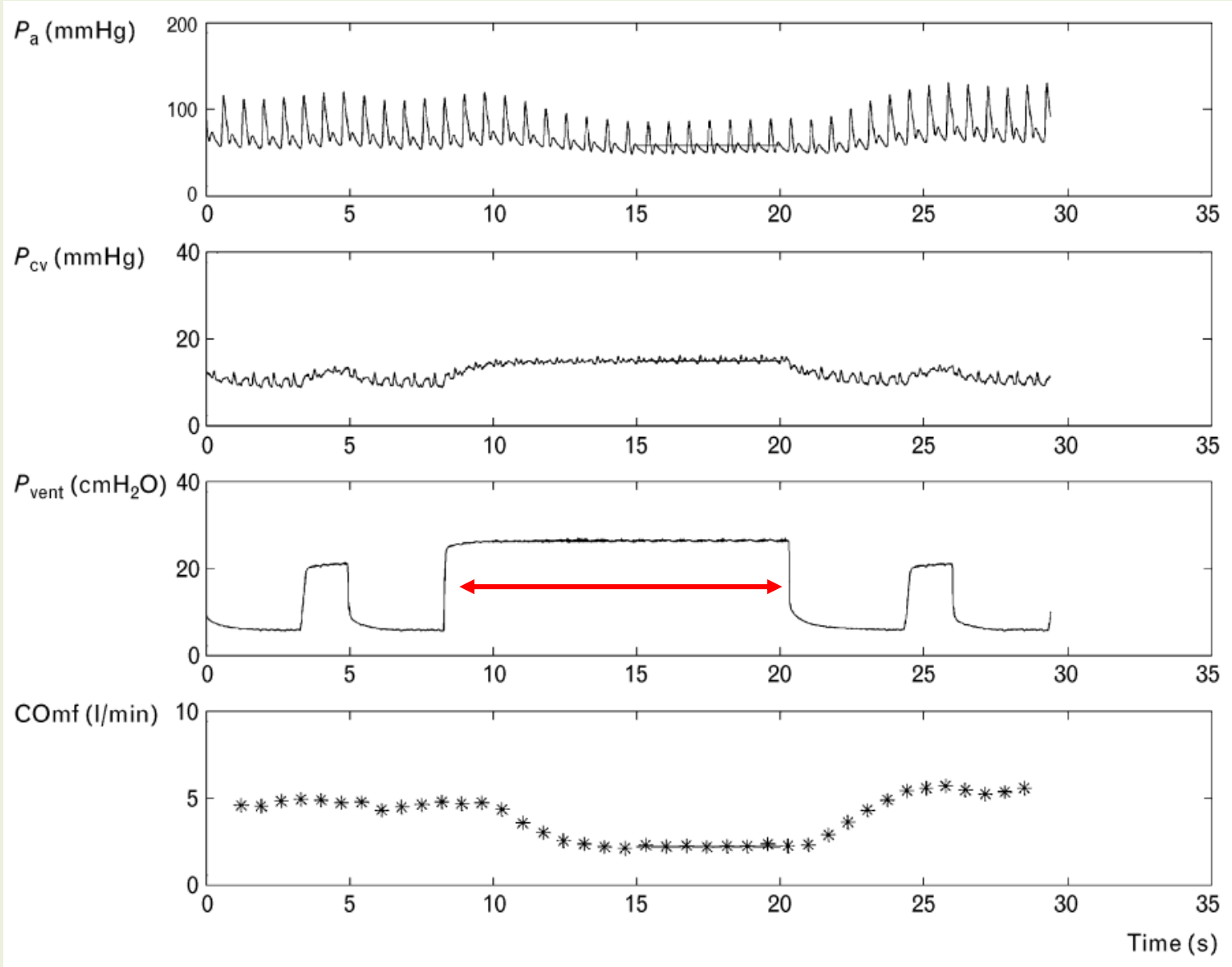
	2016 Descriptor	2012 Descriptor
Strength	Strong	1
	Weak	2
Quality	High	A
	Moderate	B
	Low	C
	Very Low	D
Ungraded strong recommendation	Best Practice Statement	Ungraded

A. INITIAL RESUSCITATION

1. Sepsis and septic shock are **medical emergencies**, and we recommend that **treatment and resuscitation begin immediately** (BPS).
2. We recommend that, in the resuscitation from sepsis-induced hypoperfusion, at **least 30 mL/kg** of IV **crystalloid** fluid be given within the **first 3 h** (strong recommendation, low quality of evidence).
3. We recommend that, following initial fluid resuscitation, **additional fluids** be guided by **frequent reassessment of hemodynamic** status (BPS).

Remarks: Reassessment should include a thorough clinical examination and evaluation of available physiologic variables (heart rate, blood pressure, arterial oxygen saturation, respiratory rate, temperature, urine output, and others, as available) as well as other noninvasive or invasive monitoring, as available.

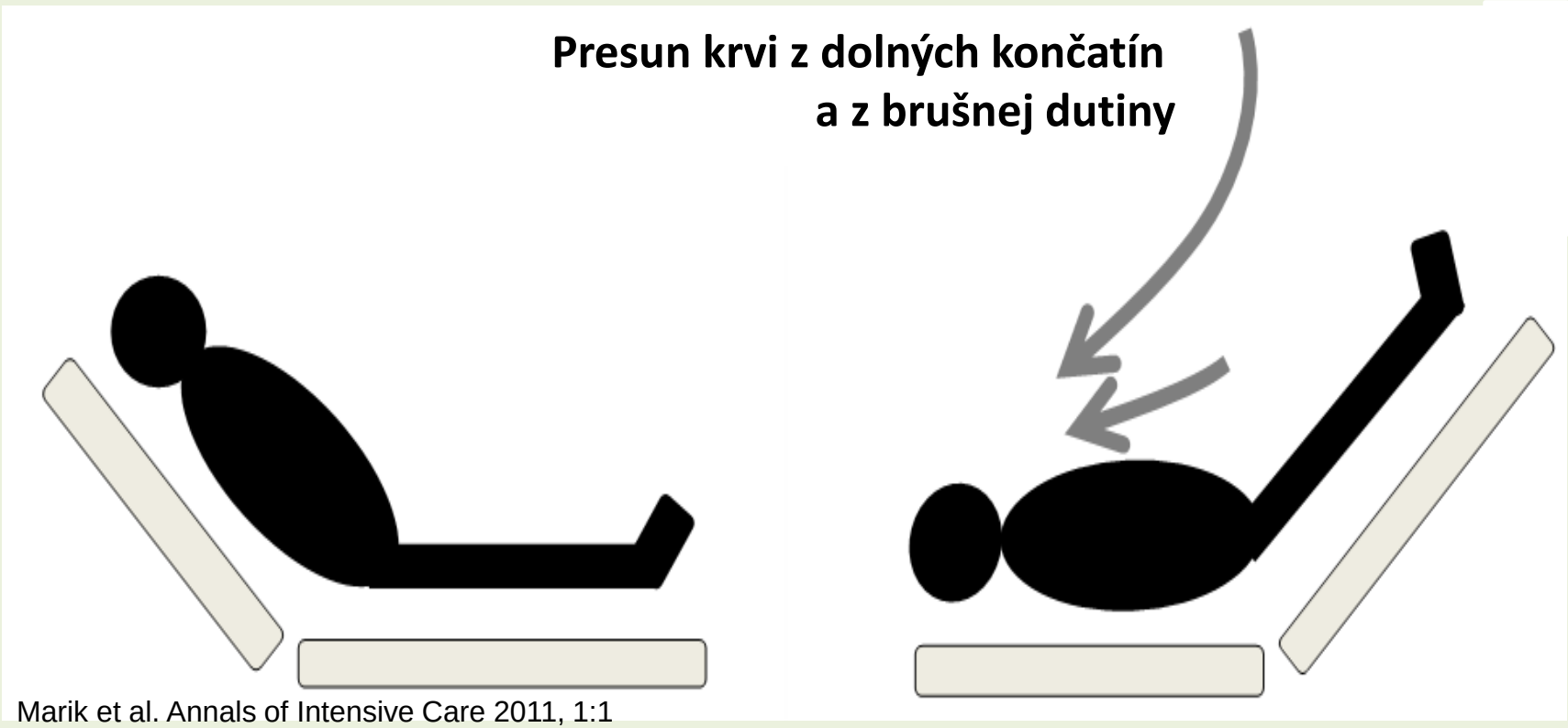
Effects of an inspiratory hold maneuver on arterial pressure (Pa), central venous pressure (Pcv), airway pressure (Pvent) and beat-to-beat cardiac output (COmf)



Jansen JRC, Maas JJ, Pinsky MR: Bedside assessment of mean systemic filling pressure. Current Opinion in Critical Care 2010, 16:231–236

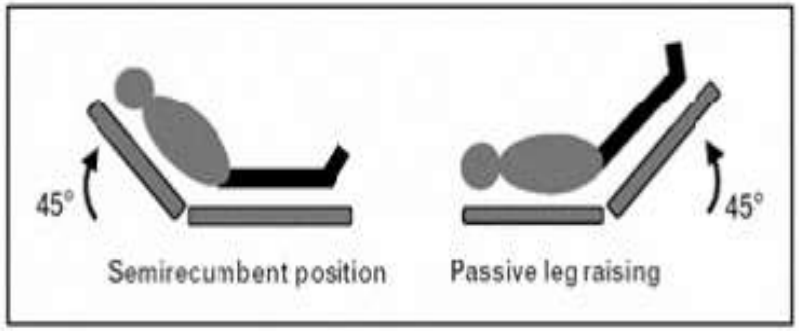
Passive leg raising test (PLRT)

- The passive leg raising test consists in measuring the hemodynamic effects of a leg elevation up to 45°.
- A simple way to perform the postural maneuver is to transfer the patient from the semirecumbent posture to the passive leg raising position by using the automatic motion of the bed.



Marik et al. Annals of Intensive Care 2011, 1:1

Figure 1 The passive leg-raising test consists of measuring the hemodynamic effects of a leg elevation up to 45°



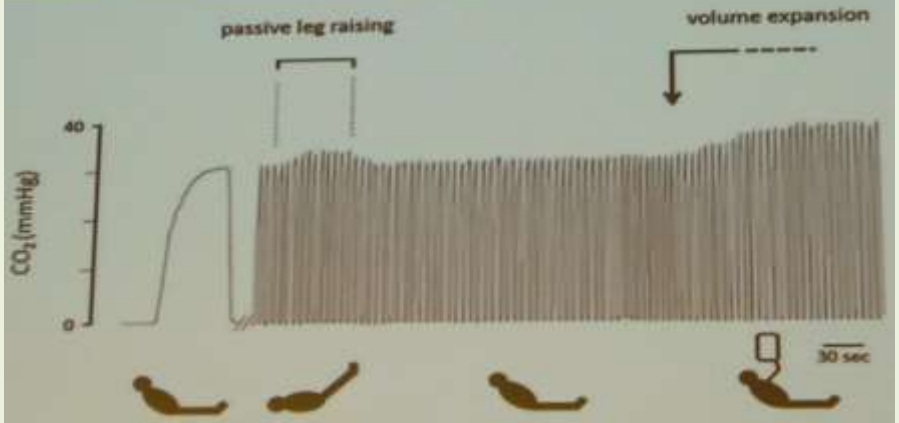
A simple way to perform the postural maneuver is to transfer the patient from the semirecumbent posture to the passive leg-raising position by using the automatic motion of the bed.

ORIGINAL

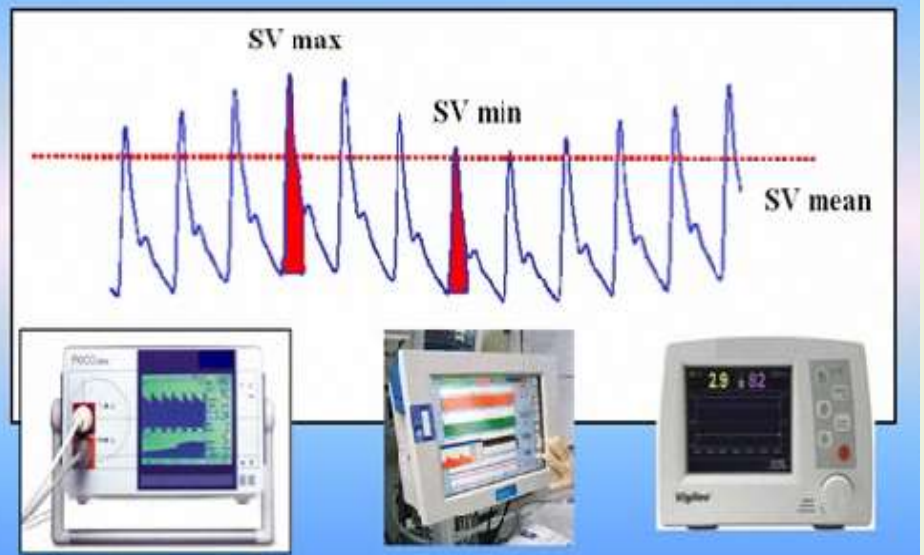
Xavier Monnet
Aurélien Bataille
Eric Magalhaes
Jérôme Barrois
Marine Le Corre
Clément Gosset
Laurent Guerin
Christian Richard
Jean-Louis Teboul

End-tidal carbon dioxide is better than arterial pressure for predicting volume responsiveness by the passive leg raising test

Teboul J-L: AboutSepsis.com



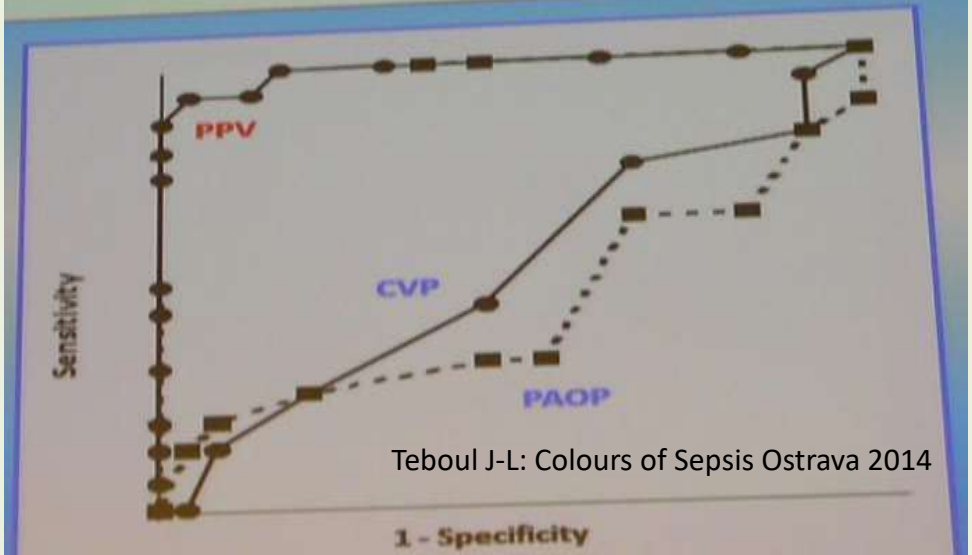
Stroke Volume Variation



Relation between Respiratory Changes in Arterial Pulse Pressure and Fluid Responsiveness in Septic Patients with Acute Circulatory Failure

FREDERIC MICHARD, SANDRINE BOUSSAT, DENIS CHEMLA, NADIA ANGUEL, ALAIN MERCAT, YVES LECARPENTIER, CHRISTIAN RICHARD, MICHAEL R. PINSKY, and JEAN-LOUIS TEBOUL

Am J Respir Crit Care Med 2000, 162: 134–138



Teboul J-L: Colours of Sepsis Ostrava 2014

Parallax MAP 65 mmHg & initial steps in shock

- **MAP increase from 65 mmHg to 85 mmHg after administration NA** did not significantly affect the metabolism of O_2, the microcirculation of the skin, diuresis or splanchnic perfusion.
- Rise to 85 mmHg from 65 mmHg **is not a significant indicator of recovery**. It is a picture of **macro**circulation (eg. under the influence of NA) **micro**circulation can still be closed and **shock may persist**!
- But **fell to 65 mmHg** from normal pressure is **an important indicator of deterioration!**

MAP 65 mmHg!!!

LeDoux D et al: Effects of perfusion pressure on tissue perfusion in septic shock. Crit Care Med. 2000, 28(8):2729-32.
Rhodes, A et al: Surviving Sepsis Campaign: International guidelines for Management of Severe Sepsis and Septic Shock: 2016, 2017, 45, 3,

Initial resuscitation of septic shock - lactate

- It serves as a **more objective** indicator of tissue perfusion than **clinical** examination or **diuresis**
- Significantly reduce mortality in **septic shock resuscitation by lactate levels** compared with resuscitation without monitoring of lactate

Rhodes, A et al: Surviving Sepsis Campaign: International guidelines for Management of Severe Sepsis and Septic Shock: 2016, 2017, 45, 3,

B. SCREENING FOR SEPSIS AND PERFORMANCE IMPROVEMENT

1. We recommend that **hospitals** and hospital systems have a **performance improvement program for sepsis**, including sepsis **screening** for acutely ill, high-risk patients (BPS).

RRT, MET...

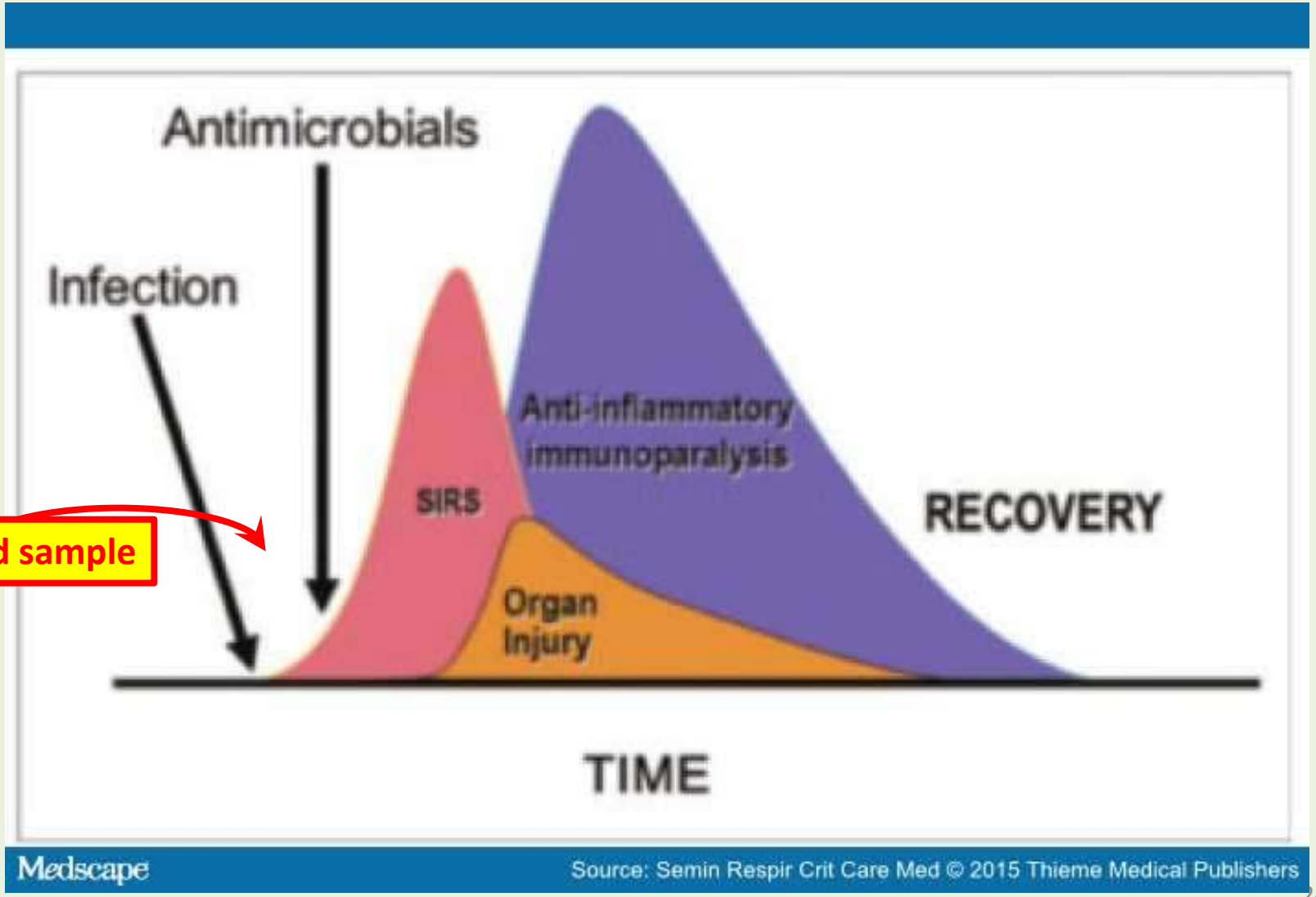
C. DIAGNOSIS

1. We recommend that appropriate routine **microbiologic cultures** (including blood) be obtained **before starting antimicrobial therapy** in patients with suspected sepsis or septic shock if doing so results in no substantial delay in the start of antimicrobials (BPS).

Remarks: Appropriate routine microbiologic cultures always include **at least two sets of blood cultures** (aerobic and anaerobic).

Immunologic view of sepsis and septic shock.

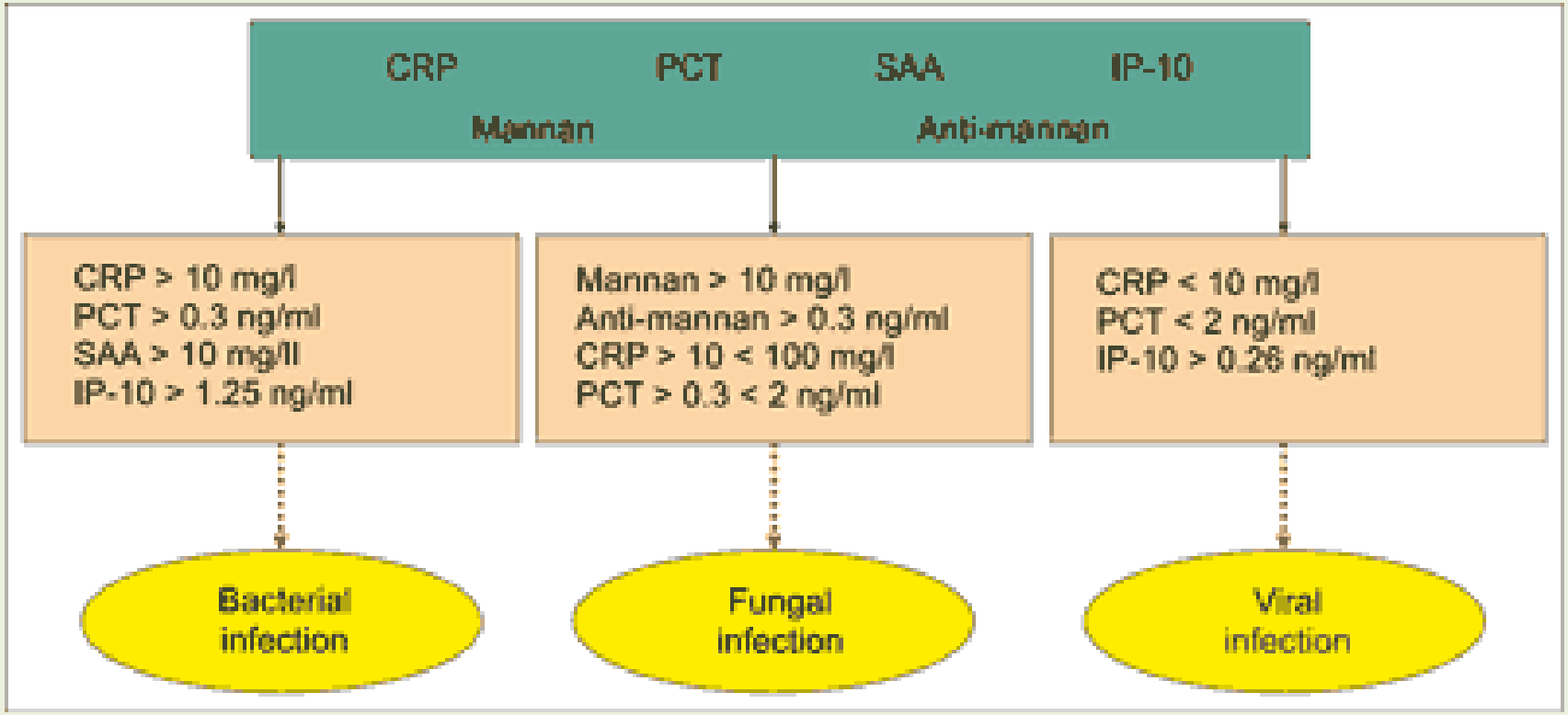
SIRS - systemic inflammatory response syndrome



Blood sample

http://www.medscape.com/viewarticle/839504_11?nlid=78644_530

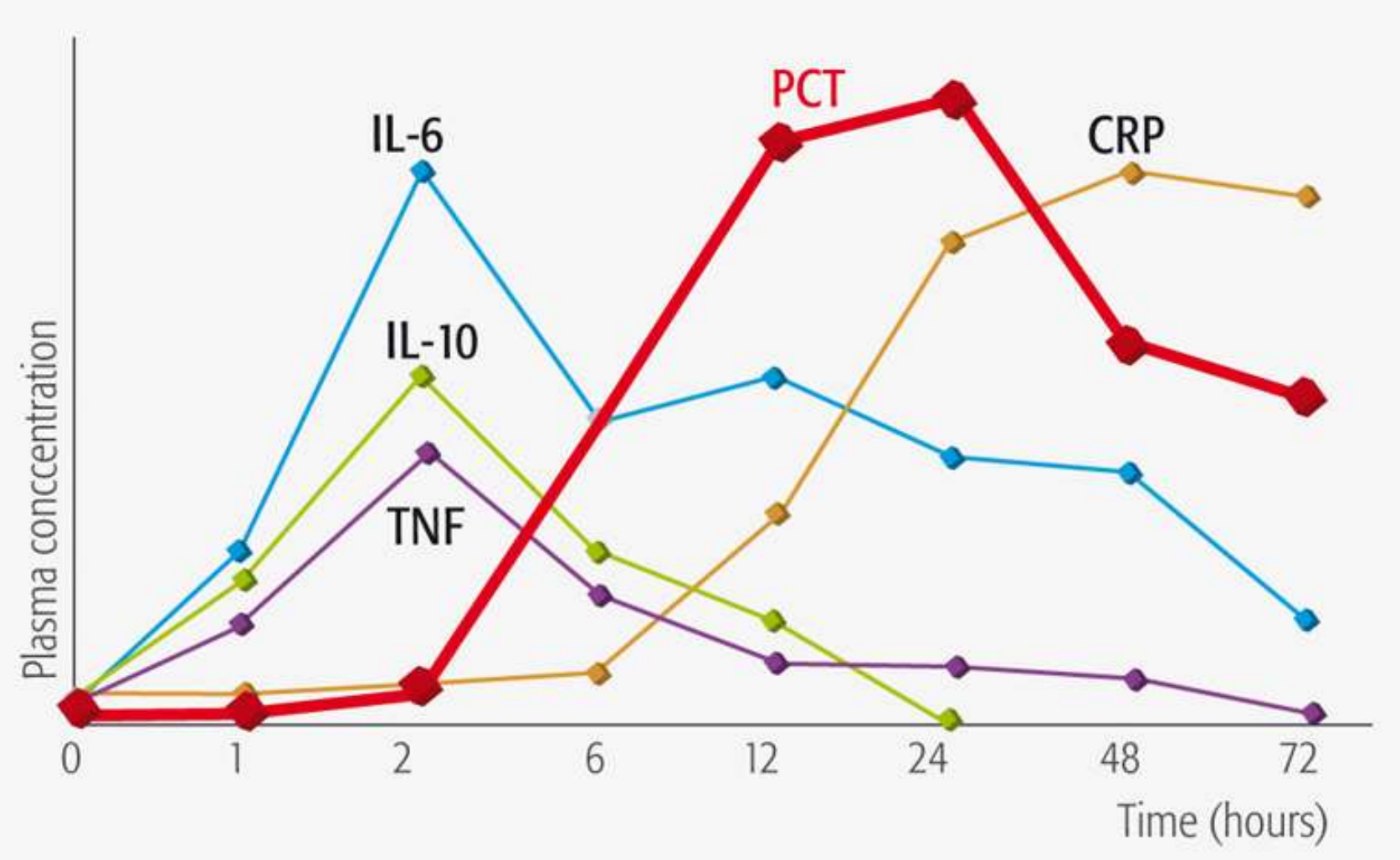
Biomarkers used in diagnosis of sepsis



CRP – C reactive protein, PCT – prokalcitonin, SAA – serum amyloid A,
IP-10 – IFN-γ inducible protein-10

Chan T, Gu F: Early Diagnosis of Using Serum Biomarkers. Expert Rev Mol Diagn 2011; 11, 5: 487-496.
http://www.czytelniamedyczna.pl/4792,diagnostyka-laboratoryjna-sepsy-biomarkery.html

Kinetic profiles of different biomarkers of bacterial infection



Meisner *et al.*, Crit Care 1999, 3:45-50
http://www.biomerieux-diagnostics.com/vidas-brahms-pct

D. ANTIMICROBIAL THERAPY

1. We recommend that administration of IV antimicrobials be initiated as soon as possible after recognition and **within 1 h** for both **sepsis** and **septic shock** (strong recommendation, moderate quality of evidence; grade applies **to both conditions**).
2. We recommend **empiric broad-spectrum therapy with one or more antimicrobials** for patients presenting with sepsis or septic shock to cover all likely pathogens (including bacterial and potentially fungal or viral coverage) (strong recommendation, moderate quality of evidence).
3. We recommend that empiric antimicrobial therapy be **narrowed** once pathogen identification and **sensitivities** are established and/or adequate clinical **improvement** is noted (BPS).

Several factors must be assessed and used in determining the appropriate antimicrobial regimen

a) The **anatomic site** of infection with respect to the typical **pathogen** profile and to the properties of individual antimicrobials to **penetrate** that site.

b) Prevalent pathogens within the community, hospital, and even hospital ward.

c) The **resistance** patterns of those prevalent pathogens.

d) The presence of specific **immune defects** such as neutropenia, splenectomy, poorly controlled HIV infection and acquired or congenital defects of immunoglobulin, complement or leukocyte function or production.

e) Age and patient **comorbidities** including chronic illness (e.g., diabetes) and chronic **organ dysfunction** (e.g., liver or renal failure), the presence of **invasive devices** (e.g., central venous lines or urinary catheter) that compromise the defense to infection.

E. SOURCE CONTROL

1. We recommend that a **specific anatomic diagnosis of infection** requiring emergent source control be identified or excluded as rapidly as possible in patients with sepsis or septic shock, and that any required **source control intervention** be implemented **as soon as** medically and logistically practical after the diagnosis is made (BPS).
2. We recommend **prompt removal of intravascular access devices** that are a **possible source** of sepsis or septic shock after other vascular access has been established (BPS).

F. FLUID THERAPY

1. We recommend that a **fluid challenge** technique be applied where fluid administration is continued as long as **hemodynamic factors** continue to **improve** (BPS).
2. 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).
3. We suggest using either **balanced crystalloids or saline** for fluid resuscitation of patients with sepsis or septic shock (weak recommendation, low quality of evidence).

F. FLUID THERAPY

4. We suggest using **albumin in addition to crystalloids** for **initial** resuscitation and **subsequent** intravascular volume replacement in patients with sepsis and septic shock **when patients require substantial amounts of crystalloids** (weak recommendation, low quality of evidence).
5. We recommend **against using hydroxyethyl starches** (HESs) for intravascular volume replacement in patients with sepsis or septic shock (strong recommendation, high quality of evidence).
6. We suggest using **crystalloids over gelatins** when resuscitating patients with sepsis or septic shock (weak recommendation, low quality of evidence).

G. VASOACTIVE MEDICATIONS

1. We recommend **norepinephrine as the first choice** vasopressor (strong recommendation, moderate quality of evidence).
2. We suggest **adding either vasopressin** (up to 0.03 U/min) (weak recommendation, moderate quality of evidence) or **epinephrine** (weak recommendation, low quality of evidence) to norepinephrine with the intent of raising **MAP to target**, or adding vasopressin (up to 0.03 U/min) (weak recommendation, moderate quality of evidence) to **decrease norepinephrine** dosage.
3. We suggest using **dopamine** as an alternative vasopressor agent to norepinephrine only in highly selected patients (e.g., patients with **low risk of tachyarrhythmias** and absolute or relative **bradycardia**) (weak recommendation, low quality of evidence).

Inotrope or Vasoactive	Dose	Mechanism of Action	HR	Systolic Function	Diastolic Function	Myocardial O2 demand	SVR	PVR
Dopamine	1-5 mcg/kg/min	Dopaminergic agonist	↑	↑	No Change	Mild Increase	Renal artery dilation	No Change
	6-10 mcg/kg/min	β1 Agonist	↑	↑	No Change	↑	↑	No Change
	11-20 mcg/kg/min	α-1 agonist	↑	↑	No Change	↑	↑↑	↑
Dobutamine	1-10 mcg/kg/min	β1 Agonist β2 Agonist	↑↑	↑↑	No Change	↑	↓	Minimal ↓
Epinephrine	0.01-0.05 mcg/kg/min	β1 Agonist β2 Agonist	↑↑	↑↑	No Change	↑	↓	No Change
	0.06-1 mcg/kg/min	α-1 agonist	↑	↑	No Change	↑	↑	↑
Norepinephrine	0.01-1 mcg/kg/min	α-1 agonist>> β1 Agonist	↑	↑	No Change	↑	↑↑	↑
Milrinone	0.3-0.7 mcg/kg/min	PDE3 inhibitor	No Change	↑	↑	No Change	↓	↓
Phenylephrine	0.1-2 mcg/kg/min	α-1 agonist	No Change	No Change	No Change	No Change	↑↑	No Change
Vasopressin	0.0003-0.008 u/kg/min	V1 receptor agonist	No Change	No Change	No Change	No Change	↑↑	No Change

H. CORTICOSTEROIDS

1. We suggest **against using IV hydrocortisone** to treat septic shock patients **if** adequate **fluid** resuscitation and **vasopressor** therapy are **able** to restore hemodynamic stability. If this is not achievable, we suggest **IV hydrocortisone at a dose of 200 mg per day** (weak recommendation, low quality of evidence).

M. MECHANICAL VENTILATION

1. We recommend using a **target tidal volume of 6 mL/kg** predicted body weight compared with 12 mL/kg in adult patients with sepsis-induced acute respiratory distress syndrome (**ARDS**) (strong recommendation, high quality of evidence).
2. We recommend using an **upper limit goal for plateau pressures of 30 cmH_2O** over higher plateau pressures in adult patients with sepsis-induced severe **ARDS** (strong recommendation, moderate quality of evidence).
3. We suggest using **higher positive end-expiratory pressure (PEEP)** over lower PEEP in adult patients with sepsis-induced moderate to severe **ARDS** (weak recommendation, moderate quality of evidence).
4. We suggest using **recruitment maneuvers** in adult patients with sepsis-induced, severe **ARDS** (weak recommendation, moderate quality of evidence).
5. We recommend using **prone over supine position** in adult patients with sepsis-induced **ARDS** and a **PaO_2/FIO_2 ratio < 150** (strong recommendation, moderate quality of evidence).

R. VENOUS THROMBOEMBOLISM PROPHYLAXIS

1. We recommend pharmacologic prophylaxis (unfractionated heparin [**UFH**] or low-molecular-weight heparin [**LMWH**]) **against venous thromboembolism (VTE)** in the absence of contraindications to the use of these agents (strong recommendation, moderate quality of evidence).
2. We recommend **LMWH rather than UFH** for VTE prophylaxis in the absence of contraindications to the use of LMWH (strong recommendation, moderate quality of evidence).
3. We suggest **combination pharmacologic VTE prophylaxis and mechanical prophylaxis**, whenever possible (weak recommendation, low quality of evidence).
4. We suggest **mechanical VTE prophylaxis** when pharmacologic VTE is contraindicated (weak recommendation, low quality of evidence).

T. NUTRITION

1. We recommend **against the administraon of early parenteral** nutrition alone or parenteral nutrion in combination with enteral feedings (but rather **initiate early enteral** nutrition) in critically ill patients with sepsis or septic shock who **can be fed enterally** (strong recommendation, moderate quality of evidence).
2. We recommend **against the administration of parenteral nutrition alone** or in combination with enteral feeds (but rather to iniate IV glucose and advance enteral feeds as tolerated) over the first 7 days in crically ill patients with sepsis or septic shock for whom early enteral feeding is not feasible (strong recommendation, moderate quality of evidence).
3. We suggest the **early initiation of enteral feeding** rather than a complete fast or only IV glucose in crically ill paents with sepsis or sepc shock who can be fed enterally (weak recommendation, low quality of evidence).
4. We suggest either **early trophic/hypocaloric or early full enteral feeding** in crically ill patients with sepsis or septic shock; if trophic/hypocaloric feeding is the inial strategy, then feeds should be advanced according to patient tolerance (weak recommendation, moderate quality of evidence).

U. SETTING GOALS OF CARE

1. We recommend that **goals of care and prognosis be discussed** with patients and families (BPS).
2. We recommend that goals of care be **incorporated into treatment** and **end-of-life care** planning, utilizing palliative care principles where appropriate (strong recommendation, moderate quality of evidence).
3. We suggest that goals of care be **addressed as early as feasible**, but **no later than within 72 hours** of ICU admission (weak recommendation, low quality of evidence).

End of Life Decisions

a. **Withholding** = refusal or no initiation of the treatment or specific treatment step, no further escalation of the treatment or specific treatment step
b. **Withdrawing** = decision to stop or remove treatment or specific treatment step after it has begun
c. **Euthanasia** = administration of a medication with intentional ending of a patient`s life according to wishes of the patient
d. **Assisted suicide** = the patient administers the lethal agent themselves with health care member`s assistance
e. **Double effect** = giving medication for pain relief on one side can speed up dying process on the other side

Hour-1 Surviving Sepsis Campaign Bundle of Care

- Measure lactate level. Remeasure if initial lactate is >2 mmol/L.
- Obtain blood cultures prior to administration of antibiotics.
- Administer broad-spectrum antibiotics.
- Begin rapid administration of 30ml/kg crystalloid for hypotension or lactate ≥4 mmol/L.
- Apply vasopressors if patient is hypotensive during or after fluid resuscitation to maintain MAP ≥65 mm Hg.

**"Time zero" or "time of presentation" is defined as the time of triage in the Emergency Department or, if presenting from another care venue, from the earliest chart annotation consistent with all elements of sepsis (formerly severe sepsis) or septic shock ascertained through chart review.*

Levy MM, Evans LE, Rhodes A: The Surviving Sepsis Campaign Bundle: 2018 update. *Intensive Care Med.* https://doi.org/10.1007/s00134-018-5085-0

Bundle elements with strength of recommendations and under-pinning quality of evidence

Bundle element	Grade of recommendation and level of evidence
Measure lactate level. Re-measure if initial lactate is > 2 mmol/L	Weak recommendation, low quality of evidence
Obtain blood cultures prior to administration of antibiotics	Best practice statement
Administer broad-spectrum antibiotics	Strong recommendation, moderate quality of evidence
Rapidly administer 30 ml/kg crystalloid for hypotension or lactate ≥ 4 mmol/L	Strong recommendation, low quality of evidence
Apply vasopressors if patient is hypotensive during or after fluid resuscitation to maintain MAP ≥ 65 mm Hg	Strong recommendation, moderate quality of evidence

Levy MM, Evans LE, Rhodes A: The Surviving Sepsis Campaign Bundle: 2018 update. *Intensive Care Med.* https://doi.org/10.1007/s00134-018-5085-0

Surviving Sepsis Campaign

A. INITIAL RESUSCITATION
B. SCREENING FOR SEPSIS AND PERFORMANCE IMPROVEMENT
C. DIAGNOSIS
D. ANTIMICROBIAL THERAPY
E. SOURCE CONTROL
F. FLUID THERAPY
G. VASOACTIVE MEDICATIONS
H. CORTICOSTEROIDS
I. BLOOD PRODUCTS
J. IMMUNOGLOBULINS
L. ANTICOAGULANTS
M. MECHANICAL VENTILATION
N. SEDATION AND ANALGESIA
O. GLUCOSE CONTROL
P. RENAL REPLACEMENT THERAPY
Q. BICARBONATE THERAPY
R. VENOUS TE PROPHYLAXIS
S. STRESS ULCER PROPHYLAXIS
T. NUTRITION
U. SETTING GOALS OF CARE

Rhodes, A., Evans, L.E., Alhazzani, W. et al. Intensive Care Med (2017). doi:10.1007/s00134-017-4683-6

Thank you for your attention!

jozef.firment@upjs.sk