

低血压、严重脓毒症、脓毒性休克 急诊处置临床路径

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低血压急诊处置路径

（一）适用对象

- 第一诊断为低血压

(二) 诊断依据

■ 有引起血压下降的原发病:

血容量不足（出血、严重呕吐、腹泻）、感染、创伤、疼痛、过敏、心源性、中毒、降压药物过量、低血糖反应、肺栓塞、糖尿病高渗综合症。

■ 有低血压症状:

头晕、视物模糊、乏力、心悸、皮肤湿冷、意识改变、尿量减少等。

■ 血压值:

收缩压 (SBP) $\leq 90/60$ mmHg, 动脉平均压 (MAP) ≤ 60 mmHg 或收缩压 (SBP) 较基础水平下降 ≥ 40 mmHg, 脉压差减少。

（三）急诊就诊

- 评估生命体征，保证气道通畅
- 病史体检查找低血压的原因
- 给氧，开放静脉通道
- 心电监护、脉搏氧饱和度和自动血压监测，
- 12导联心电图，床边胸部X线检查

（四）低血压的治疗

1 快速鉴别低血压原因

- 详细询问病史
- 全面体格检查
- 完善辅助检查

血容量不足（出血、严重呕吐、腹泻）、
感染、创伤、疼痛、过敏、心源性、中毒、降压
药物过量、低血糖反应、肺栓塞、糖尿病高渗
综合症

1. 液体复苏

- 晶体溶液(如生理盐水和等张平衡盐溶液)或胶体溶液(如白蛋白和人工胶体液)。
- 建立快速静脉通路，中心静脉导管以及肺动脉导管。

2. 输血治疗

- 在补充血液容量的同时，酌情补充血细胞成分，如浓缩红细胞、新鲜冰冻血浆、血小板、凝血因子、纤维蛋白原等。
- 注意输血不良反应甚至严重并发症。

3. 血管活性药与正性肌力药

- 足够的液体复苏后仍存在低血压或者输液还未开始的严重低血压病人。
- 不常规使用血管活性药，才考虑应用血管活性药与正性肌力药。

血管活性药物的选择

- (1) **多巴胺** 作用于多巴胺受体、 β 1-受体和 α -受体。1-3 μ g / (kg·min) ，使血管扩张，增加尿量；2-10 μ g (kg·min)时主要作用 β -受体，增强心肌收缩能力而增加心输出量，也增加心肌氧耗；>10 μ g (kg·min)时以 α -受体兴奋为主，收缩血管。
- (2) **多巴酚丁胺** β 1、 β 2受体激动剂，使心肌收缩力增强，血管扩张和减少后负荷。
- (3) **去甲肾上腺素**，主要效应是增加外周阻力来提高血压，同时也不同程度地收缩冠状动脉。

4.原发病的治疗

- 过敏性休克
- 感染性休克
- 神经源性休克
- 心源性休克
- 外伤性休克

（五）辅助检查

1.必需检查项目：

（1）血常规+血型、尿常规+酮体、便常规+潜血、网织红细胞；

（2）凝血功能、肝肾功能、血糖、血脂、电解质、血沉、C反应蛋白、血乳酸；

（3）胸部正侧位片、心电图、腹部B超。

2.根据患者情况进行：

血气分析、CT、D-二聚体、血管超声、心脏超声、诊断性穿刺等检查，条件允许行血流动力学监测。

（六）治疗方案与药物选择

- 评估引起低血压原发病因，立即液体复苏。
- 监测皮温、神志、血压、心率、尿量，必要时行创血流动力学监测（MAP、CVP和PAWP、CO和SV）。
- 血管活性药物。
- 根据患者具体情况可输注血液制品。
- 临床评估，根据患者病情变化调整治疗。
- 根据患者病情，内科保守治疗无效可必要时行外科手术治疗。
- 对症支持治疗，控制血糖、预防感染。

(七) 出院标准

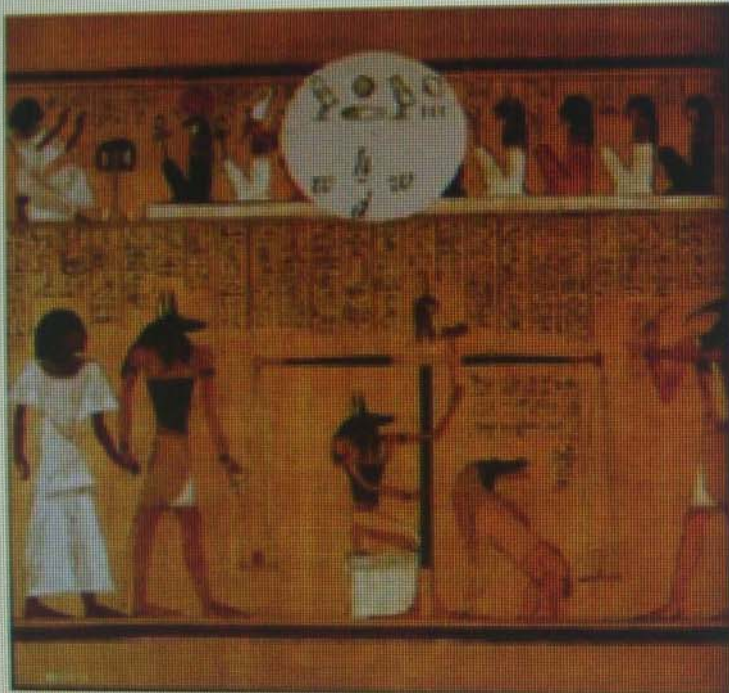
- 1.生命体征平稳，症状好转，无活动性出血，低血容量的病因得以改善。
- 2.血流动力学稳定。
- 3.无其他需要继续住院处理的并发症。

（八）变异及原因分析

- 伴有影响本病治疗效果的合并症，需要进行相关诊断和治疗。
- 病情较重，需要手术相关科室治疗，转入相应路径。
- 常规治疗无效或加重，转入相应路径。
- 出现严重并发症。

严重脓毒症及脓毒性休克 急诊处置路径

Sepsis - known since the ancient times of human history



In the **Egyptian legends** the „u-khed-u“ was mentioned as a disease :
„ originating from the intestine spreading via the circulatory system, the disease finally results in death, when seizing the heart“



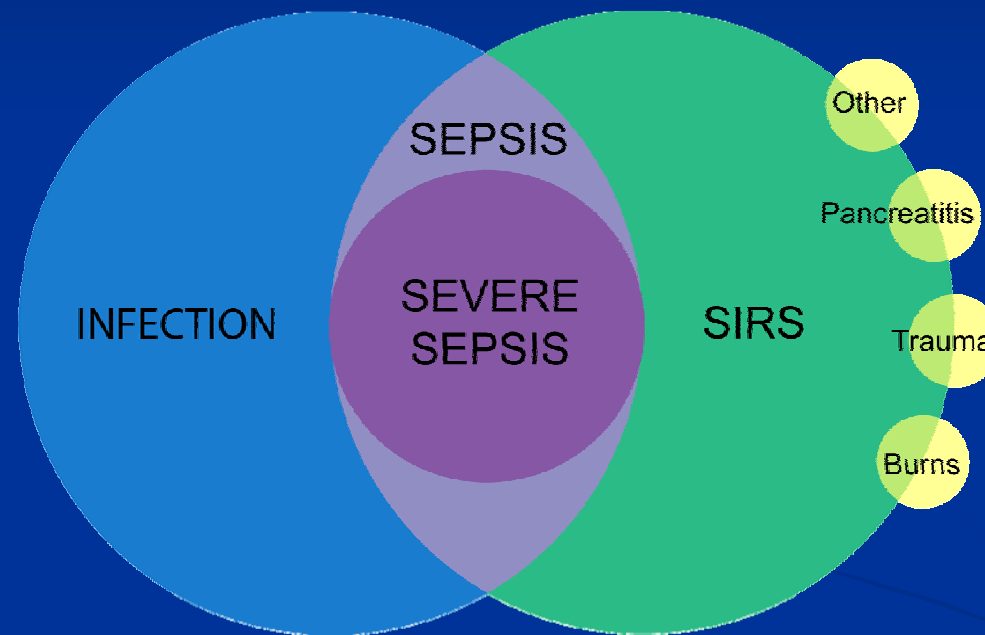
The word „sepsis“ derives from the **ancient Greeks**. It means a dysequilibrium (foulness and digestion) of body fluids.

Epidemiology in the US

- **Leading cause of death** in the non-coronary ICU.
- **750,000 new cases** that occur in the United States each year.
- **Grow** at a rate of **1.5% per year** as medicine becomes more aggressive.
- **Mortality is 30% to 50%** for severe sepsis and **50% to 60%** for septic shock.
- **Accounting for 40%** of total ICU expenditure

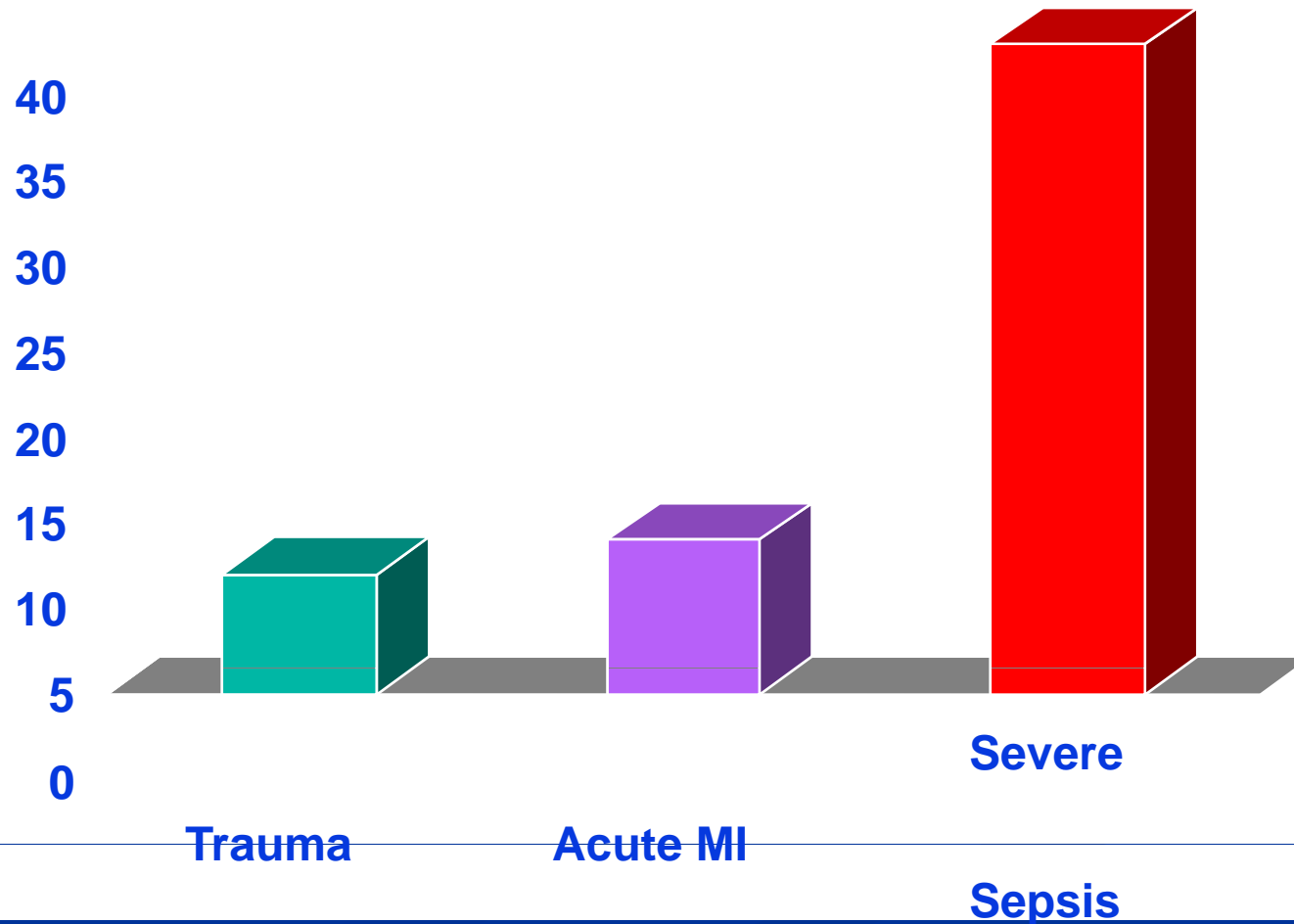
Dellinger RP, Carlet JM, Masur H, Gerlach H, Calandra T, Cohen J, Gea-Banacloche J, Keh D, Marshall JC, Parker MM, Ramsay G, Zimmerman JL, Vincent JL, Levy MM and the SSC Management Guidelines Committee. *Crit Care Med* 2004;32:858-873 *Intensive Care Med* 2004;30:536-555

Sepsis: A Complex Disease



Adapted from: Bone RC et al. *Chest*. 1992;101:1644-55.
Opal SM et al. *Crit Care Med*. 2000;28:S81-2.

Sepsis mortality in Cooper (USA)



诊断治疗的难度

■ Sepsis

- 86% said that symptoms of sepsis can easily be misattributed to other conditions.
- 89% said doctors are eager for a breakthrough in treating sepsis.

- 心肌梗死
- 症状
- 心电图
- 酶学标志物

病例

患者 男性，84岁，因“意识障碍半天”来诊。

患者因脑出血后遗症长期卧床，近一周出现精神倦怠，进食少，有呛咳，三天来呼之不应，测体温35.2℃，有痰不易咳出，来急诊。

初步诊断？

进一步检查？

诊断的难度

■ 脓毒症

- 高热 $T > 38.3^{\circ}\text{C}$ ($101.^{\circ}\text{F}$)
- 寒战
- 血白细胞升高 $> 12000/\text{mm}^3$
- 低体温 $T < 36^{\circ}\text{C}$ (96.8°F)
- 心动过速 $> 90\text{bpm}$
- 血白细胞降低 $< 4000/\text{mm}^3$
- 急性精神状态改变
- 呼吸急促 $> 20\text{bpm}$
- 非糖尿病患者血糖升高 $> 120\text{mg/dl}$

■ 严重脓毒症

- $\text{SBP} < 90\text{mmHg}$
- $\text{MAP} < 65\text{mmHg}$
- SBP 下降大于基础血压 40%
- 肌酐 $> 2.0\text{mg/dl}$ (176.8mmol/L)
- 超过 2 小时 排尿量 $< 0.5\text{ml/kg/hour}$
- 胆红素 $> 2.0\text{mg/dl}$ (34.2mmol/L)
- 血小板计数 < 100000
- 乳酸 $> 2\text{mmol/L}$ (18.0mg/dl)
- 凝血功能异常, ($\text{INR} > 1.5$ 或 $\text{aPTT} > 60\text{秒}$)
- 双肺浸润性改变 $\text{PaO}_2/\text{FiO}_2 < 300$
- 双肺浸润性改变并需吸氧方能维持 $\text{SpO}_2 > 90\%$

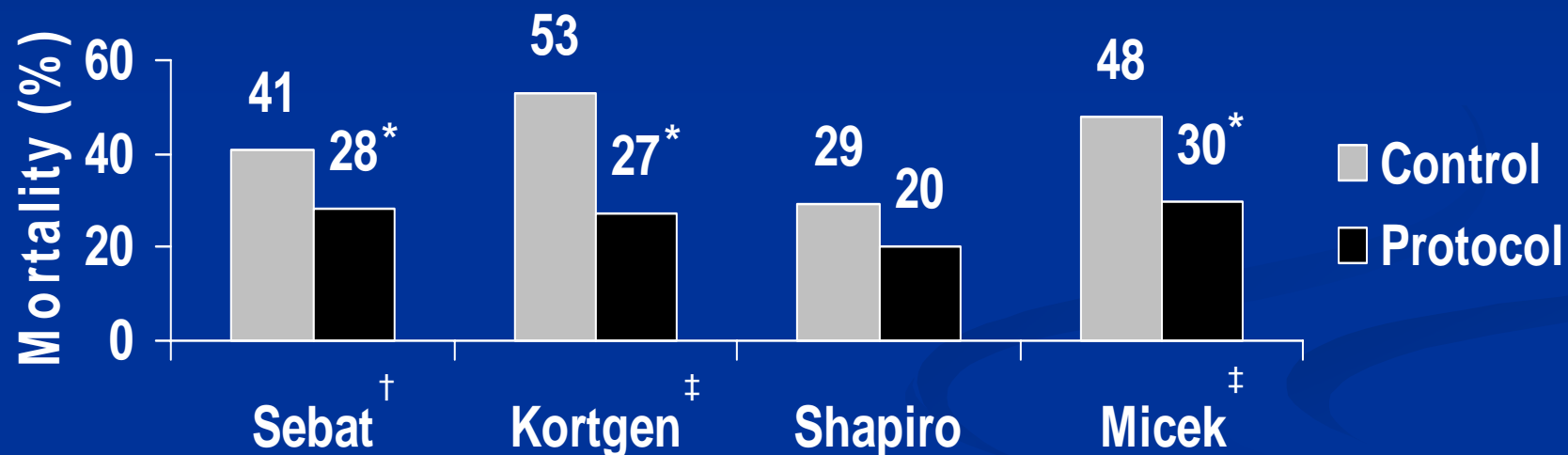
2004, 2008 Guideline Sponsoring Organizations

- **American Association of Critical Care Nurses**
- **American College of Chest Physicians**
- **American College of Emergency Physicians**
- **American Thoracic Society**
- **Australian and New Zealand Intensive Care Society**
- **European Society of Clinical Microbiology and Infectious Diseases**
- **European Society of Intensive Care Medicine**
- **European Respiratory Society**
- **International Sepsis Forum**
- **Society of Critical Care Medicine**
- **Surgical Infection Society**

诊断突破--标志物?

- 诊断?
- 预后?
- 敏感性?
- 特异性?
- **PCT and CRP** have been most widely used, but even these have **limited** ability **to distinguish sepsis from other** inflammatory conditions or to predict outcome.
- Many biomarkers have been evaluated for use in sepsis. Most of the biomarkers had been tested clinically, primarily as prognostic markers in sepsis; relatively **few have been used for diagnosis. None** has sufficient specificity or sensitivity to be **routinely** employed in clinical practice.

Sepsis Protocols: Implementation Consistently Reduces Mortality



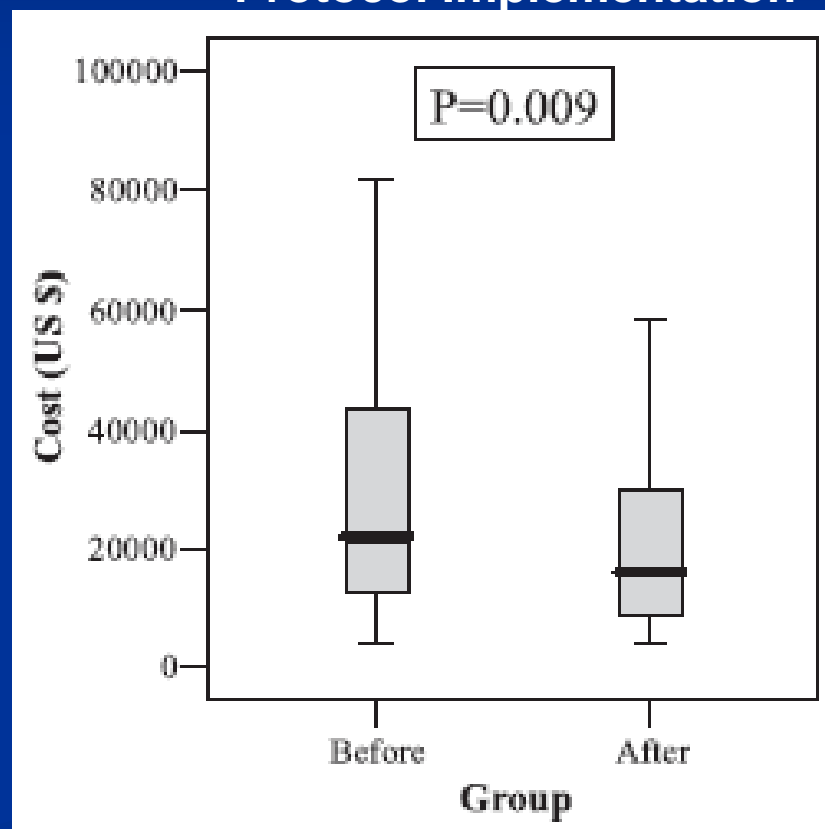
* $P < .05$ compared with control; †In-hospital mortality; ‡28-day mortality.

Sebat F, et al. *Chest*. 2005;127:1729-1743; Kortgen A, et al. *Crit Care Med*. 2006;34(4):943-949; Shapiro NI, et al. *Crit Care Med*. 2006;34(4):1025-1032; Micek ST, et al. *Crit Care Med*. 2006;34(11):2707-2713.

Sepsis Protocols: Economic Benefit

- Significant difference in median per-patient costs (black lines)
 - \$21,985 before
 - \$16,103 after
- Attributable to ICU and ward bed day charges
- Significantly lower median length of stay by 5 days ($P = .023$)

Per-patient Cost Before and After Protocol Implementation



Improvement in Process of Care and Outcome After a Multicenter Severe Sepsis Educational Program in Spain

Ferrer R, Artigas A, Levy MM, et al.

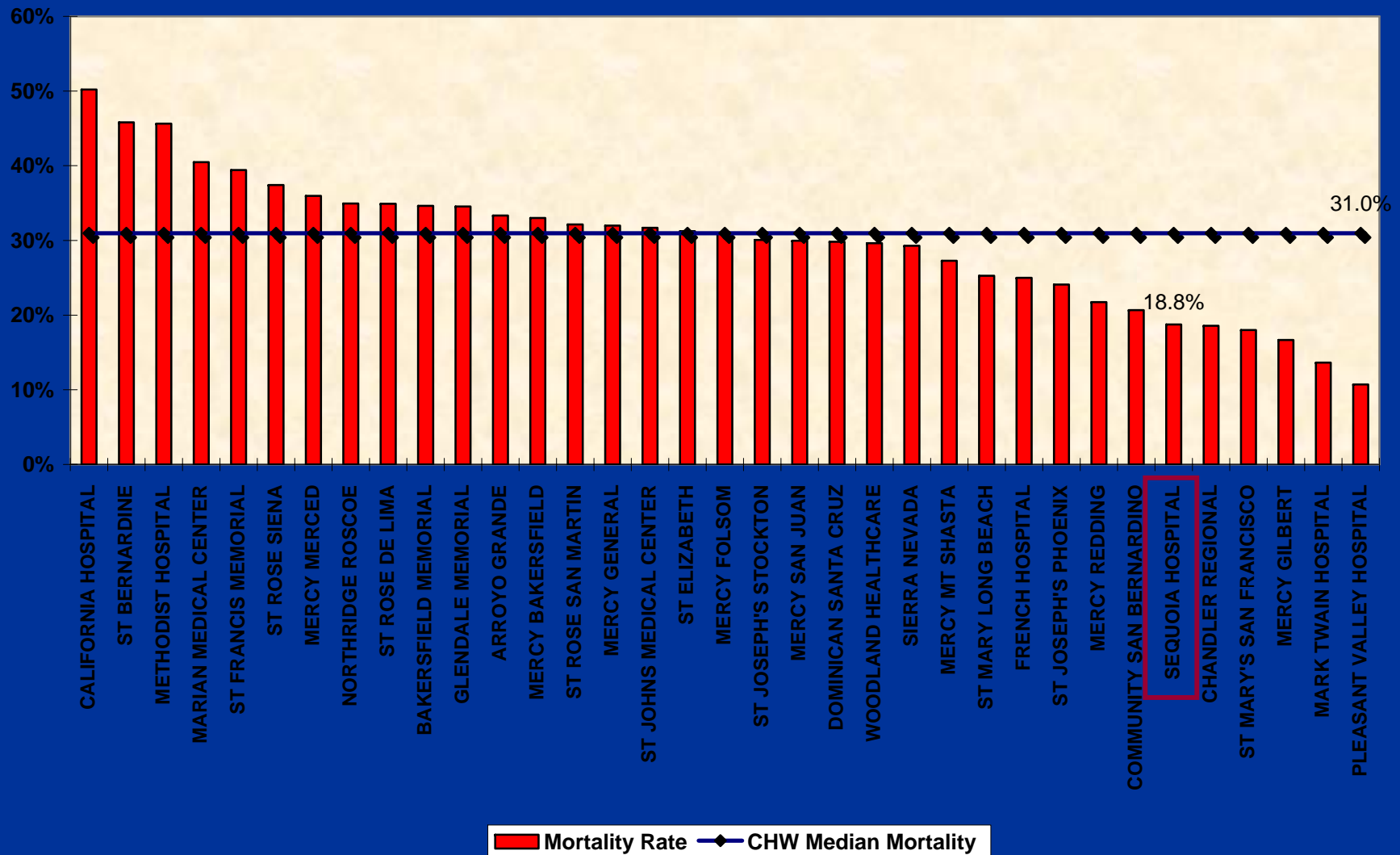
JAMA 2008; 299(19):2294-2303

Results

- **2600 severe sepsis patients**
 - Pre-intervention
 - Intervention with SSC bundles
 - Long term follow-up
- **Improved compliance**
- **Decreased mortality which was sustained**
 - $P = 0.04$
- **Statistically significant compliance maintained in management bundle but lost in resuscitation bundle.**

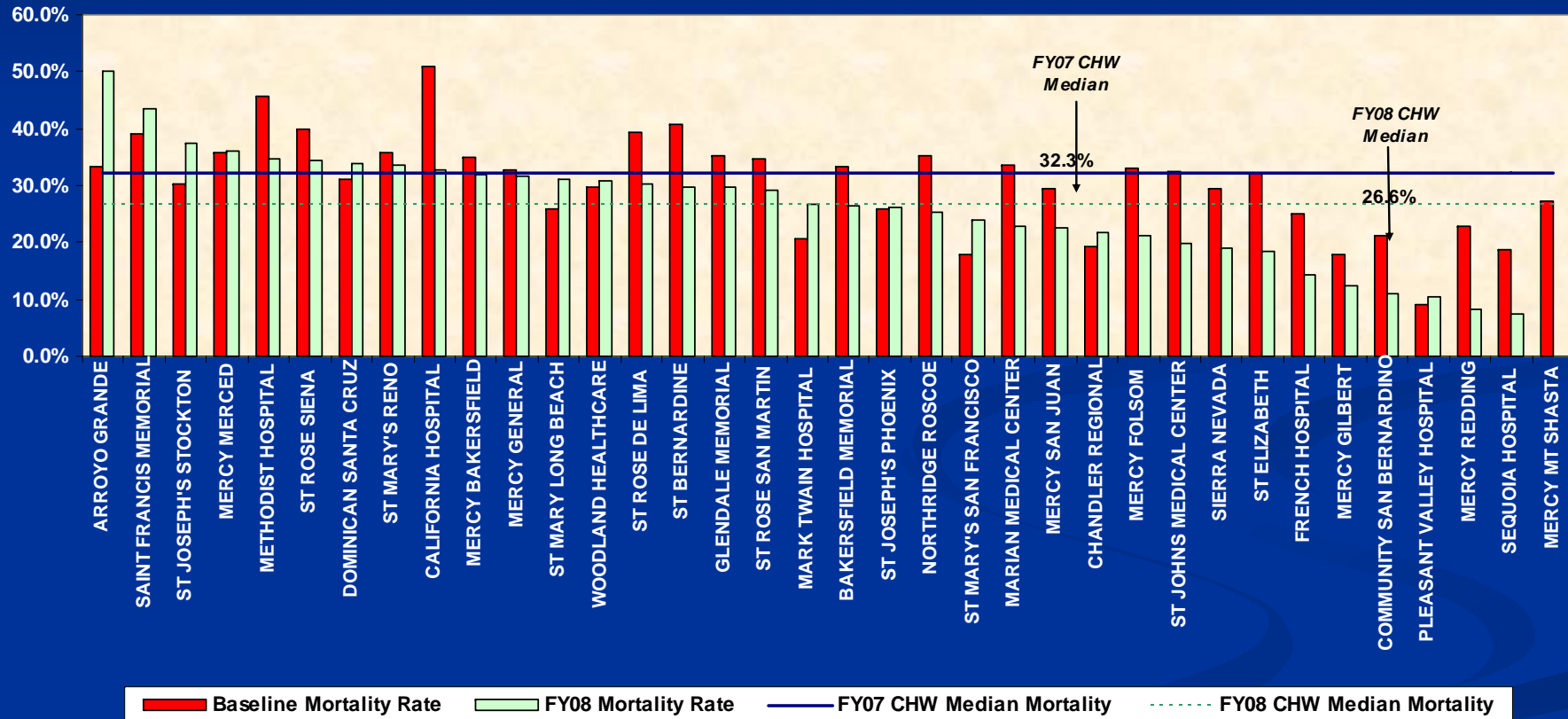
Wide Variation in Hospital Mortality

Catholic Healthcare West
FY07 Severe Sepsis Mortality Rate by Hospital



CHW Mortality Rate Through 2008

Catholic Healthcare West
FY07 Sepsis Mortality Rate by Hospital compared to FY08 Feb YTD



Conclusions

A national educational effort to promote bundles of care for severe sepsis and septic shock was associated with improved guideline compliance and lower hospital mortality. However, compliance rates were still low, and the improvement in the resuscitation bundle lapsed by 1 year.

Networks

- **Europe**
 - **United Kingdom**
 - **Ireland**
 - **Germany**
 - **Portugal**
 - **Spain**
 - **Netherlands**
 - **Italy**
 - **Croatia**
 - **Poland**
- **Latin America**
 - **Brazil**
 - **Chile**
- **Asia**
 - **China**
- **North America**
 - **Colorado**
 - **California: Sutter**
 - **Baltimore/D.C.**
 - **IHI**
 - **Kansas**
 - **Puerto Rico**
 - **Texas (State-wide)**
 - **Illinois**
 - **Chicago**
 - **Minnesota**
 - **Minneapolis**
 - **SCCM Collaborative**
 - **East Coast Collab**
 - **West Coast Collab**

（一）适用对象

- 严重脓毒症
- 脓毒性休克

(二) 诊断依据

2001年国际脓毒症定义诊断标准

■ 系统性炎症反应综合症 (SIRS)

1. 体温 $>38^{\circ}\text{C}$ 或 $<36^{\circ}\text{C}$
2. 心率 >90 次/分
3. 呼吸 >20 次/分或 $\text{PaCO}_2 < 4.3 \text{ kPa}$ (32mmHg)
4. 白细胞计数 $>12 \times 10^9/\text{L}$ 或 $<4 \times 10^9/\text{L}$ 或不成熟中性粒细胞 $>10\%$

■ 脓毒症

有感染证据，且具有SIRS指标两项或两项以上者

(二) 诊断依据

2001年国际脓毒症定义诊断标准

- 严重脓毒症

脓毒症+ 器官功能衰竭

- 脓毒性休克

脓毒症+ 循环器官功能衰竭(低血压休克)

表2 下列任意一项器官功能不全表现

-
- 收缩压(SBP) $<90\text{mmHg}$ 或平均动脉压(MAP) $<65\text{mmHg}$
 - SBP比基础值下降 $>40\text{mmHg}$
 - 双肺浸润并需吸氧才能维持 $\text{SPO}_2 > 90\%$
 - 双肺浸润性改变氧合指数($\text{PaO}_2/\text{FiO}_2$) <300
 - 血肌酐 $>2.0\text{mg/dl}$ ($176.8\mu\text{mol/L}$)或者尿量 $<0.5\text{ml/kg/h}$ 持续2h以上
 - 血胆红素 $>2.0\text{mg/dl}$ ($34.2\mu\text{mol/L}$)
 - 血小板计数 $<100 \times 10^9/\text{L}$
 - 凝血功能异常($\text{INR} > 1.5$ 或 $\text{APTT} > 60$ 秒)
 - 乳酸 $>2\text{mmol/L}$ (18.0mg/dl)
-

（三）急诊就诊

1.必需检查项目：

（1）血常规+血型、尿常规+酮体、大便常规+潜血；

（2）凝血功能、肝肾功能、血糖、血脂、电解质、血沉、C反应蛋白（CRP）、血乳酸、血气分析、血培养；

（3）胸部正侧位片、心电图、腹部B超。

2.根据患者情况进行：胸腹部CT、D-二聚体、心脏超声、诊断性穿刺等有创性检查，条件允许血流动力学监测等。

3.评估病情严重程度、Apache II 和SOFA 评分。

（四）治疗方案的选择

2004年及2008年严重脓毒症及脓毒性休克治疗指南，严重脓毒症治疗方案包括

1. 早期复苏治疗：
2. 抗生素治疗：
3. 感染源的控制：
4. 液体疗法：
5. 血管加压类药物及正性肌力药物：
6. 支持治疗：机械通气、镇静麻醉药物应用、血糖控制、肾脏替代治疗、碳酸氢盐治疗、预防深静脉血栓、预防应激性溃疡。

Severe Sepsis Resuscitation Bundle

*Complete tasks within **6 hours** of identifying severe sepsis.*

1. Measure serum lactate.
2. Obtain blood cultures prior to antibiotic administration.
3. Administer broad-spectrum antibiotic within 3 hours of ED admission and within 1 hour of non-ED admission.
4. In the event of **hypotension and/or serum lactate > 4 mmol/L**:
 - a. Deliver an initial minimum of 20 mL/kg of crystalloid or equivalent.
 - b. Begin vasopressors for hypotension not responding to initial fluid resuscitation to maintain MAP > 65 mm Hg.
5. In the event of persistent hypotension despite fluid resuscitation (**septic shock**) and/or lactate > 4 mmol/L:
 - a. Achieve a central venous pressure (**CVP**) of > 8 mm Hg
 - b. Achieve a central venous oxygen saturation (**ScvO₂**) > 70% or mixed venous oxygen saturation (**ScvO₂**) > 65%

Severe Sepsis Management Bundle

Complete tasks within 24 hours of identifying severe sepsis.

1. Administer low-dose steroids for septic shock in accordance with a standardized hospital policy.
2. Administer recombinant human activated protein C (rhAPC) in accordance with a standardized hospital policy.
3. Maintain glucose control 80-150 mg/dL.
4. Maintain a median inspiratory plateau pressure (IPP) ≤ 30 cm H₂O for mechanically ventilated patients.

2. 液体复苏

血乳酸 $\geq 4\text{mmol/L}$ 的严重脓毒症患者，开始标准液体复苏：

- 2h内输注 $\geq 20\text{ml/kg}$ 晶体液或等量胶体液(如白蛋白和人工胶体液)。
- 经上述补液后，复测血乳酸 $\geq 4\text{mmol/L}$ ，及早放置中心静脉导管或肺动脉导管。

3.输血治疗

- 中心静脉血氧饱和度降低，Hb <70g/L或红细胞压积<30%，输注悬浮红细胞。
- 酌情补充血细胞成分，新鲜冰冻血浆、血小板、凝血因子、纤维蛋白原等。
- 注意输血不良反应甚至严重并发症。

4. 抗生素治疗

- 经验治疗，联合或单用，依据本地区常见的致病菌及药敏结果。
- 血培养（应用抗生素前）
- 针对可能的致病菌及早应用广谱抗生素（急诊患者在来院3h内，住院患者在1h内）

5.控制感染源

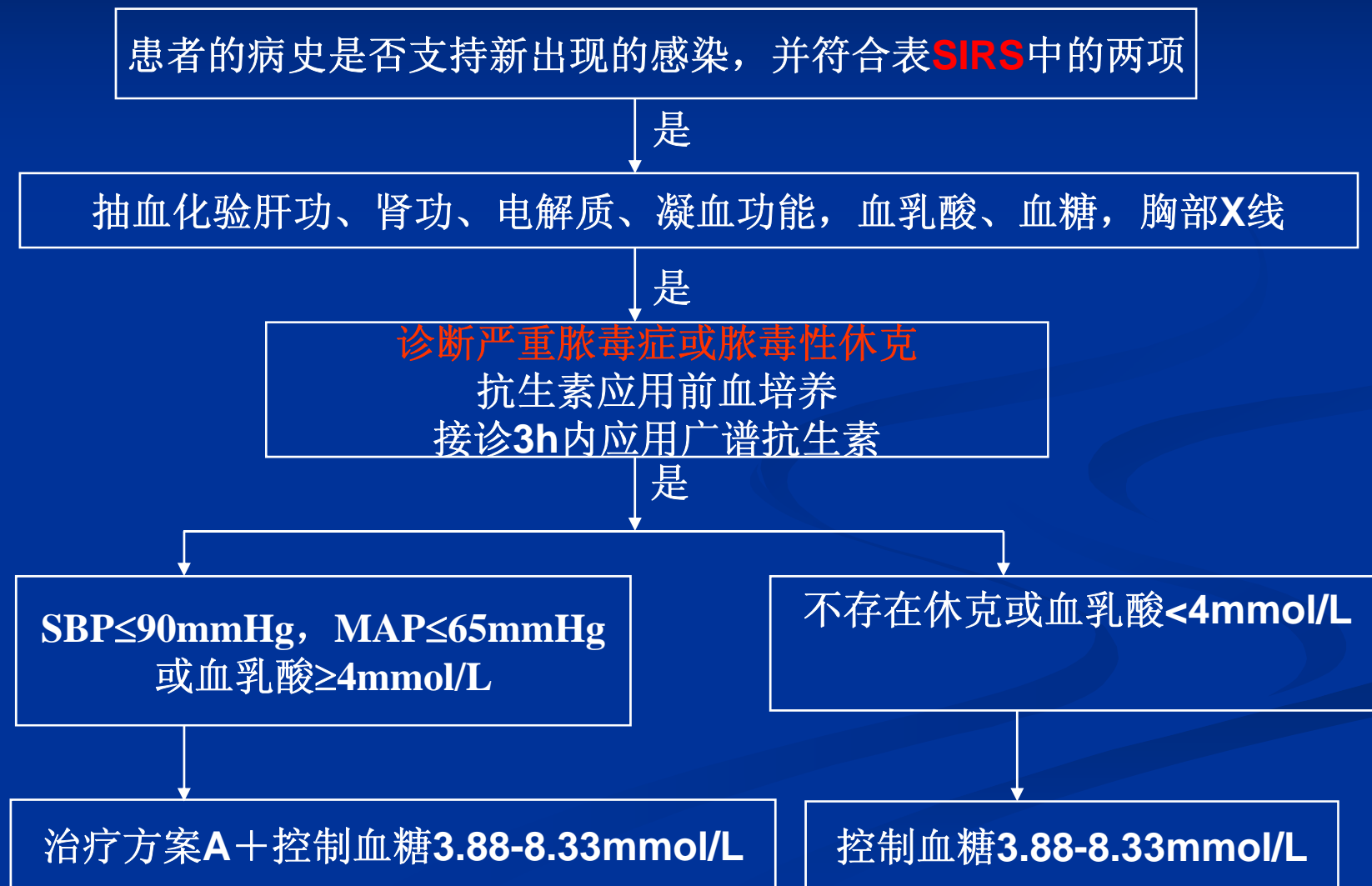
应用抗生素

外科感染灶如局部软组织、肝脓肿、腹腔脓肿等可以清创、引流或切开手术治疗。

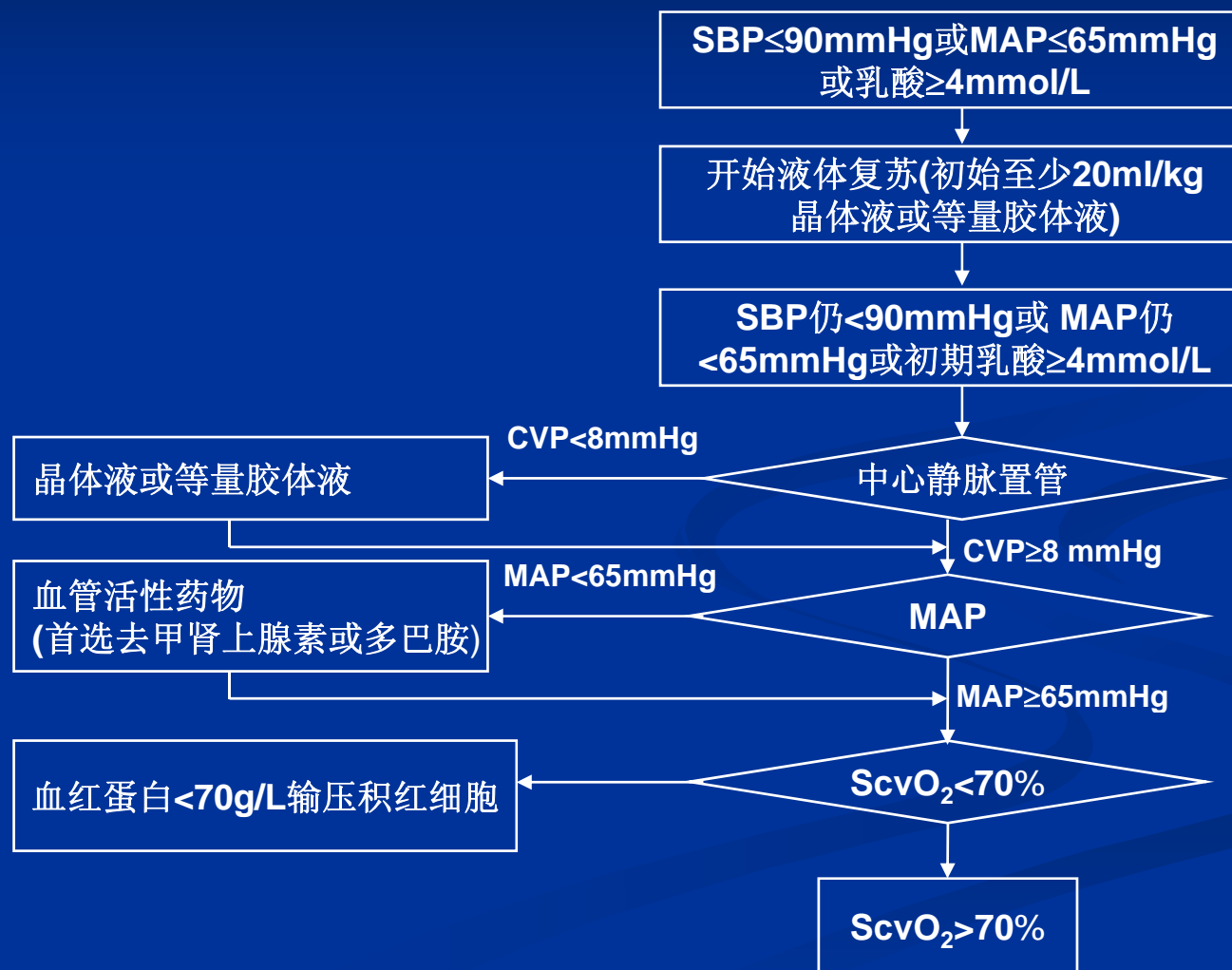
6. 严重脓毒症及脓毒性休克的支持治疗

- 机械通气
- 镇静、麻醉和神经肌肉阻断
- 血糖控制
- 肾脏替代治疗
- 碳酸氢盐治疗
- 深静脉血栓、应激性溃疡预防

入选筛查流程图

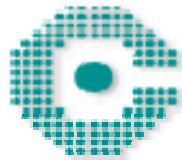


1. 急诊治疗流程



6. 严重脓毒症的支持治疗

- 机械通气
- 镇静、麻醉和神经肌肉阻断
- 血糖控制
- 肾脏替代治疗
- 碳酸氢盐治疗
- 深静脉血栓、应激性溃疡预防



SEPSIS-INDUCED HYPOPERFUSION
(Clinical picture of sepsis plus one or both of the following criteria)

- 1) Hypotension AFTER initial fluid bolus
- OR
- 2) Lactate ≥ 4 mmol/L with any BP

With hypotension defined as:
SBP ≤ 90 mmHg or MAP ≤ 65 mmHg

Supplemental O₂ \pm
ETI with
mechanical
ventilation
(if necessary)

Continue crystalloid resuscitation
250-1000 ml boluses

Critical care consultation
(if not already consulted)

CVP < 8 mmHg

Crystalloid

CVP**

CVP 8-12 mmHg

MAP < 65 mmHg

Vasopressors
(norepinephrine or
dopamine preferred)

MAP

MAP ≥ 65 mmHg

$\geq 70\%$

Transfuse if HCT
less than 30

$< 70\%$

ScvO₂**

Inotrope
(If PA catheter inserted, keep
cardiac index ≥ 3.0 L/min/m²)

$\geq 70\%$

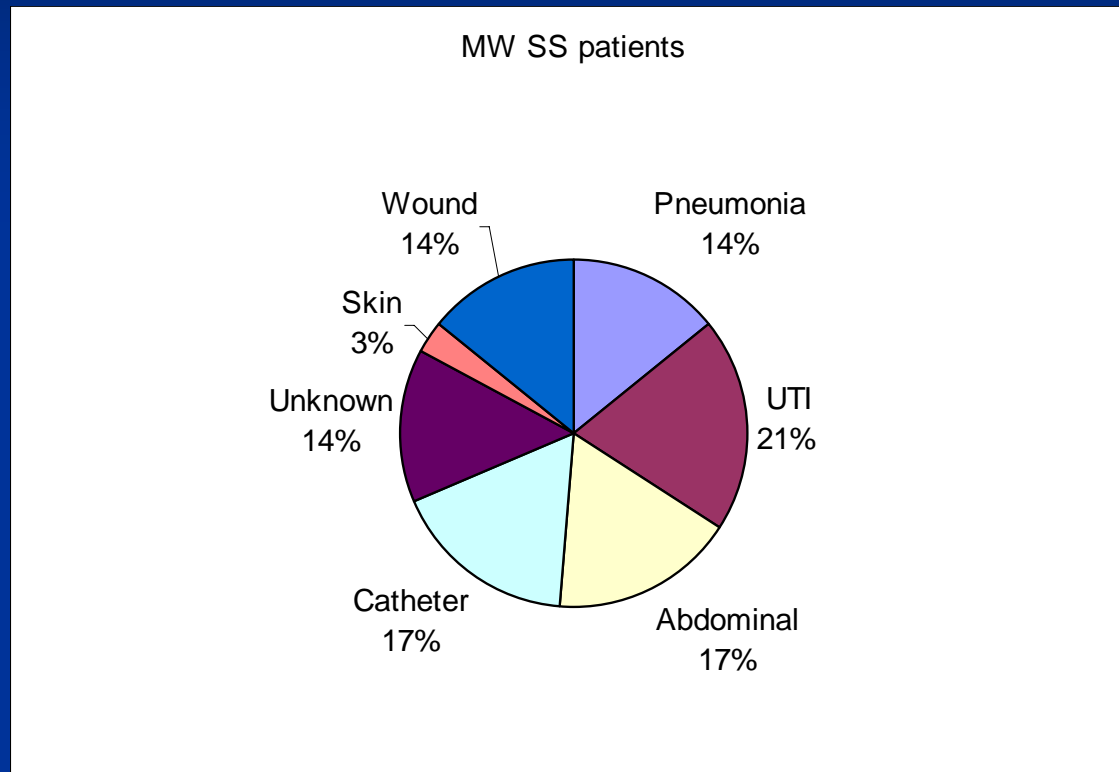
YES

Resuscitation complete.
Establish re-evaluation
intervals.

Achieve
ALL
Goals?

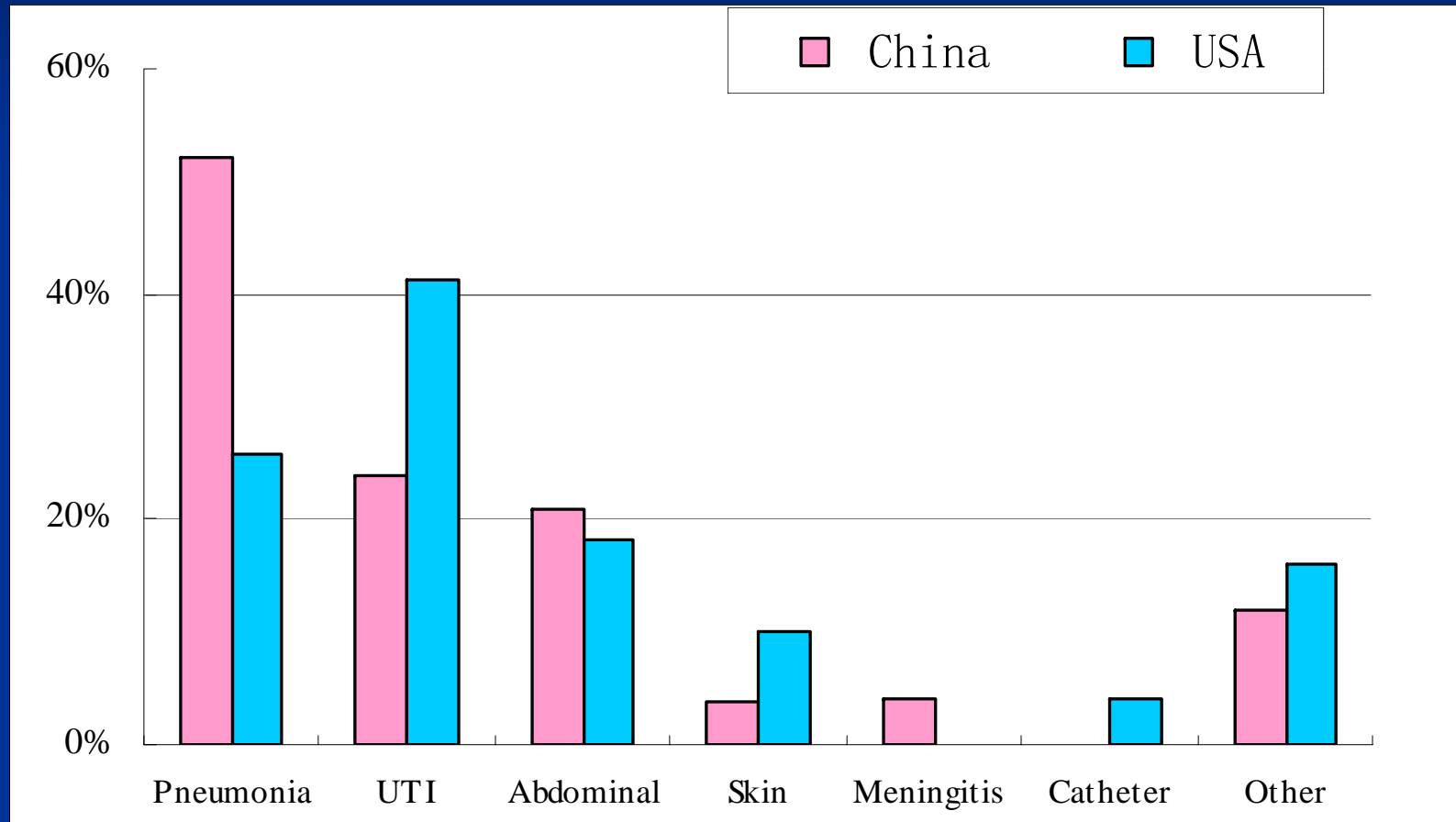
NO

Source of Infection (MW)



Wang Z, Schorr C, Trzeciak SW, Parrillo JE, Dellinger RP. Does patient origin at time of septic shock presentation alter outcomes? *Chest* 2007; 132(Suppl): 560.

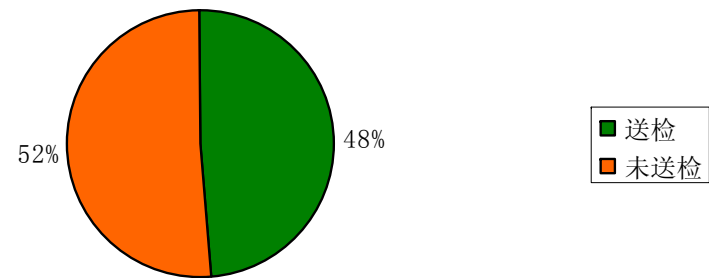
Source of Infection



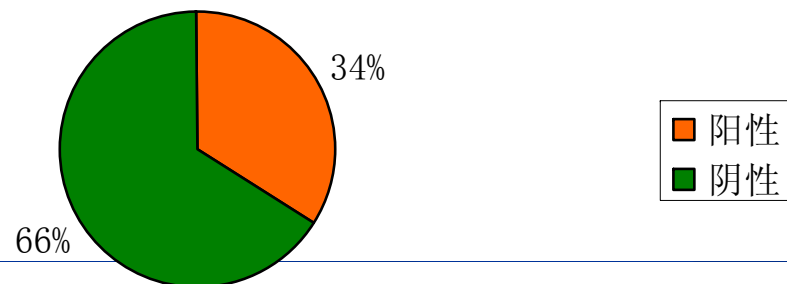
Wang Z, Schorr C, Dellinger RP. Comparison of guideline compliance between US and china in severe sepsis patients from emergence department. 11 WPCCID 2008. Oral presentation.

血培养结果

血培养送检率

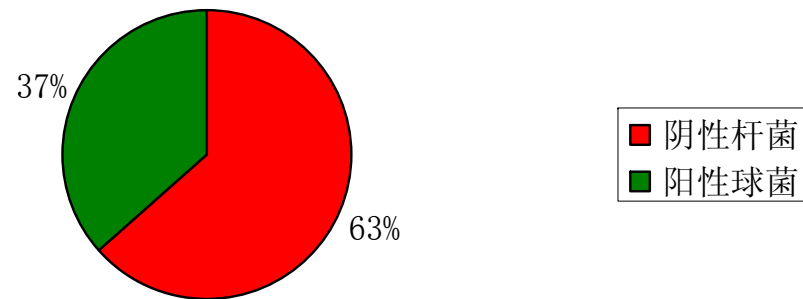


血培养阳性率

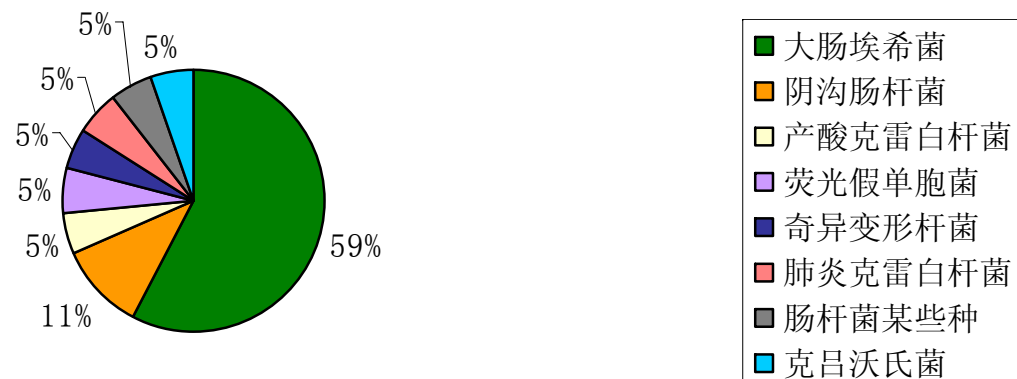


血培养结果

血培养阳性结果中阴性杆菌所占的比例



杆菌的构成



谢谢