II FOCUS di PEDIATRIA
INCONTRI MONOTEMATICI MENSILI
la gestione della prima emergenza con PBLS-D

Ospedale "Sacro Cuore di Gesù"
FATEBENEFRATELLI
Benevento
U.O.C. di PEDIATRIA
NEONATOLOGIA – UTIN

MARTEDI **24 MAGGIO** 2011

Approccio al bambino in stato di shock

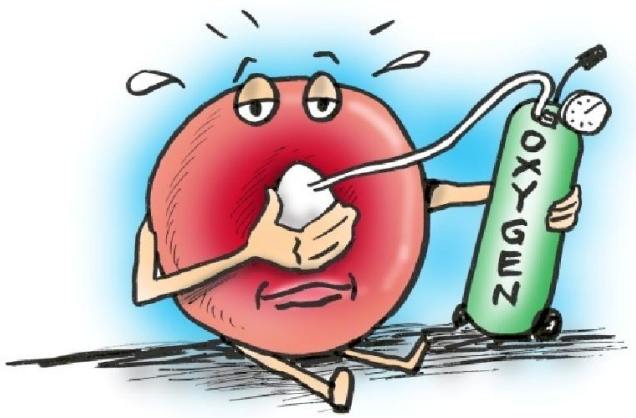
Marcella Gaffuri

Terapia Intensiva Neonatale e Pediatrica
UOdO Pediatria
Azienda Ospedaliera Universitaria Integrata Verona

Shock: argomenti trattati

- **Fisiopatologia**
- **Tipi di shock**
- **Inquadramento diagnostico**
- **Trattamento e monitoraggio**
- **Casi clinici**

Shock: sindrome clinica



squilibrio sistemico
disponibilità O_2 / substrati
e richieste metaboliche tissutali

↓

° metabolismo aerobio → anaerobico lattacido
° ↓ energia per l'omeostasi cellulare
° distruzione pompe ioniche di membrana
° rigonfiamento cellulare e lisi membrana

↓

morte cellulare



Richieste tissutali, legate a:

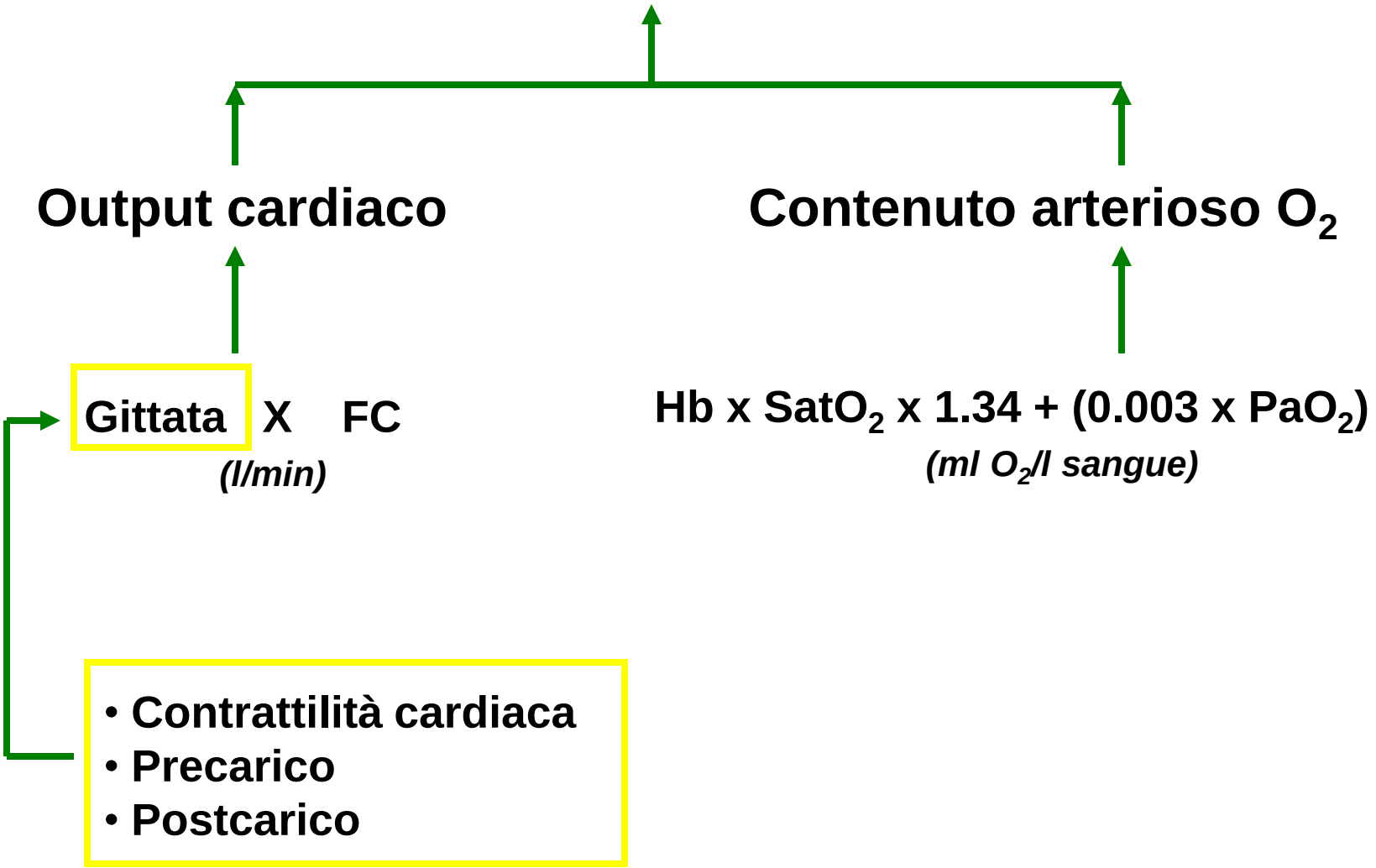
- **disponibilità O_2**
- **perfusione**

Disponibilità O_2: Oxygen delivery (DO_2)

- quantità O_2 rilasciato ai tessuti / tempo : ml/min/ m^2
- deve essere sufficiente per la domanda tissutale
- critica in tutti i tipi di shock

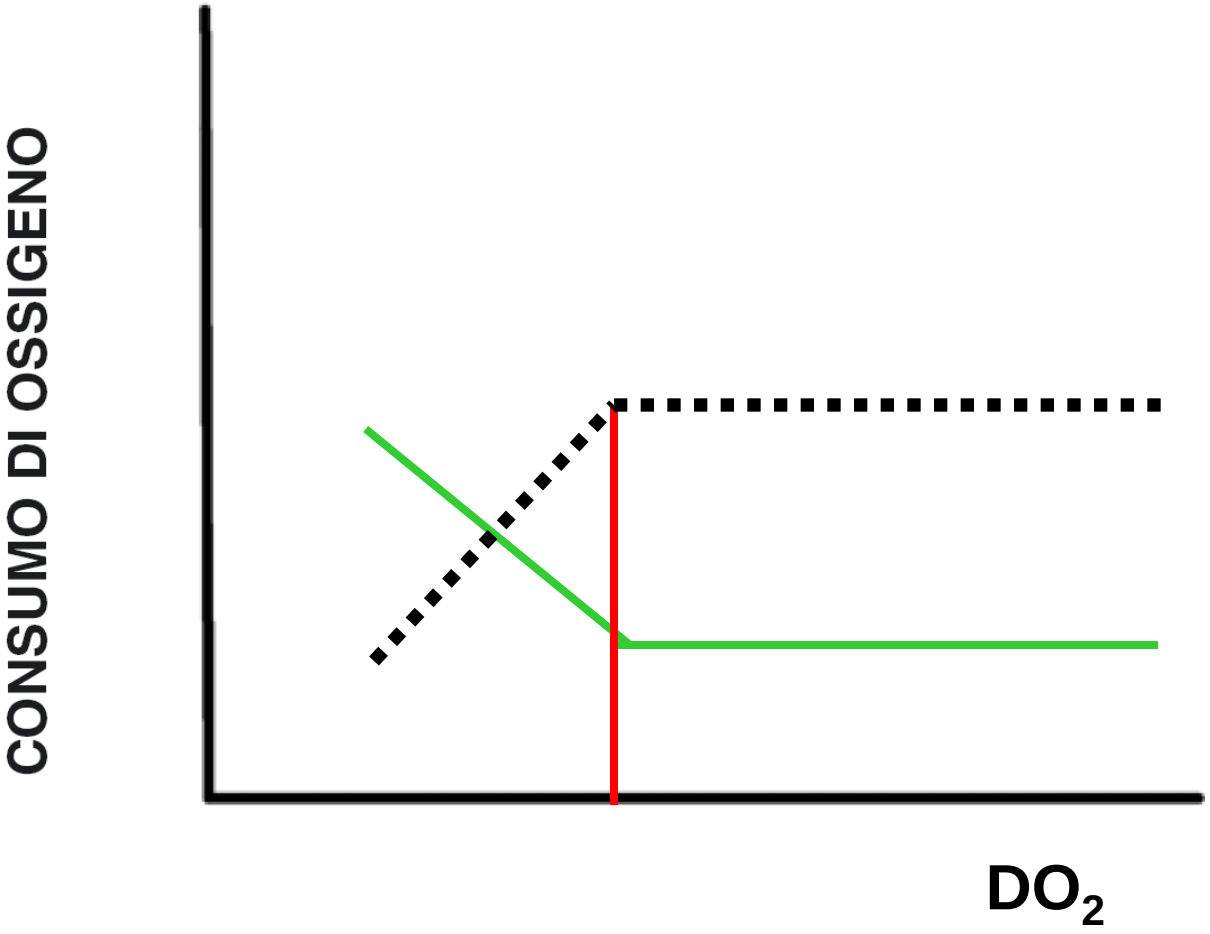


Disponibilità O_2 = Oxygen delivery (DO_2)



Consumo ossigeno dipende da:

- DO_2
- percentuale estrazione O_2



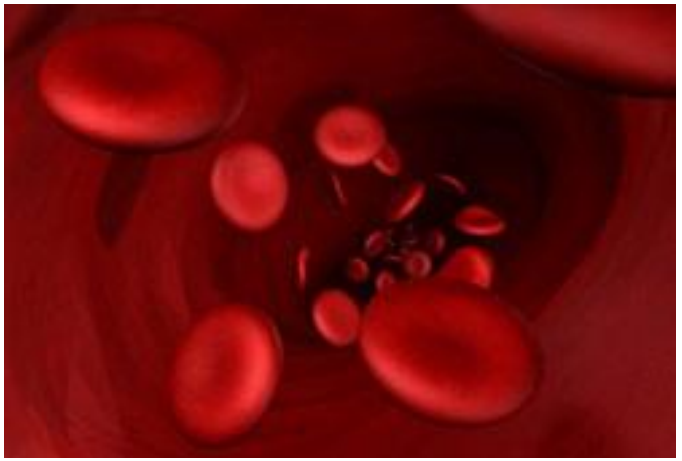
J.-L. Vincent
Intensive Care Med (2004)



Richieste tissutali, legate a:

- disponibilità O_2
- perfusione

Perfusione:



Flusso perfusione ai tessuti = $\dfrac{\text{P perfusione} = (\text{P art} - \text{P ven})}{\text{Resistenze Vascolari Tessuto}}$

MAP

Output cardiaco

Gittata X FC

(l/min)

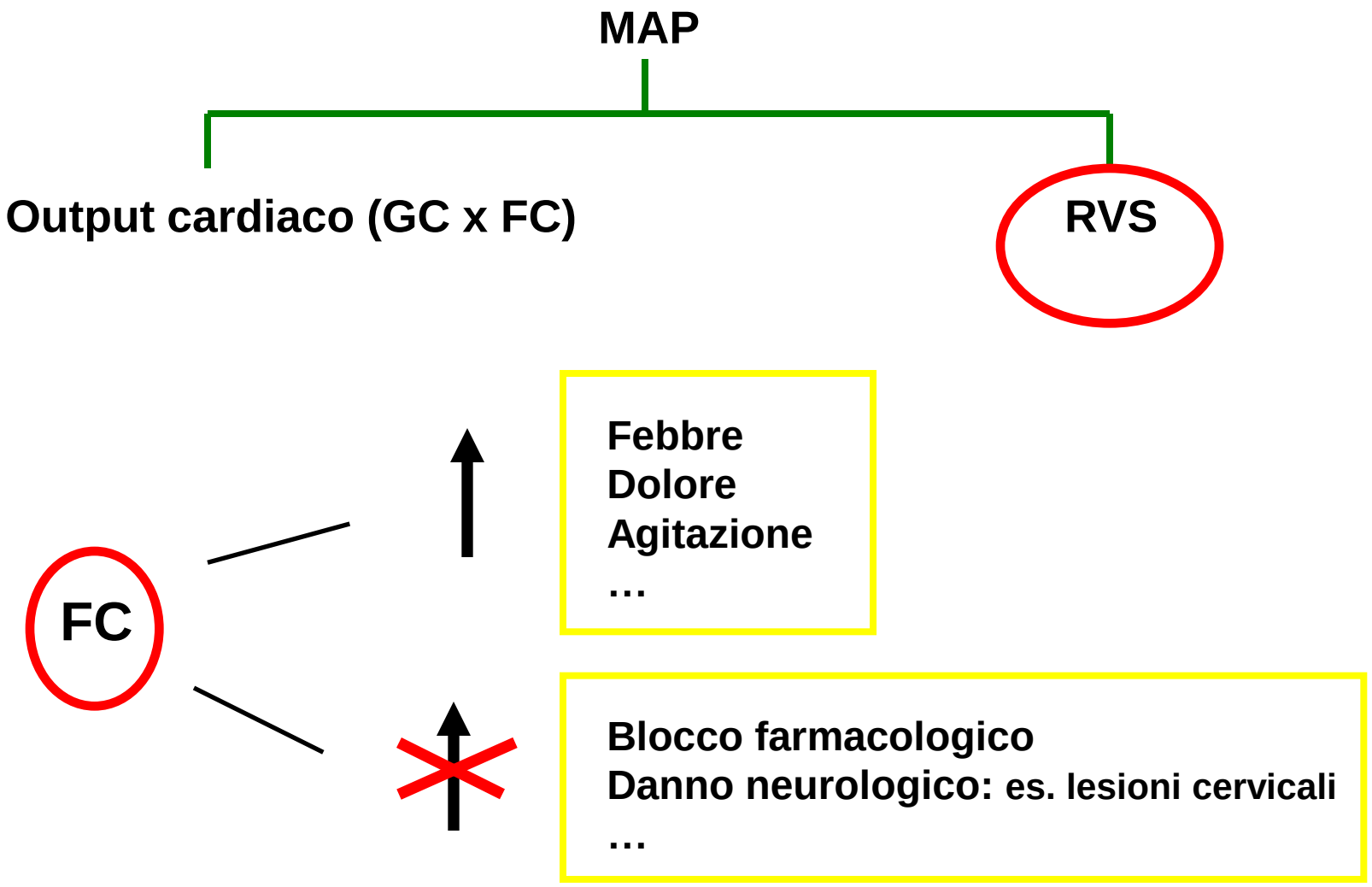
- Contrattilità cardiaca
- Precarico
- Postcarico

Resistenze vascolari periferiche

(RVS)

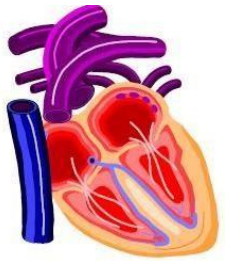
- Lunghezza vasi
- Viscosità ematica
- Diametro dei vasi

Ipoperfusione tissutale: risposte



Ipoperfusione tissutale: ↑ RVS

Perfusione “deviata” per preservare organi nobili





° Cute: fredda, marezzata, ↑ Tempo Refill

° Sist. Cardiovascolare: polsi deboli, delta polsi centrali/ periferici

° Rene: oliguria (< 1 ml / Kg / h)

° Intestino: ileo paralitico, ↑ chetoni, acidosi metabolica

° Cervello: irritabilità, agitazione, sopore

Fasi shock:

Compensato: Omeostasi circolo organi nobili e pressione arteriosa conservate a spese di organi meno nobili *(cute, intestino, reni, …)*

Scompensato: i meccanismi di compenso non mantengono più una perfusione adeguata

Irreversibile: il danno è troppo esteso per recuperare l'omeostasi dei tessuti

→ MOF (multi organ failure)
→ morte del paziente

Blood Pressure Percentiles by Age and Height From Nonoverweight Children and Adolescents in Germany

Hannelore K. Neuhauser

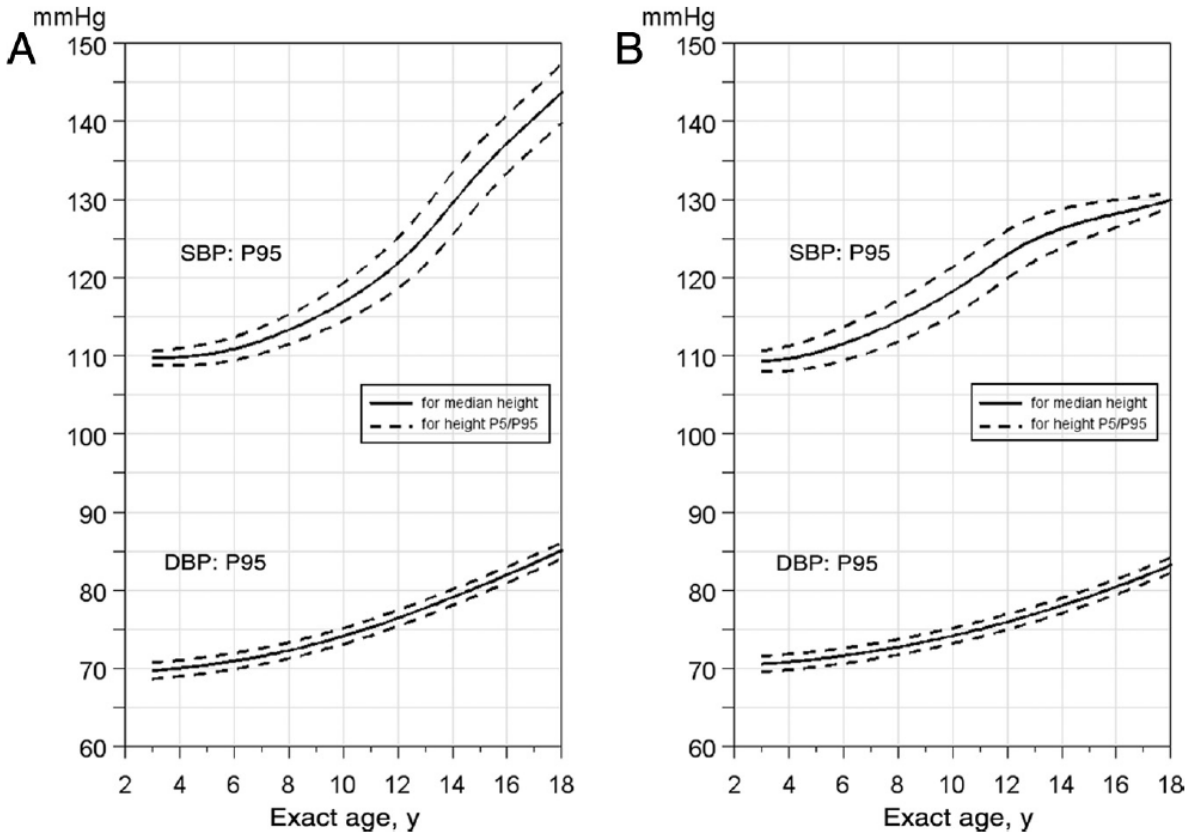


FIGURE 1

95th percentile of BP according to age and height percentile among nonoverweight children aged 3 to 17 years. A, Boys; B, girls. P*n* indicates *n*th percentile.

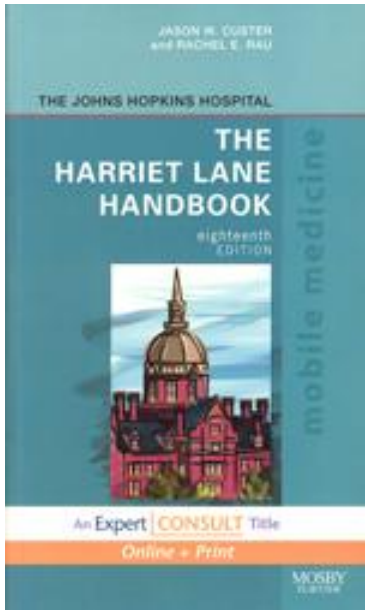
Pressione arteriosa:

shock compensato - scompensato

Pediatrics 2011;127;e978

Valori normali minimi, pressione sistolica:

Età	Pressione sistolica (mmHg)
0 – 1 mese	60
1 mese – 1 anno	70
> 1 anno	70 + (età in anni X 2)



Clinical practice parameters for hemodynamic support of pediatric and neonatal septic shock: 2007 update from the American College of Critical Care Medicine*

Threshold Rates	Heart Rate (bpm)	Mean Arterial Pressure-Central Venous Pressure (mm Hg)
Term newborn	120–180	55
Up to 1 yr	120–180	60
Up to 2 yrs	120–160	65
Up to 7 yrs	100–140	65
Up to 15 yrs	90–140	65

Crit Care Med 2009

Tipi di shock

Tipi di shock:

Ipovolemico	**deficit assoluto / relativo liquidi intravascolari**
Cardiogeno	**deficit pompa cardiaca**
Ostruttivo	**ostruzione al flusso ematico cuore / grandi arterie**
Distributivo	**tono vascolare periferico inappropriatamente basso**
Dissociativo	**inadeguato trasporto di O_2**

Shock ipovolemico:

Perdita “plasma” extracorporea

- **gastroenterite**
- **ustioni**
- **diabete insipido**
- **fase poliurica post NTA**
- **insufficienza surrenalica**

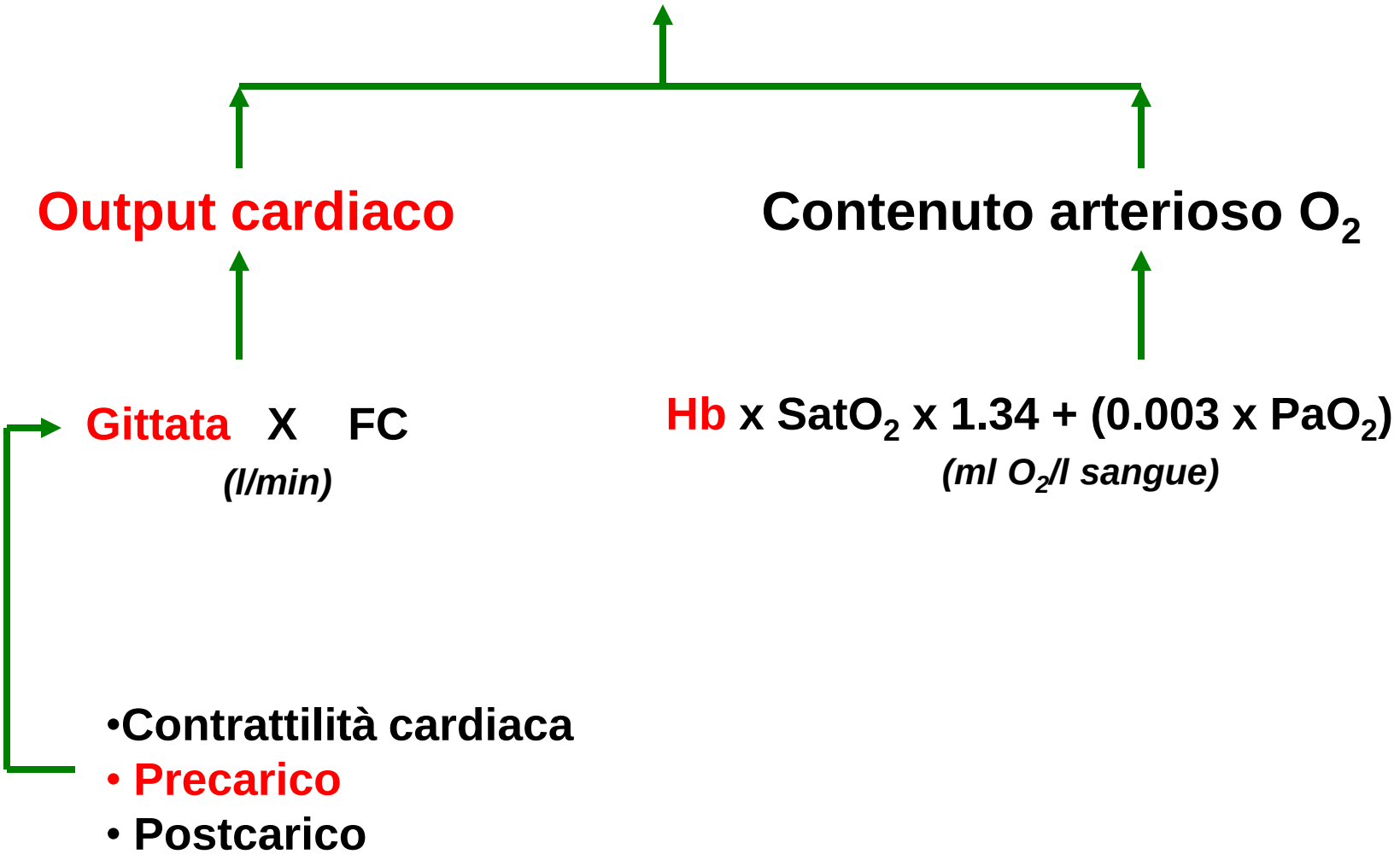
Emorragie

- **trauma**
- **chirurgia**
- **sang. gastrointestinale**

Perdite interstiziali
(capillary leak -
deficit relativo liquidi tot)

- **ferite - ustioni**
- **s.nefrosica**
- **ascite**
- **sepsi**

Shock ipovolemico: oxygen delivery

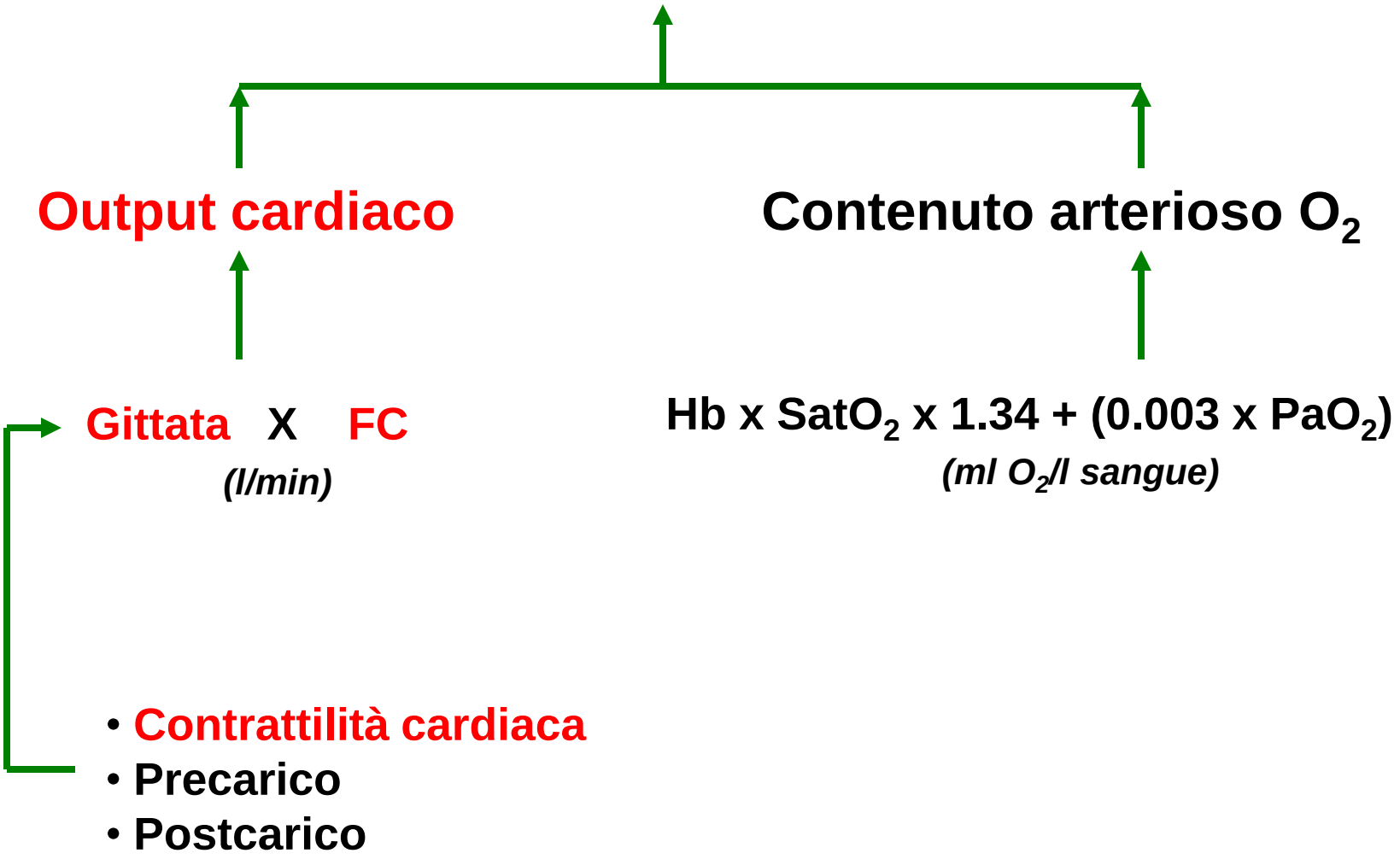


Shock cardiogeno:

Disfunzione contrattilità cardiaca

- **aritmie**
- **scompenso cardiaco**
- **sepsi**
- **cardiomiopatie**
- **tamponamento cardiaco / traumi**
- **ischemia cardiaca**
- **farmaci – agenti tossici**

Shock cardiogeno: oxygen delivery

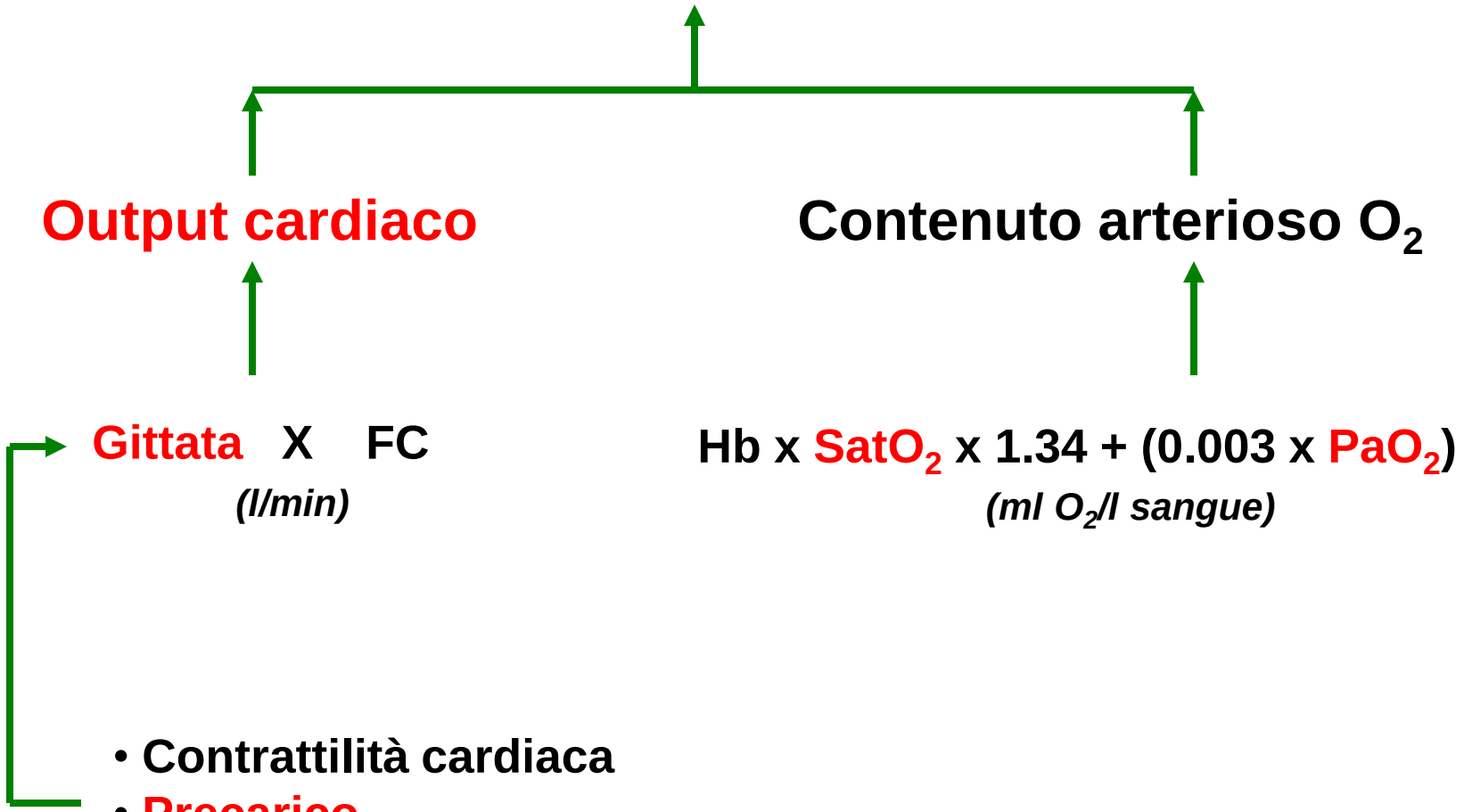


Shock ostruttivo:

L’output cardiaco è ostacolato

- **coartazione / interruzione aortica**
- **severa stenosi valvola aortica**
- **endocardite batterica**
- **cardiomiopatia ipertrofica**
- **pnx – embolia polmonare**

Shock ostruttivo: oxygen delivery



Shock distributivo:

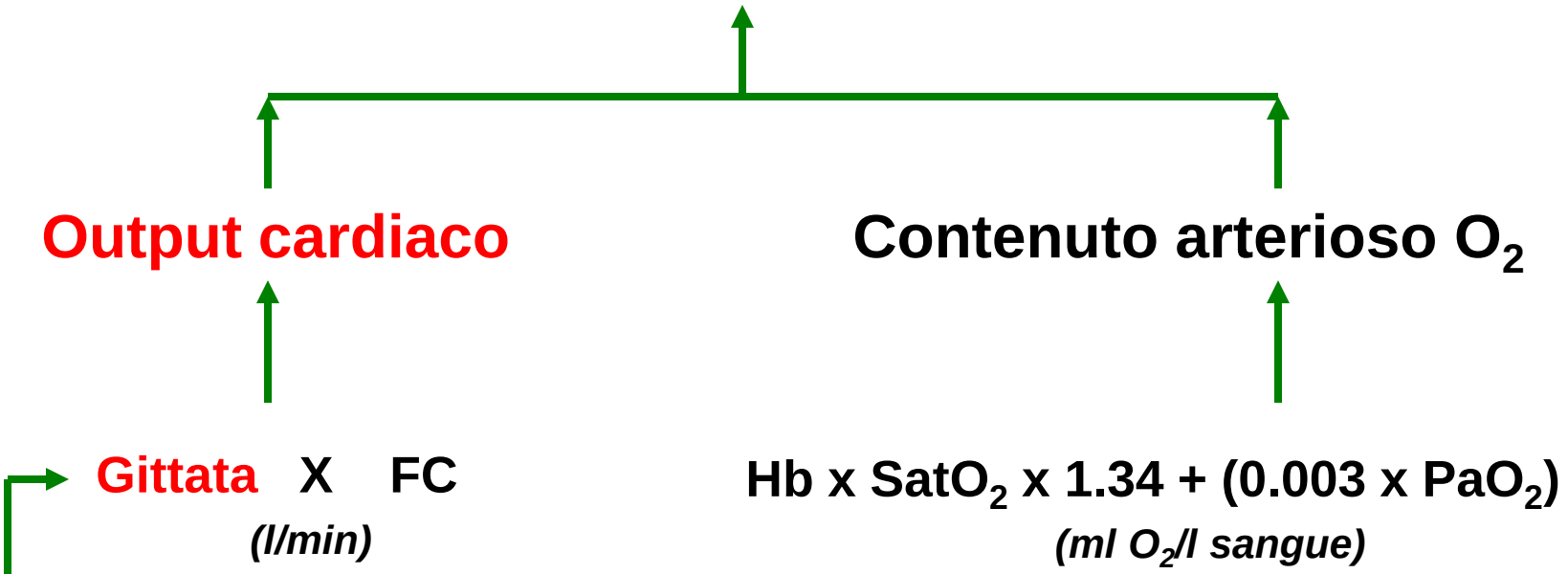
Tono vascolare periferico inappropriatamente basso → ridotto ritorno venoso al cuore

- **anafilassi**
- **farmaci (antibiotici, sedativi, …)**
- **emoderivati**
- **sepsi**
- **lesioni midollari, traumi**



mancata risposta tachicardizzante simpatico-mediata (FC bassa)

Shock distributivo: oxygen delivery



Shock: approccio

- **Anamnesi**
- **Es. Obiettivo**
- **Problemi**
- **Esami**
- **Programma / terapia**



Shock: anamnesi

- **Patologie pregresse**
  - **Anamnesi parto / gravidanza**
  - **Allergia**
  - **Deficit immunitari**
  - **Patologie cardiache / renali**
  - **Screening metabolici**
- **Curve crescita**
  - **Malattie metaboliche**
- **Rischio infettivo**
  - **Febbre**
  - **Contatti malati**
- **Ingestione farmaci - tossici**
- **Trauma**
  - **Modalità**
- **Perdita liquidi**
  - **Gastroenterite**
  - **Ustioni**

Shock: approccio

- **Anamnesi**
- **Es. Obiettivo**
- **Problemi**
- **Esami**
- **Programma / terapia**



Shock: esame obiettivo

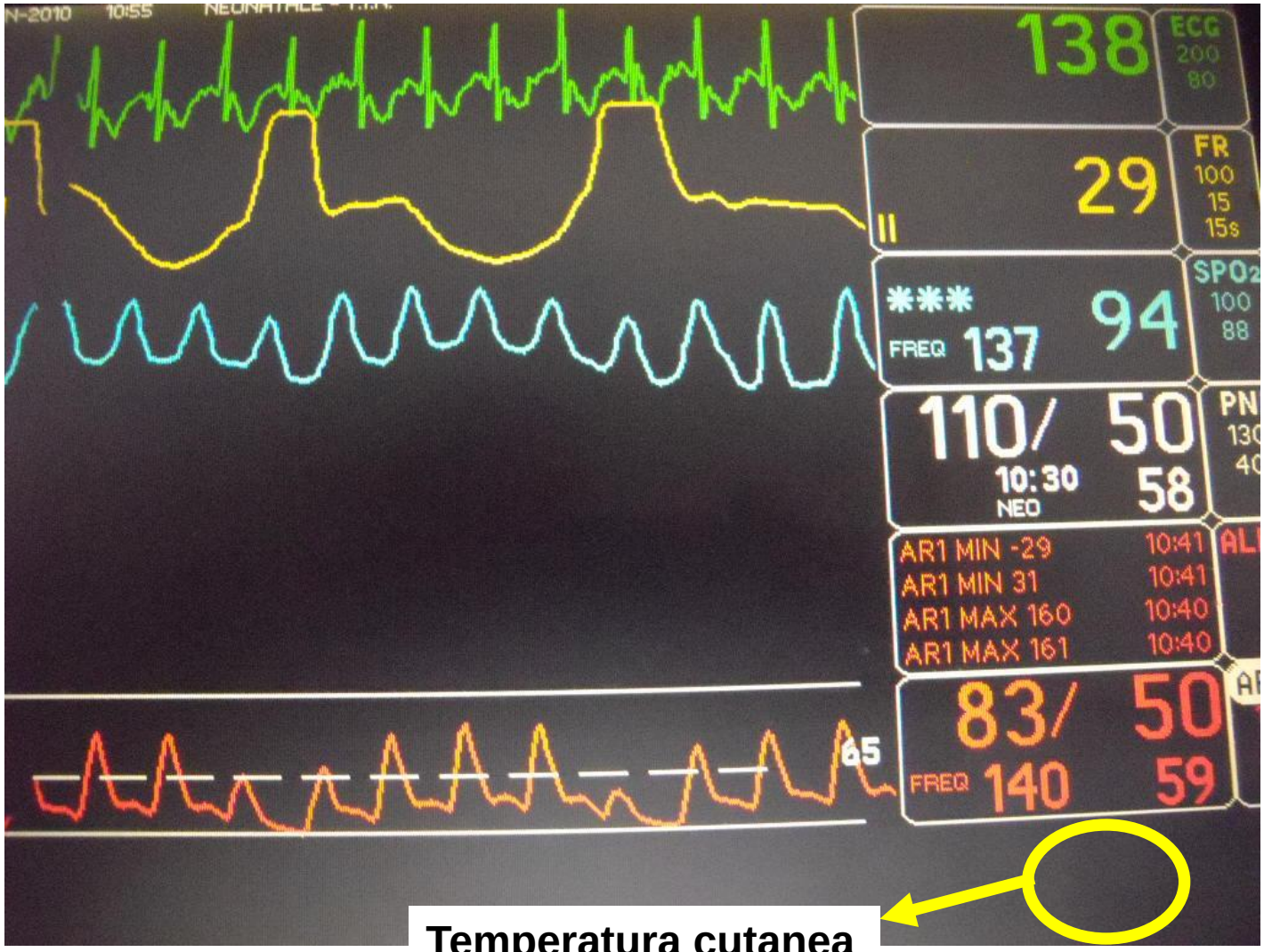


Shock: cute

- Idratazione
- Colore
- Marezzatura
- Tempo Refill
- Temperatura estremità
- Lesioni



Shock: parametri vitali



Normal ranges of heart rate and respiratory rate in children from birth to 18 years of age: a systematic review of observational studies

Lancet 2011; 377: 1011–18

Susannah Fleming

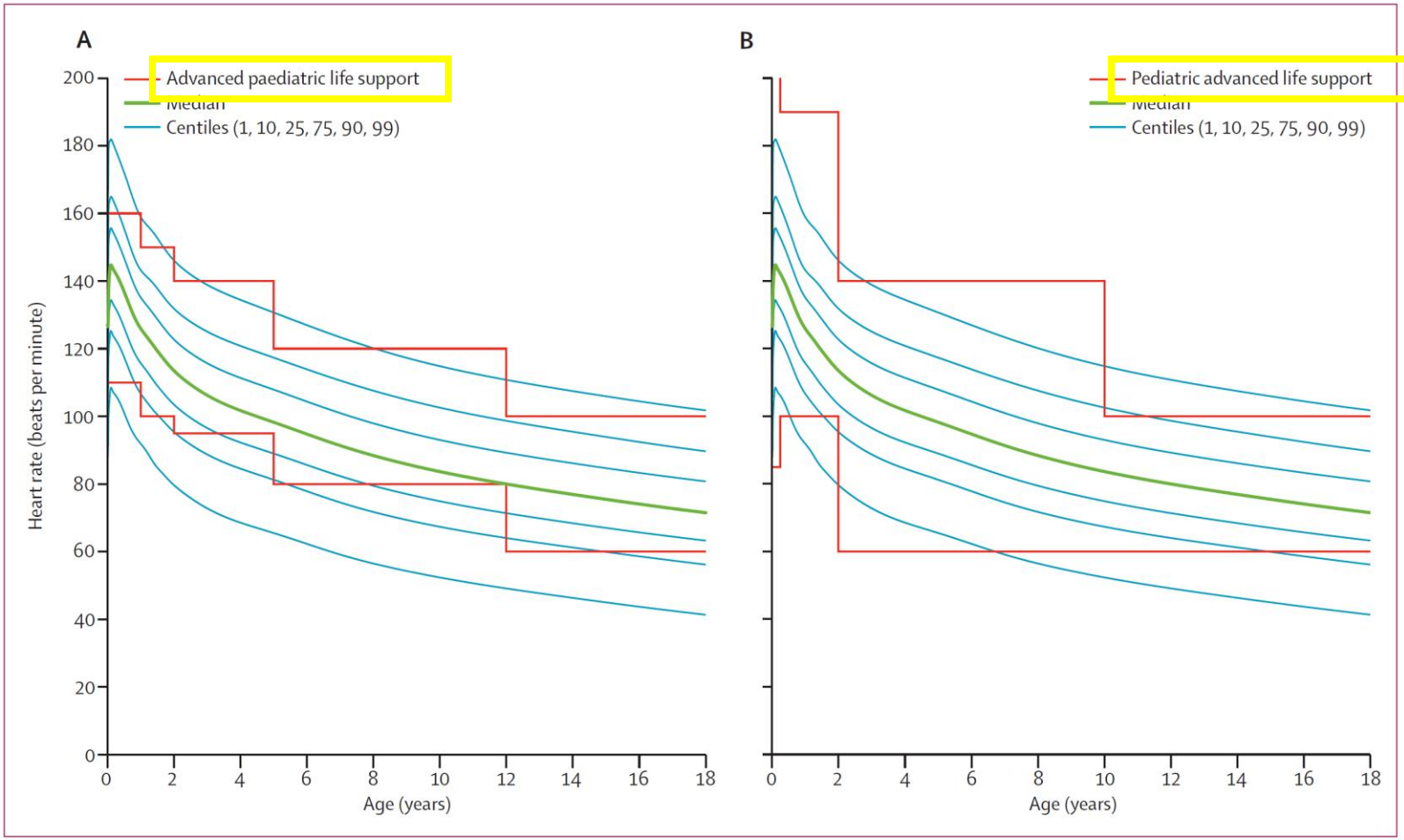
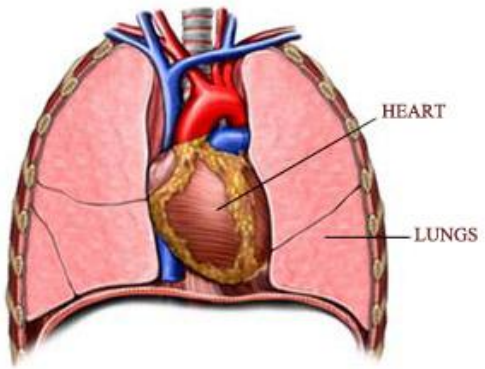
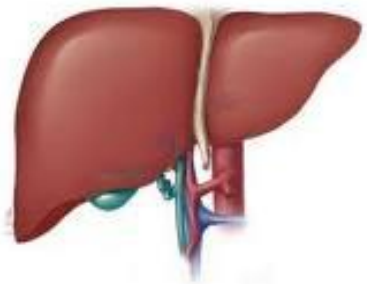


Figure 5: Comparison of heart rate centiles with paediatric reference ranges from the advanced paediatric life support (A) and pediatric advanced life support (B) guidelines

Shock: altri segni

- Soffio / itto cardiaco
- Epatomegalia
- Distensione vene giugulari
- Broncospasmo / stridore
- Rantoli / dispnea
- Tipo respiro / iperventilazione
- Crampi addominali, vomito





- **Output urinario**

≥ 1 ml / K / h







- **Stato neurologico:** ***Glasgow Coma Scale***

	Adulti/bambini	Meno di 2 anni
Apertura occhi		
4	Apertura spontanea	Apertura spontanea
3	A comando	Allo stimolo verbale
2	Al dolore	Al dolore
1	Nessuna risposta	Nessuna risposta
Risposta motoria		
6	Esegue gli ordini semplici	Spontanea
5	Localizza lo stimolo doloroso	Risposta al tatto
4	Allontana lo stimolo doloroso	Risposta al dolore
3	Flessione (decorticazione)	Flessione (decorticazione)
2	Estensione (decerebrazione)	Estensione (decerebrazione)
1	Nessuna risposta	Nessuna risposta
Risposta verbale		
5	Orientata	Gorgoglia - Vocalizza
4	Confusa	Irritabile, pianto consolabile
3	Inappropriata	Pianto non consolabile, urla
2	Suoni incomprensibili	Lamento
1	Nessuna risposta	Nessuna risposta



Ipossia, ipercapnia

Integrazione clinica – parametri



Calo $SatO_2$

Shock: approccio

- Anamnesi
- Es. Obiettivo
- Problemi
- Esami
- Programma / terapia



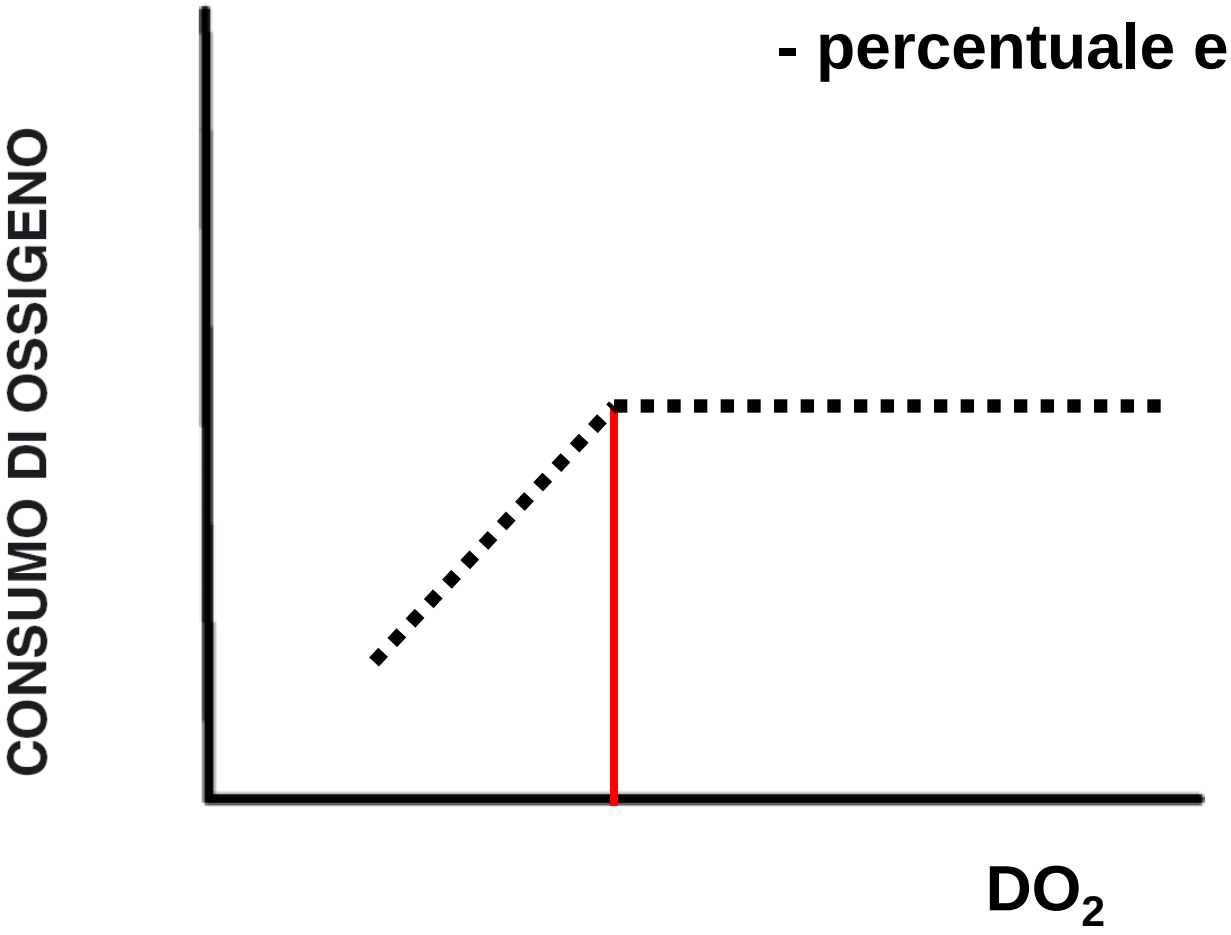
Shock: esami laboratorio



- Es. Emocromocitometrico	Emorragia? Sepsi? CID?
- pH	Acidosi? HCO_3? Lattato?
- Na, albumina, PS urine, creatinina	Idratazione? Perfusione?
- AST, ALT, lipasi, troponina…	Danno ischemico?
- PCR, procalcitonina	Sepsi?
- Glicemia	Malattie metaboliche?
- Gruppo, prova crociata, coagulazione	
- Delta SaO_2 arteriosa - venosa mista	Perfusione ?

Consumo ossigeno: dipende da:

- DO_2
- percentuale estrazione O_2

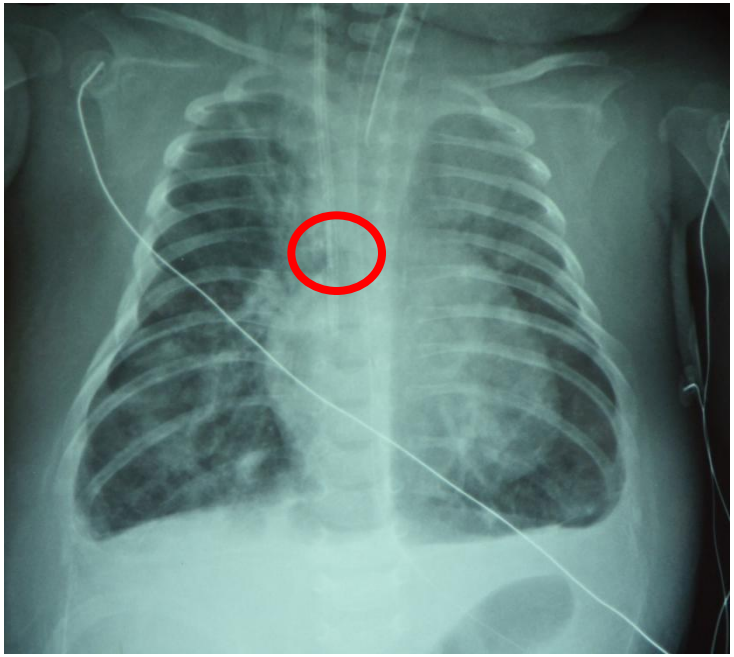


J.-L. Vincent
Intensive Care Med (2004)

Shock: esami strumentali

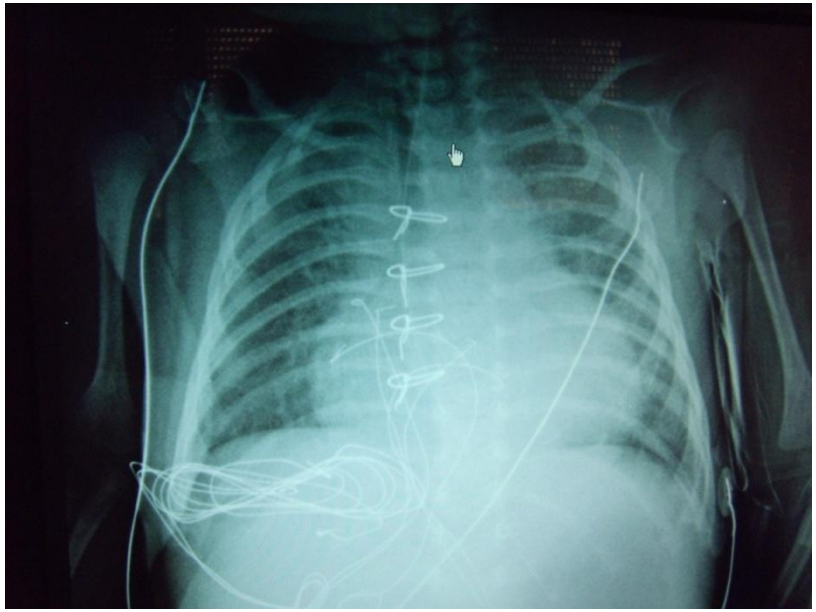
- **Rx Torace** (cardiomegalia? infezione? edema?)
- **ecocardiogramma** (cardiopatia? contrattilità? riempimento?)
- **ECG** (dilatazione atriale da sovraccarico?)
- **ecografia addome** (ascite? vene cave?)

Shock: esami strumentali



Iper espansione

Cardiomegalia



Shock: approccio

- **Anamnesi**
- **Es. Obiettivo**
- **Problemi**
- **Esami**
- **Programma / terapia**



Shock: trattamento

Clinical practice parameters for hemodynamic support of pediatric and neonatal septic shock: 2007 update from the American College of Critical Care Medicine*

Joe Brierley, MD; Joseph A. Carcillo, MD

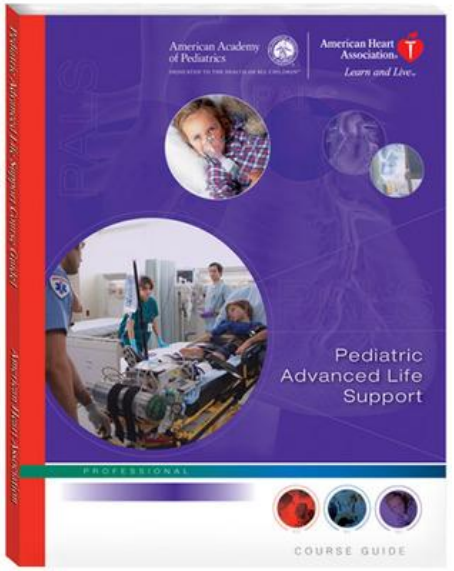
Crit Care Med 2009 Vol. 37, No. 2

(Crit Care Med 2002 Vol. 30, No. 6)

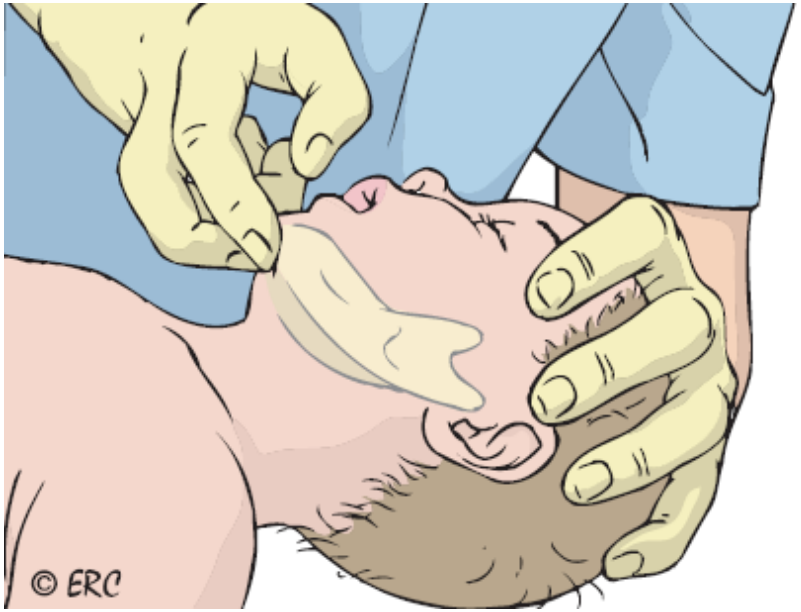
Part 10: Pediatric Basic and Advanced Life Support

2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations

- **A**irway
- **B**reathing
- **C**irculation
- **D**isability
- **E**xposure



Airway





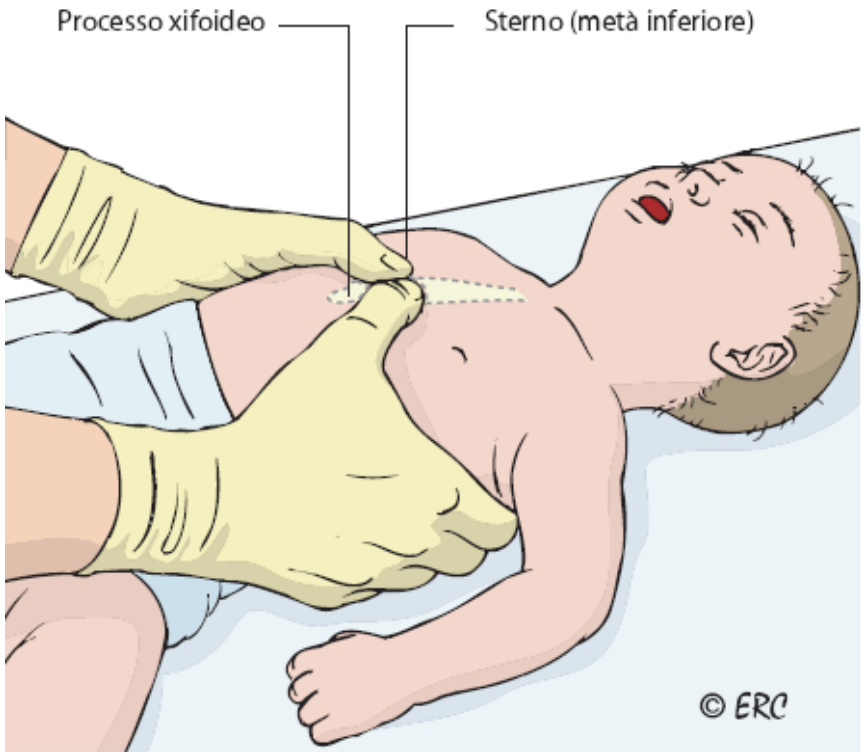


Breathing





Circulation



Accessi vascolari:











Approccio terapeutico: fluidi subito!!

Bolo fluidi



Eccezione priorità:
in shock anafilattico



Lieberman P
J Allergy Clin Immunol 2005

Shock anafilattico, Adrenalina:

J ALLERGY CLIN IMMUNOL
FEBRUARY 2006



0,01 mg/ Kg i.m.

diluizione 1:1.000

dose max 0,5 mg

ogni 5’-10’

↓↓ MAP / arresto cardiaco non responsivo ad adrenalina i.m. + boli fluidi

→ **adren e.v.**

0.1 ml / Kg dil 1:10.000

Colloids versus crystalloids for fluid resuscitation in critically ill patients (Review)

Perel P, Roberts I



Types of participants

Critically ill patients (excluding neonates) who required volume replacement. We included patients who were critically ill as a result of trauma, burns, were undergoing surgery, or had other critical conditions such as complications of sepsis.

We excluded pre-operative elective surgical patients.

2011, Issue 3

There is no evidence from RCTs that resuscitation with colloids, instead of crystalloids, reduces the risk of death in patients with trauma, burns or following surgery. As colloids are not associated with an improvement in survival, and further, colloids are considerably more expensive than crystalloids, it is hard to see how their continued use outside the context of RCTs in subsets of patients of particular concern, can be justified.

Part 10: Pediatric Basic and Advanced Life Support

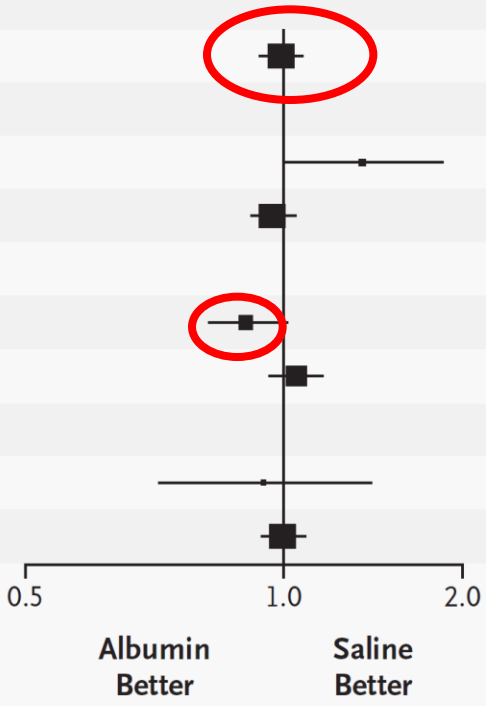
2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations

Isotonic crystalloids are recommended as the *initial* resuscitation fluid for infants and children with any type of shock. There is insufficient evidence to identify the superiority of any specific isotonic crystalloid over others.

A Comparison of Albumin and Saline for Fluid Resuscitation in the Intensive Care Unit

The SAFE Study Investigators*

Patients	Albumin Group	Saline Group	Relative Risk (95% CI)
	no. of deaths/total no.		
Overall	726/3473	729/3460	0.99 (0.91–1.09)
Trauma			
Yes	81/596	59/590	1.36 (0.99–1.86)
No	641/2831	666/2830	0.96 (0.88–1.06)
Severe sepsis			
Yes	185/603	217/615	0.87 (0.74–1.02)
No	518/2734	492/2720	1.05 (0.94–1.17)
ARDS			
Yes	24/61	28/66	0.93 (0.61–1.41)
No	697/3365	697/3354	1.00 (0.91–1.09)



N ENGL J MED 2004

Segni sovraccarico:



Rantoli a livello polmonare

↓ paO_2, ↑ lavoro respiratorio

Epatomegalia

Turgore vene giugulari

→ **iniziare inotropi !**

Fluidi: 2 # Neonato

Cristalloidi: 10 ml / Kg e.v. – i.o.

Parametri invariati dopo 2-3 boli cristalloidi

? Emorragia → **GRC**

(limite: Hb <10g/dl, per ottenere $SatO_2$ venosa mista > 70%)

Int Care Med 2008
De Oliveira

- **inotropo**
- **allerta TIP : CVC (PVC), catetere arterioso (MAP invasiva)**

Se non miglioramento e sospetto shock cardiogeno: restrizione idrica

Inotropi, infusioni continue:

Accessi !!

Accesso venoso periferico / i.o. :

- **Dobutamina**
- **Dopamina o Adrenalina a basse dosi, diluiti**

  o con 2° infusione a velocità adeguate per raggiungere il cuore

Accesso centrale :

- **Dopamina, Adrenalina, Noradrenalina**

Clinical practice parameters for hemodynamic support of pediatric and neonatal septic shock: 2007 update from the American College of Critical Care Medicine*

Quali inotropi:

Table 5. Inotropes, Mechanism, Doses, And Clinical Indications In Patients With Shock.

Inotrope	Mechanism	Effects	Clinical Usage	Dosing Range
Dopamine	DA at lower dosing range $\beta_{1\&2}$ at increasing doses α at the higher end of dosing	Increased cardiac output; vasoconstriction at higher doses	**Septic shock** (low cardiac output shock)	**5-20 µg/kg/min**
Epinephrine	$\beta_{1\&2}$ at increasing doses α at the higher end of dosing	Increased cardiac output; vasoconstriction at higher doses	**Moderate to severe septic shock** (low cardiac output shock)	**0.05-5 µg/kg/min** (doses greater than 1 µg/kg/min indicate extremely severe dysfunction)
Norepinephrine	Predominance of α, even at lower doses $\beta_{1\&2}$ at increasing doses	Increased vasoconstriction and some increased cardiac output	**Moderate to severe "warm" septic shock** (high cardiac output with vasodilation)	**0.05-5 µg/kg/min** (doses greater than 1 µg/kg/min indicate extremely severe dysfunction)
Dobutamine	$\beta_{1\&2}$ at increasing doses	Increased cardiac output	**Septic shock** (low cardiac output shock) ***or* myocarditis/cardiomyopathy** (often with dopamine)	**2.5-20 µg/kg/min**
Milrinone	Increases cAMP via inhibition of phosphodiesterase, modulating intracellular Ca^{++}	Increased diastolic relaxation, increased cardiac output and vasodilation	**Myocarditis/cardiomyopathy** (often with dopamine)	**2.5-1.0 µg/kg/min**

Inotropi, infusioni continue:

↓ CO / ↓ RVS	→	Dopa, eventuale Adrenalina
↓ CO / ↑ RVS	→	Dobu, Adrenalina basse dosi, Inibitori fosfodiesterasi
↓ RVS	→	Nora
↓ contrattilità e normali RVS	→	Dubo o dose media Dopa

Crit Care Med 2009

Altre terapie:

Secondo eziologia shock

Traumi: **- procedure invasive**

Allergia: **- antistamici (H1 e H2 antagonisti)**

- β_2 agonisti / steoridi (prednisone)

Neonato: **- prostaglandine (dotto-dipendenza?)**

Perdita bicarbonati: **- supplementazione HCO_3**

ECMO

Goal terapia:

- **FC**
- **MAP**
- **TR**
- **Polsi**
- **Stato mentale**
- **Diuresi**



Joseph A. Carcillo

Pediatrics 2009;124;500-508

Close adherence to these guidelines will result in resolution of shock in about 90% of cases.

Pediatr Emer Care 2010;26: 867–869

Cosa dice la letteratura…





Mortality and Functional Morbidity After Use of PALS/APLS by Community Physicians

Joseph A. Carcillo, Bradley A. Kuch, Yong Y. Han, Susan Day, Bruce M. Greenwald, Karen A. McCloskey, Anthony L. Pearson-Shaver and Richard A. Orr

Pediatrics 2009

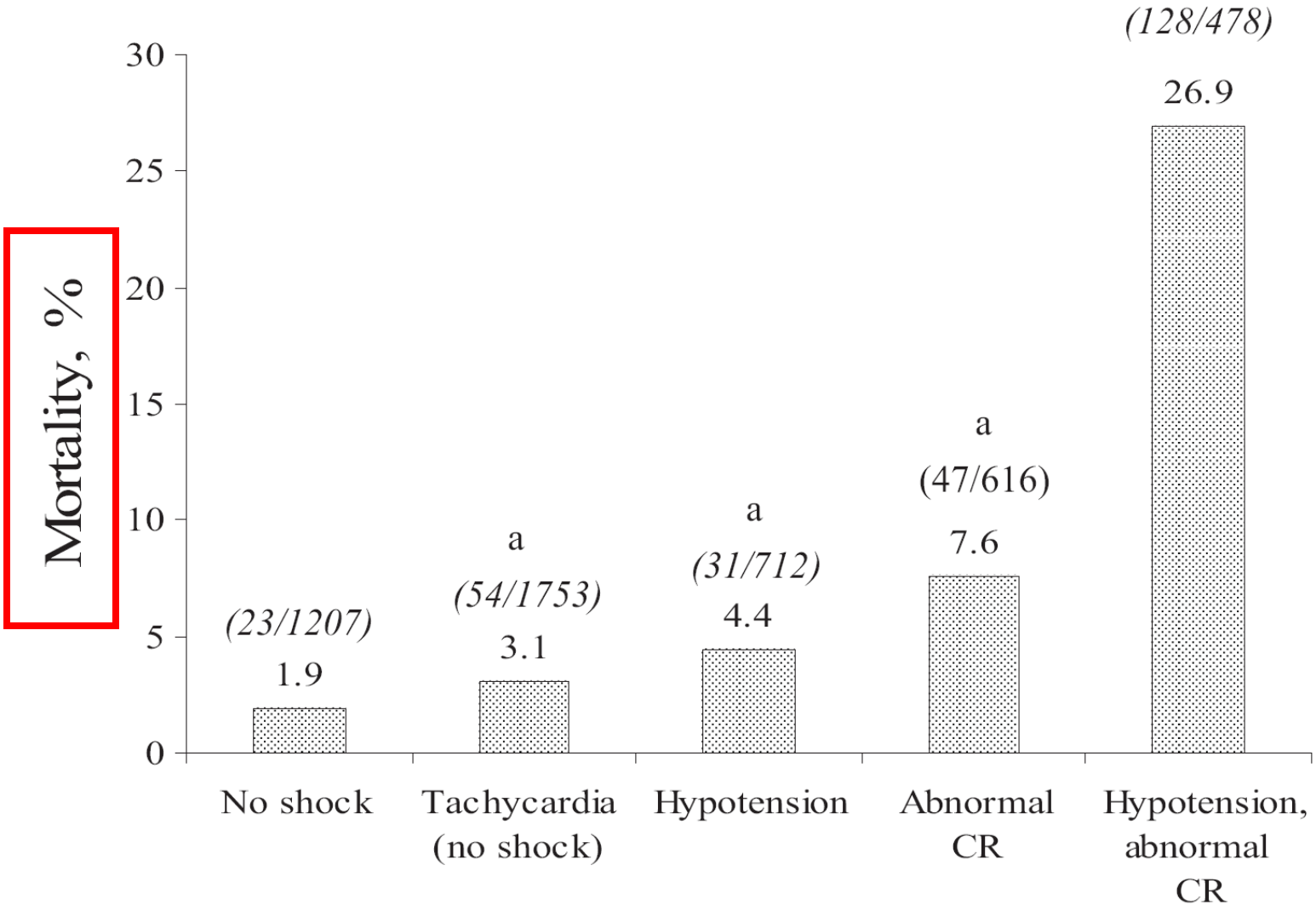
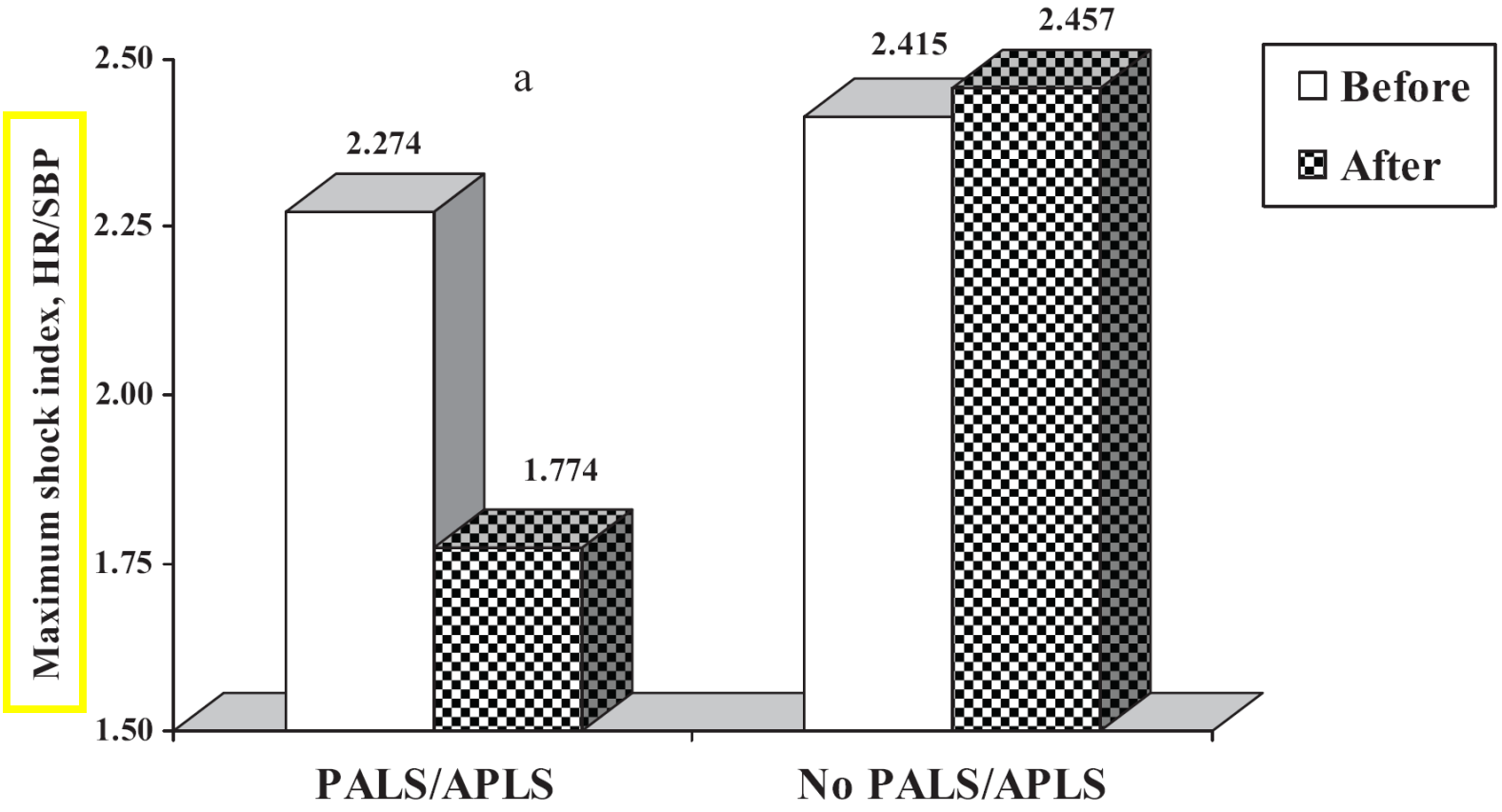


FIGURE 1

Mortality rates increase according to the degree of hemodynamic abnormality at presentation to the community hospital. CR indicates capillary refill time. [a] $P < .05$ versus no shock.



Inoltre: l'utilizzo dei protocolli PALS/APLS nei pazienti in shock è associato a riduzione della mortalità e della morbilità

Conclusioni:

- **3 parametri clinici facilmente disponibili (FC, Pressione arteriosa, Tempo Refill) permettono di inquadrare in PS i pz con ↑ rischio mortalità per shock**

- **importanza attinenza linee guida PALS/APLS per ridurre morbilità – mortalità da shock**

Clinical Spectrum of Shock in the Pediatric Emergency Department

Jay D. Fisher, MD, David G. Nelson, MD,* Heidi Beyersdorf, MD,* and Lawrence J. Satkowiak, MD†*

Periodo studio: 8 anni. Accessi PS : 30.000/ anno

1 / 1600 accessi in Pronto Soccorso : segni di shock

TABLE 2. Shock Classification

Shock Physiology	n (%), n = 147	Delayed,* n = 21
Septic	84 (57)	11
Hypovolemic	35 (24)	5
Distributive	21 (14)	4
Cardiogenic	7 (5)	1

Pediatr Emer Care 2010

- **Intubazione: 41%**
- **Somministrazione vasopressori: 21%**

TABLE 4. Predominant Cardiovascular Sign

Age	Poor Perfusion/Pulses, n (%)	Hypotension, n (%)
0–90 d (n = 46)	40 (87)	6 (13)
3–36 mo (n = 47)	41 (87)	6 (13)
3–12 yr (n = 31)	15 (48)	16 (52)
>12 yr (n = 23)	7 (30)	16 (70)

Anaphylaxis Management in the Pediatric Emergency Department

Opportunities for Improvement

Scott Russell, MD, Kathy Monroe, MD,† and Joseph D. Losek, MD**

Pediatric Emergency Care • Volume 26, Number 2, February 2010

Second symposium on the definition and management of anaphylaxis: Summary report—Second National Institute of Allergy and Infectious Disease/Food Allergy and Anaphylaxis Network symposium

Hugh A. Sampson, MD,[a] Anne Muñoz-Furlong, BA,[b] Ronna L. Campbell, MD, PhD,[c]

"L'anafilassi è
una reazione allergica grave
con insorgenza rapida
che può portare a morte
dopo contatto con un allergene"

J ALLERGY CLIN IMMUNOL
FEBRUARY 2006

Anaphylaxis is highly likely when any one of the following 3 criteria are fulfilled:

Acute onset of an illness (minutes to several hours) with involvement of the skin, mucosal tissue,

AND AT LEAST ONE OF THE FOLLOWING

a. Respiratory compromise
b. Reduced BP or associated symptoms of end-organ dysfunction

Two or more of the following that occur rapidly after exposure *to a likely allergen*

a. Involvement of the skin-mucosal tissue
b. Respiratory compromise
c. Reduced BP or associated symptoms
d. Persistent gastrointestinal symptoms

Reduced BP after exposure to *known allergen for that patient* (minutes to several hours):

a. Infants and children: low systolic BP (age specific) or greater than 30% decrease in systolic BP*

J ALLERGY CLIN IMMUNOL
FEBRUARY 2006

When a patient fulfills any of the 3 criteria of anaphylaxis the patient should receive epinephrine immediately because epinephrine is the treatment of choice in anaphylaxis.

J ALLERGY CLIN IMMUNOL
FEBRUARY 2006

Accessi in PS: **55.000 / anno**

Accessi per anafilassi: **4,5 / 10.000**

Anamnesi positiva: **50%**

Ospedalizzati: **26%**

TABLE 3 Organ System Involvement

Organ System	
Dermatologic	**92%** **≥ 2 organi interessati**
Respiratory	
Gastrointestinal	
Cardiovascular	

TABLE 2. Organ Systems and Associated Symptoms and Signs

System	Symptoms and Signs
Respiratory	Mouth or lip tingling or itching, throat or chest tightness, hoarseness, stridor, wheezing, dyspnea, and respiratory failure
Cardiovascular	Arrhythmias, circulatory failure, hypotension, and cardiac arrest
Gastrointestinal	Nausea, abdominal pain (cramps), vomiting, and diarrhea
Dermatological	Diaphoresis, flushing, pruritus, urticaria, and angioedema

TABLE 4. Epinephrine Treatment

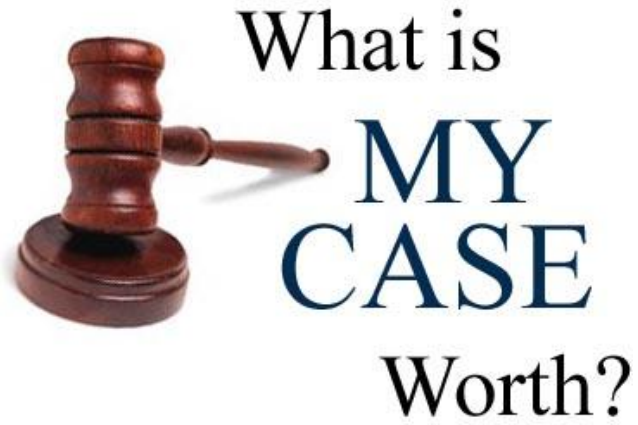
	Admit (n = 32)*, n (%)	ED Only (n = 91), n (%)
Before hospitalization and/or ED	23 (72)	46 (51)

TABLE 5. Emergency Department Interventions

Interventions	Admit (n = 32)*, n (%)	ED Only (n = 91), n (%)
Steriods	31 (97)	66 (73)
H_1 and/or H_2 antihistamine	31 (97)	83 (91)



Aspetti medico legali



In cartella:

Chiarezza e completezza !

- **Anamnesi (reaz. allergica, traumi, etc)**
- **Tempi registrati**
- **Parametri e loro modifiche**
- **Farmaci (principio attivo, dosi, vie di infusione)**
- **Numero serie accessi vascolari**
- **Identificativi emoderivati**



Casi clinici



Caso clinico # 1

T.A. **4 mesi**

Nata a termine, perinatalità regolare
Fratello con flogosi alte vie
Da 4 giorni inappetenza, rinite

Poi febbricola, distress: accesso in PS

E.O. all'ingresso

marezzata, FC 190/m, FR 85/m, PANI 85/40 (65)mmHg, TR 4"
oliguria
Iporeattiva, distress, rantoli/gemiti
SatO_2 80% FiO_2 4l/m in maschera

pH V: 7.16, pCO_2 70mmHg, BE -10 mmol/l, latt 6 mmol/l

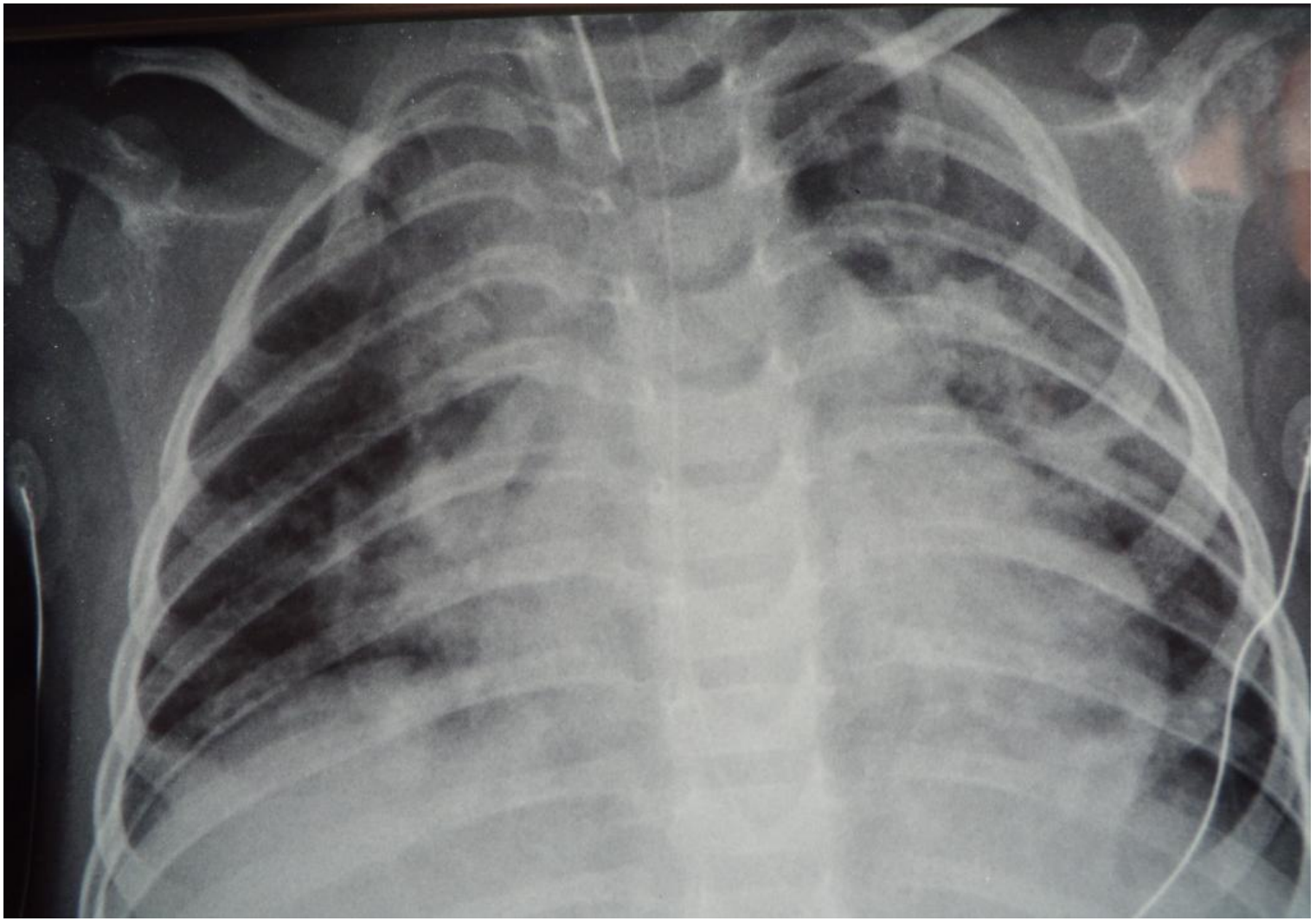
Approccio:

Intubato → RxT: chiazzette addensamento
cardiomegalia, ICT 0.8

Ecocardio: disf.ne grave contrattilità (FE 15%),
dilatazione Vsx
versamento pericardico

Aspetto di miocardio non compatto

ECG: sovraccarico atriale bilaterale



Interventi:

- O_2 100%
- 2 boli Sol fisiologica (20cc/Kg X 2)

Trasferimento in TIP

marezzata, FC 170/m, FR 60/m, PANI 60/30 (46)mmHg, TR 4", oliguria, estremità ipotermiche, polsi iposfigmici, ritmo di galoppo, epatomegalia sedata, $SatO_2$ 90% con FiO_2 40%

pH V: 7.25, pCO_2 57mmHg, BE -8 mmol/l, latt 5.6 mmol/l

Posizionamento CVC GI destra (PVC 12cmHO_2, $SatO_2$ Vm 55%)

Inizio dobutamina 5 mcg/Kg/m → 8 mcg/kg/m

Eco addome: vena cava inferiore distesa, modica ascite

Persistenza oliguria: **bolo furosemide**
↓ idratazione ev 60 ml/Kg/die

Dopo 12 ore

↓ marezzatura, FC 150/m, PANI 90/50 (63)mmHg, TR 2-3”
PCV 9cmH2O
Ripresa diuresi
Auscultazione: bronchiolite, $SatO_2$ 92-95% con FiO_2 25%

Ecocardio: FE >25-30%

pH V: 7.34, pCO_2 48mmHg, BE -4 mmol/l, latt 3.5 mmol/l, $SatO_2$ Vm 72%

Revisione caso:

- **Bronchiolite in paziente affetta da miocardio non compatto**
- **Scompenso cardiocircolatorio precipitato da infezione respiratoria**
- **Iniziale peggioramento dopo boli di fluidi per sovraccarico volemico**
- **Successivo miglioramento dopo diuretico, restrizione idrica e supporto inotropo**

Punti chiave:

- **Diagnosi differenziale**

- **Esami strumentali**

- **Dopo boli fluidi, se segni sovraccarico:**

  - diuretico
  - inotropi
  - restrizione idrica

Caso clinico # 2

S.M. **40 giorni. Terzogenita. Nata a termine. PN 3800 gr.**
Perinatalità regolare. Allattamento al seno esclusivo.

Comparsa scariche diarroiche, dopo 2 giorni : vomiti, dispnea → PS H altra Sede

- **peso 2550 g (- 1250 gr)**
- **TR 4-5”, FC 125/m, PANI 70/42 mmHg**
- **Fontanella anteriore depressa, reattività e tono buoni**
- **sottocute distrofico**
- **cute pallida, pliche cutanee**
- **diuresi contratta**

→ Difficile accesso venoso. Posizionamento I.O. e idratazione



pH cap: 7.13, pCO2 18.8mmHg, BE -22mmol/l, lattato 3.3mmol/l

Idratazione i.o. - HCO_3 - Antibiotico

Hb 12.9g/dl, Ht 39.7%, creatinina 7mg/dl, Na 151mEq/l

Fuoriuscita intraossea, posizionato cvp e trasferimento nostra UO

TIP VR: 7 ore dopo accesso in PS

peso 2.800 gr
disidratata
FC 153/m, PANI 90/42 (57) mmHg, TR 3”
Respiro Kussmaul
FA depressa, reattività buona

Hb 8.6g/dl, Ht 26.9%, creatinina 2.7mg/dl, Na 156mEq/l,
albumina 25g/l, pH urine 6, euglicemica

pH cap: 7.24, pCO_2 16.8mmHg, pO_2 33mmHg, BE -18mmol/l, latt 1.8mmol/l

Respiro di Kussmaul

Interventi:

- **Bolo SF (20cc/Kg X 2)**
- **CVC GI dx (PVC 9 mmHg) controllo posizione ecoguidato**
- **eco addome-cuore (discreto riempimento)**
- **Pasti**
- **Idratazione ev 180ml/K/die**
- **HCO_3**
- **Antibiotico proseguito (PCR e GB nella norma)**

Accertamenti malattie metaboliche e acidosi tubulare

dopo 8 ore **pH ven: 7.28, pCO2 33mmHg, BE -10mmol/l, latt 1.8mmol/l, $SatO_2$ Vm 67%**

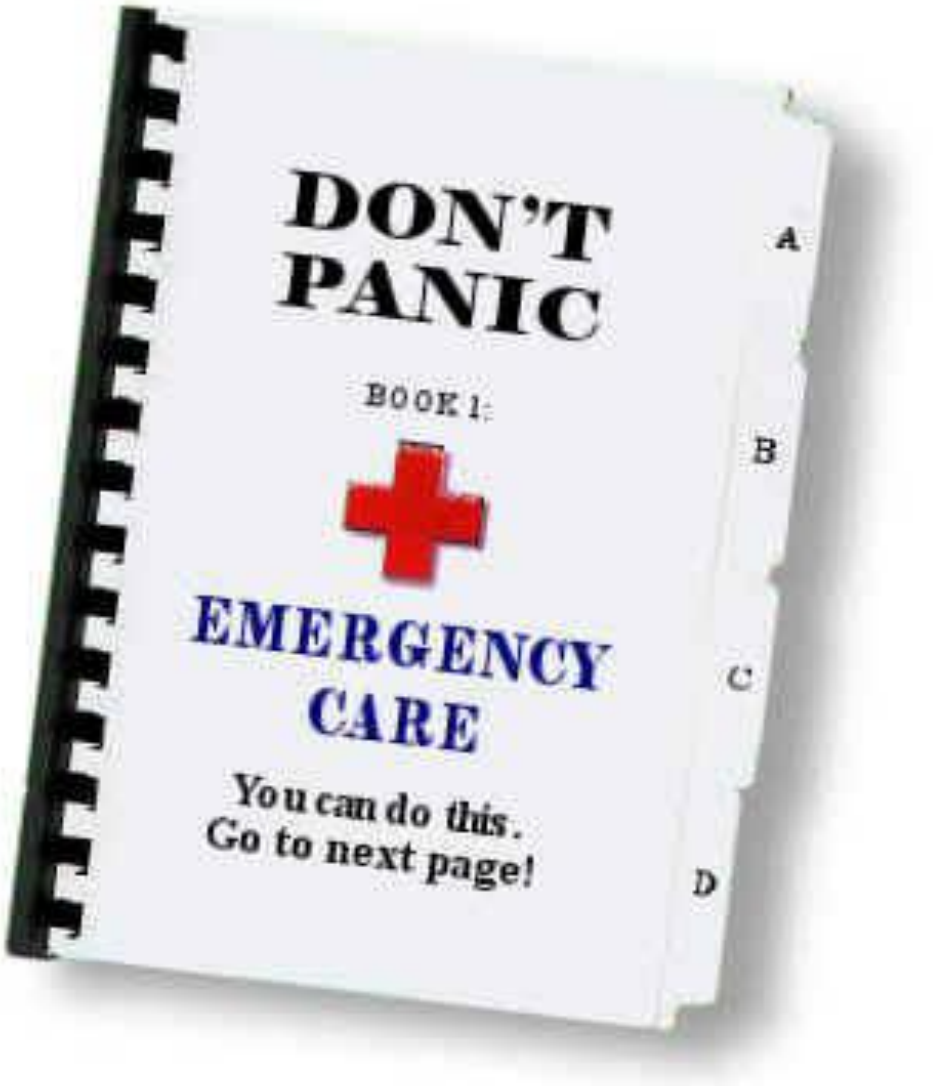
In 4 giorni **Peso 3430gr (+630gr / 4 giorni).**
creatinina 0.5mg/dl, Na 145mEq/l

pH cap: 7.38, pCO2 36.6mmHg, BE –3.3mmol/l, latt 2.1mmol/l

Revisione caso:

- **Acidosi metabolica e disionemia da shock ipovolemico con insufficienza renale acuta pre renale**
  Deficit nutrizionale
- **Regressione dopo adeguata idratazione e HCO_3**
- **Richiesto follow up pediatrico - nefrologico**

Conclusioni:



Approccio al bambino con shock:

- **Inquadramento diagnostico**
- **Accurata valutazione parametri vitali e monitoraggio continuo**
- **Accesso vascolare**
- **Terapia precoce e mirata**

Grazie per l'attenzione !

