# VIII CONGRESSO NAZIONALE SIMEU

Rimini, 18-21 Ottobre 2012

# CONTROVERSIES IN SEPTIC SHOCK AND MONITORING

## Early goal-directed therapy as simple as possible: a "less-invasive" approach to the treatment of Septic Shock in the ED

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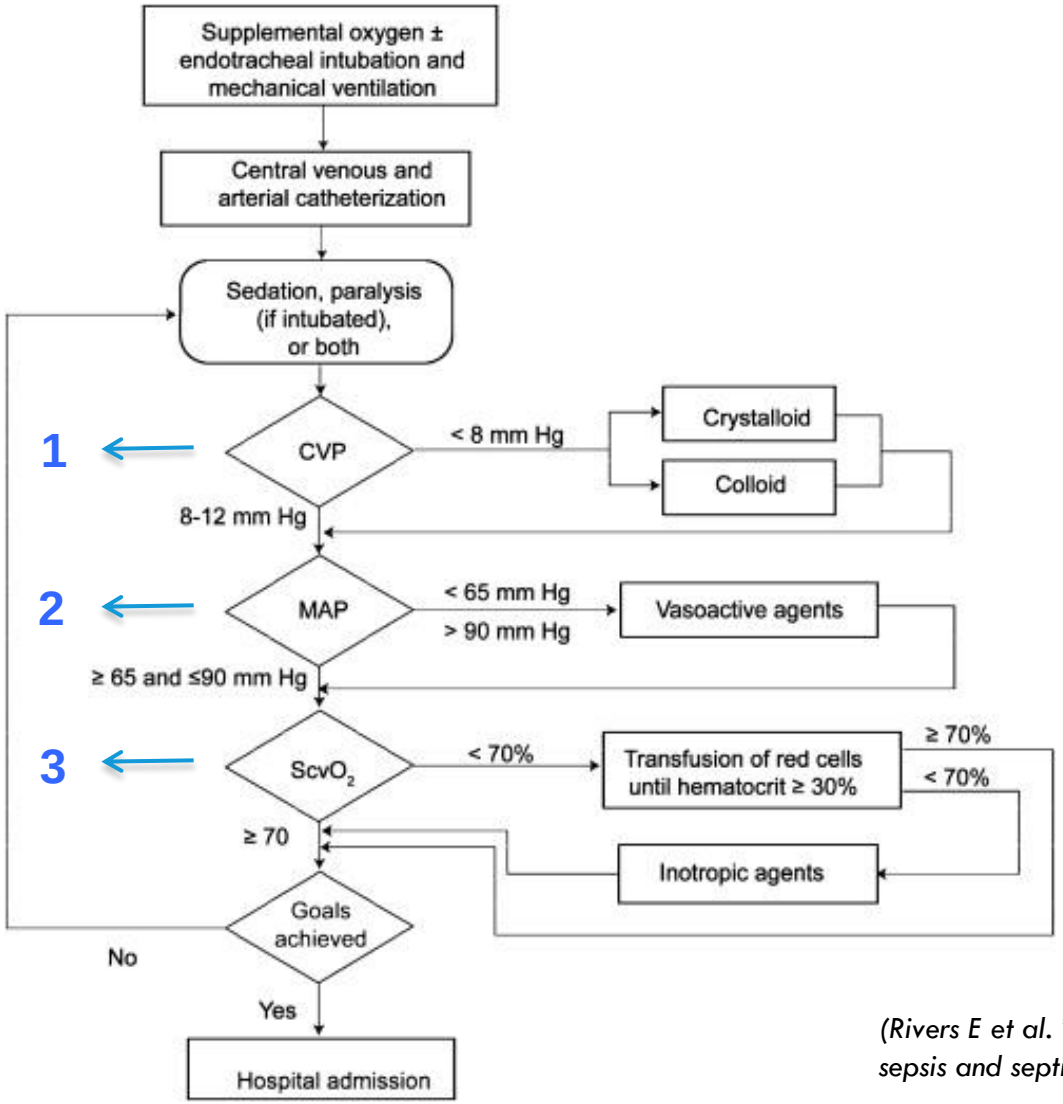
# EARLY GOAL DIRECTED THERAPY (EGDT)
## A milestone in the treatment of sepsis

- Sepsis as a time-dependent disease
- Definition of hemodinamic goals to guide treatment
- Effective treatment algorithm (EGDT)

***Rivers E et al.*** *"Early goal-directed therapy in the treatment of severe sepsis and septic shock"* ***NEJM 2001; 345:1368–1377***

# EARLY GOAL DIRECTED THERAPY (EGDT)




**END POINTS:**

1) CVP 8-12mmHg
2) MAP ≥ 65mmHg
3) ScvO2 ≥ 70%

*(Rivers E et al. "Early goal-directed therapy in the treatment of severe sepsis and septic shock"* ***NEJM 2001; 345:1368–1377****)*

# POSSIBLE EGDT PITFALLS

- EGDT as a *"BUNDLE"*: what is the role of each step ?
- Invasive measurement of CVP and $ScvO_2$:
  - (i) are they accurate ?
  - (ii) are they necessary ?
  - (iii) early = invasive ?
- Feasibility in the ED:
  - (i) resource availability
  - (ii) know-how of the staff
  - (iii) invasive procedure can be postponed ?
- The ED "setting" of the study of Rivers et al can be compared to our ED reality ?

# ARE THERE OTHER OPTIONS ?

## Evaluating hemodinamics with ultrasound and serum lactate

**FLUID STATUS**

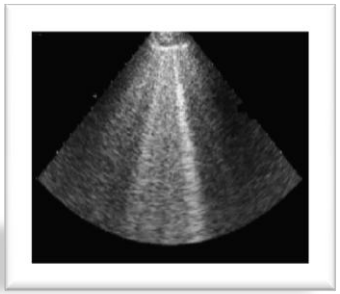
US MONITORING

- INFERIOR VENA CAVA COLLPSIBILITY INDEX (%) ΔIVC

$$\frac{\text{EXP DIAM} - \text{INSP DIAM}}{\text{EXP DIAM}} \times 100$$

(**Barbier,** ICM, 2004)
(**Feissel,** ICM, 2004)

- LUNG ULTRASOUND (B-LINES)



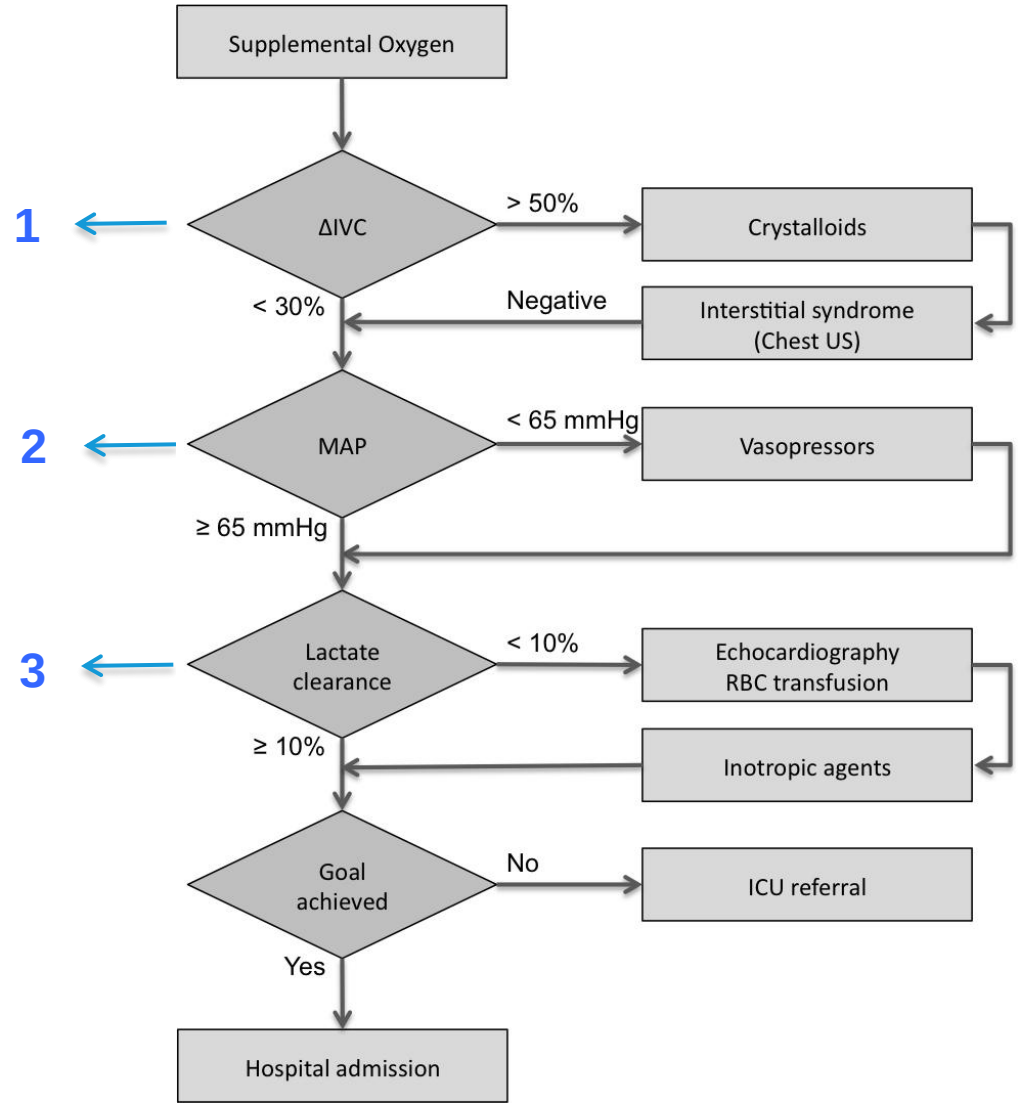
**TISSUE PERFUSION**

SERUM LACTATE CLEARANCE

$$\frac{\text{(S. LACTATE AT INCLUSION} - \text{S. LACTATE AFTER 6 HOURS)}}{\text{S. LACTATE AT INCLUSION}} \times 100$$

(**Jones,** JAMA, 2010)

# "LESS INVASIVE" APPROACH TO EGDT




**END POINTS:**

1) ΔIVC between 50% and 30%
2) MAP ≥ 65mmHg
3) lactate clearance > 10%

# AIMS

- Feasibility of a “less invasive” approach to EGDT in the first 6 hours of the septic shock treatment

- Evaluate (a) how many patients can be treated without invasive devices (b) how long can the invasive treatment be postponed (c) if there is a role for “bedside” ultrasound in the identification of the source of infection

- Compare intrahospital mortality, 28 and 60 days mortality of our study with the study *Rivers et al (NEJM, 2001)*

# METHODS

## INCLUSION CRITERIA

- Age > 18 years
- Criteria for the diagnosis of sepsis
- Biochemical signs of hypoperfusion (s. lactate >4 mmol/L) — CRYPTIC SHOCK

  **and / or**

  Persistent MAP < 65 mmHg after a fluid challenge with 20ml/kg of crystalloids (in 30 minutes) — SEPTIC SHOCK

## EXCLUSION CRITERIA

- Acute myocardial infarction
- Pulmonary edema at presentation
- Cardiac arrest
- Pregnancy
- Surgery planned in the first 3 hours of treatment
- Ultrasound of inferior vena cava not adequate for anatomical or clinical reasons

# RESULTS

- 47 participants, 22 females and 25 males, mean age was 70.2 years; 13 with cryptic shock (serum lactate >4mmol/L) and 34 with overt septic shock

- Baseline characteristics of patients, interventions and overall mortality have been compared with the EGDT cohort of Rivers *(NEJM 2001)*

# RESULTS

## Baseline characteristics of participants

| | Present study | Rivers et al | *P* |
|---|---|---|---|
| Number of subjects | 47 | 130 | |
| Age (years) [mean ±SD] | 70.2 [±15.2] | 67.1 [±17.4] | *NS* |
| Sex (%) | | | |
| *M* | 53.2 | 50.8 | *NS* |
| *F* | 46.8 | 49.2 | *NS* |
| Apache II score [mean ±SD] | 20.2 [±5.6] | 21.4 [±6.9] | *NS* |
| **Comorbidity** (%) | | | |
| *CHD* | 25.0 | 36.7 | *NS* |
| *CAD* | 19.2 | 26.5 | *NS* |
| *COPD* | 18 | 18 | *NS* |
| *Diabetes* | 23.8 | 30.8 | *NS* |
| *Liver failure* | 20.9 | 23.1 | *NS* |
| *Neurological disease* | 25.0 | 34.2 | *NS* |
| *Chronic renal failure* | 5.8 | 21.4 | ***0.01*** |
| *Immunosuppression* | 21.2 | 4.3 | ***0.01*** |
| *Active cancer* | 35.3 | 12.8 | ***0.01*** |
| **Subgoup of sepsis** (%) | | | |
| *Cryptic shock* | 27.6 | 48.7 | ***0.01*** |
| *Septic shock* | 72.4 | 51.3 | ***0.01*** |
| **Hemodinamics** | | | |
| *MAP t0 (mmHg) [*mean ±*SD]* | 60.1 [±13.6] | 74 [±27] | ***0.01*** |
| *MAP t6 (mmHg) [*mean ±*SD]* | 74.9 [±12.5] | 95 [±19] | ***0.01*** |
| *S. lactate t0 (mmol/L) [*mean ±*SD]* | 4.6 [±3.4] | 7.7 [±4.7] | ***0.01*** |
| *S. lactate t6 (mmol/L) [*mean ±*SD]* | 3.0 [±2.7] | 4.3 [±4.2] | ***0.04*** |

# RESULTS

## Feasibility and interventions

| Interventions | |
|---|---|
| Feasibility of inferior vena cava US scan (%) | 92.3 |
| Feasibility of lung US (%) | 100 |
| Total fluids in 6 hours (L) (mean ±SD) | 5.2 (± 2.3) |
| CVC inserted (%) | 61.7 |
| Time to CVC (minutes) (mean ±SD) | 154 (± 111) |
| Serum lactate testing (%) | 100.0 |
| “Bedside” US identification of the source of infection (%) | 32.1 |

# RESULTS

## Compliance with the Surviving Sepsis Campaign

| Hemocultures and antibiotics administration | |
|---|---|
| Total hemocultures (%) | 94.2 |
| Hemocultures in the first 2 hours (%) | 96.0 |
| Positive hemocultures (%) | 31.8 |
| Antibiotics within 1 hour (%) | 63.8 |
| Antibiotics within 6 hours (%) | 100 |
| Time to antibiotics administration (minutes) [mean ±SD] | 71 [± 54] |

# RESULTS

## Hemodinamic goals achievement

| | Present study | Rivers et al |
|---|---|---|
| ΔIVC between 30% and 50% (%) | 97.1 | N.A. |
| CVP between 8 and 12 mmHg (%) | N.A. | 99 |
| MAP ≥ 65 mmHg in 6 hours (%) | 89.4 | 100 |
| Lactate clearance > 10% at 6 hours | 70.3 | N.A. |
| $ScvO_2$ ≥ 70 % (%) | N.A. | 94.9 |
| US pattern of lung interstitial syndrome (%) | 34.6 | N.A. |
| Clinically overt pulmonary edema (%) | 8.5 | N.A. |
| Use of vasopressors (%) | 53.1 | 26.7 |

# RESULTS

## Intrahospital, 28 and 60 days Mortality

| | Present study | Rivers et al | *P* |
|---|---|---|---|
| Number of subjects | 47 | 130 | |
| **Intrahospital mortality (%)** | | | |
| Cryptic Shock (s. lactate >4 mmol/L) | 23.1 | 15.2 | *NS* |
| Septic Shock | 44.1 | 41 | *NS* |
| **Total mortality (%)** | | | |
| 28 days | 34 | 30.8 | *NS* |
| 60 days | 38.3 | 38.5 | *NS* |

# CONCLUSIONS

- A “less invasive” US-guided approach to septic shock is easily feasible in the ED in near all cases at least for the first “golden” hours.
- With this approach we spared a CVC in the 40% of cases and in the remaining 60% it was placed for vasopressor infusion (81.2%) or to secure an adequate venous access.
- IVC and lung US have been successfully employed for the administration of an adequate amount of fluids allowing at the same time to avoid or treat promptly pulmonary edema.
- With “*bedside*” US we were able to identify the source of infection in 1/3 of cases

# CONCLUSIONS

- Baseline characteristics and severity score (i.e. APACHE II) of our population were similar to those of Rivers et al. We recorded although a far higher percentage of septic shock and patients with immunosuppression compared with the original EGDT cohort.

- Nevertheless we had a similar intrahospital, 28 and 60 days mortality, supporting further study on the use of our or similar approach in the treatment of septic shock.

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# THANK YOU !