Terapia Empírica, Terapia Anticipada y Tratamiento

Víctor Olivar López
SERVICIO DE URGENCIAS PEDIATRICAS
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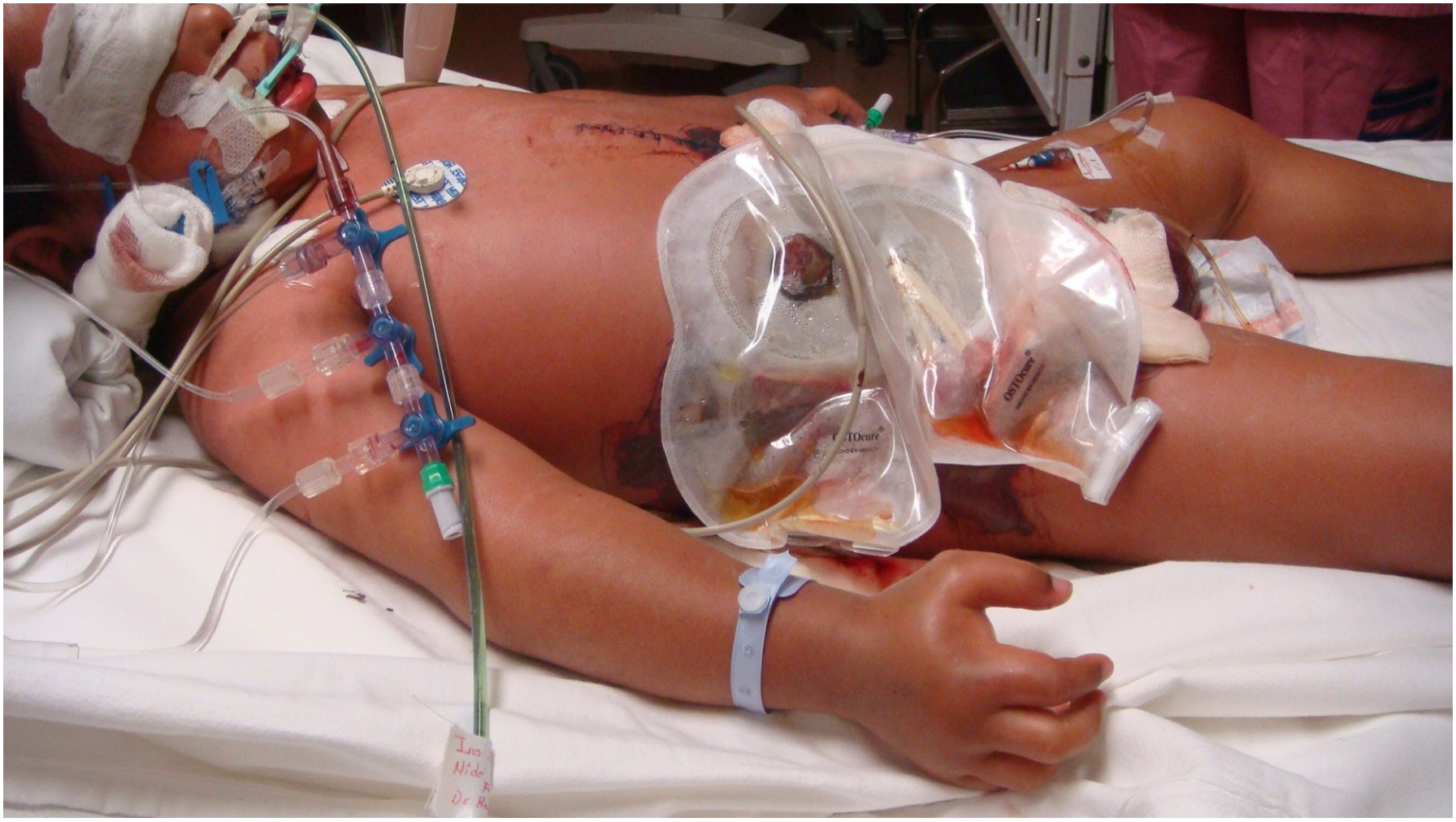
Estado de Choque



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Estado de Choque

DEFINICIONES

International pediatric sepsis consensus conference: Definitions for sepsis and organ dysfunction in pediatrics*

Brahm Goldstein, MD; Brett Giroir, MD; Adrienne Randolph, MD; and the Members of the International Consensus Conference on Pediatric Sepsis

SIRS[a]

The presence of at least two of the following four criteria, **one of which must be abnormal temperature or leukocyte count:**

- Core[b] temperature of >38.5°C or <36°C.
- Tachycardia, defined as a mean heart rate >2 SD above normal for age in the absence of external stimulus, chronic drugs, or painful stimuli; or otherwise unexplained persistent elevation over a 0.5- to 4-hr time period **OR for children <1 yr old: bradycardia, defined as a mean heart rate <10th percentile for age in the absence of external vagal stimulus, β-blocker drugs, or congenital heart disease; or otherwise unexplained persistent depression over a 0.5-hr time period.**
- Mean respiratory rate >2 SD above normal for age or mechanical ventilation for an acute process not related to underlying neuromuscular disease or the receipt of general anesthesia.
- Leukocyte count elevated or depressed for age (not secondary to chemotherapy-induced leukopenia) or >10% immature neutrophils.

Infection

A suspected or proven (by positive culture, tissue stain, or polymerase chain reaction test) infection caused by any pathogen OR a clinical syndrome associated with a high probability of infection. Evidence of infection includes positive findings on clinical exam, imaging, or laboratory tests (e.g., white blood cells in a normally sterile body fluid, perforated viscus, chest radiograph consistent with pneumonia, petechial or purpuric rash, or purpura fulminans)

Sepsis

SIRS in the presence of or as a result of suspected or proven infection.

Severe sepsis

Sepsis plus one of the following: cardiovascular organ dysfunction OR acute respiratory distress syndrome OR two or more other organ dysfunctions. Organ dysfunctions are defined in Table 4.

Septic shock

Sepsis and cardiovascular organ dysfunction as defined in Table 4.

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Estado de Choque

DEFINICIONES

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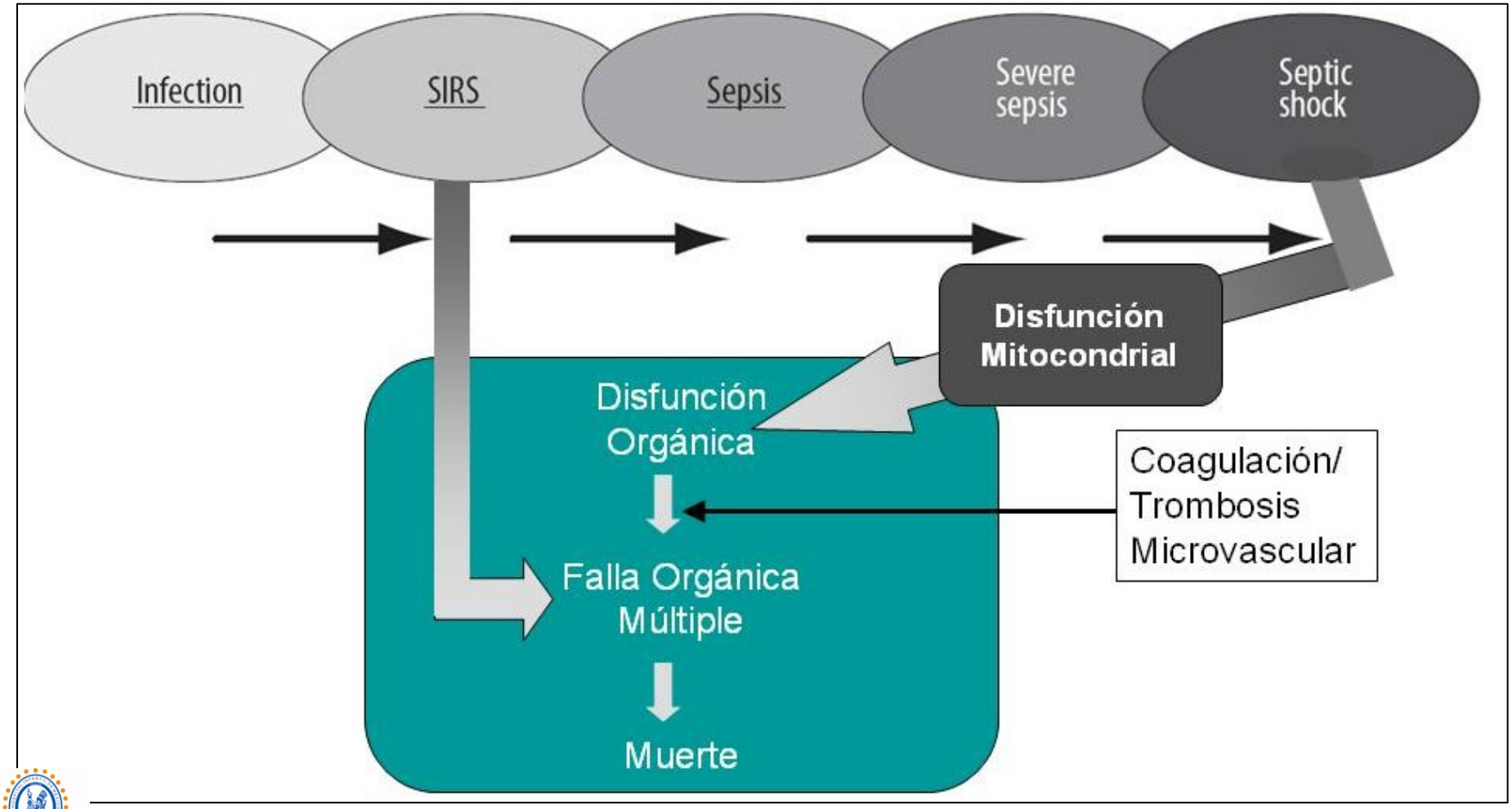

Estado de Choque

A PESAR…..

International pediatric sepsis consensus conference: Definitions for sepsis and organ dysfunction in pediatrics*

Brahm Goldstein, MD; Brett Giroir, MD; Adrienne Randolph, MD; and the Members of the International Consensus Conference on Pediatric Sepsis

Entendimiento de la fisiopatología

Mejoras en el tratamiento

La incidencia va en aumento

Altos índices de mortalidad

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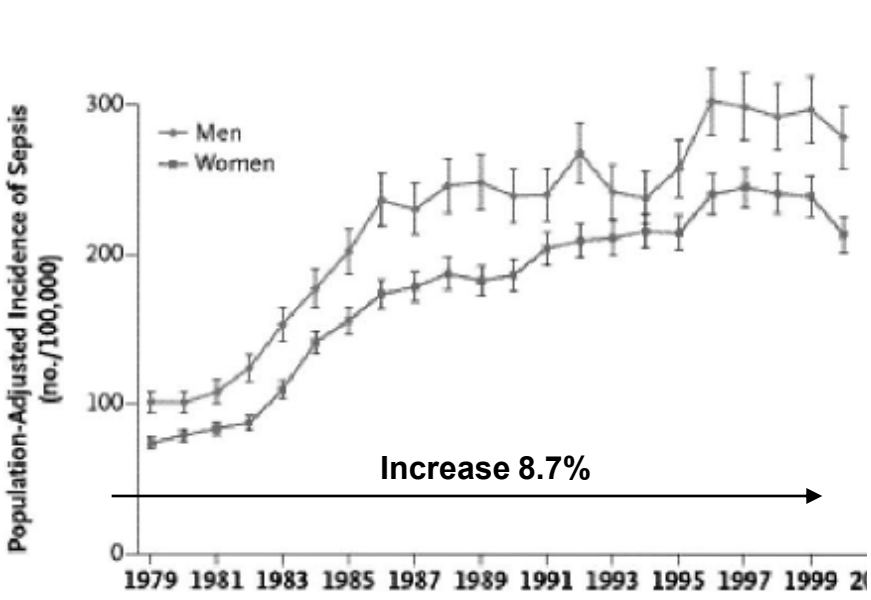
Estado de Choque

EPIDEMIOLOGIA



Sepsis Severa

US: Mortalidad: 28.6% (3 casos/1000 habitantes o 215,000 muertes)

Angus, Crit Care Med, 2001

Int'l: Incidencia: 21.1% (sepsis severa-choque séptico)

Mortalidad: 16.9% a 53.6% (pacientes en UCI)

Alberti, Intensive Care Med, 2002

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Estado de Choque

Scope and epidemiology of pediatric sepsis

R. Scott Watson, MD, MPH; Joseph A. Carcillo, MD

Pediatric Crit Care Med 2005;6:S3-S5

Primera causa de muerte en el mundo

EEUU

	Infants	No. of Deaths[a]		Children 1–14 yrs old	No. of Deaths[a]
1	Congenital anomalies	6,554	1	Accidents	5,824
2	Prematurity	3,933	2	Severe sepsis	1,570
3	Sudden infant death syndrome	3,397	3	Cancer	1,514
4	Severe sepsis	2,135	4	Congenital anomalies	1,144
5	Respiratory distress syndrome	1,454	5	Homicide	1,024
6	Complications of pregnancy	1,309	6	Diseases of the heart	545
7	Accidents	787	7	Human immunodeficiency virus	399

Sarampión

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Estado de Choque

DIEZ PRINCIPALES CAUSAS DE MORBIMORTALIDAD EN URGENCIAS OBSERVACION 2011		
1	Hemartrosis	190
2	Otras convulsiones y las no especificadas	147
3	Epistaxis	101
4	Diarrea sin otra especificación	81
5	Neumonía, no especificada	66
6	Traumatismo intracraneal, no especificado	65
7	Estado asmático	37
8	Septicemia, no especificada	30
9	Cuerpo extraño en el tubo digestivo, parte no especificada	29
10	Epilepsia y síndrome epilepsia	23

DIEZ PRINCIPALES CAUSAS DE MORBIMORTALIDAD EN URGENCIAS HOSPITALIZACION 2011 (6 MESES)		
1	Neumonía, no especificada	453
2	Agranulocitosis (Leucopenia)	155
3	Neutropenia	128
4	Septicemia, no especificada	80
5	Diarrea sin otra especificación	34
6	Leucemia linfoblástica aguda	31
7	Bronquiolitis aguda, no especificada	29
8	Diarrea y gastroenteritis de presunto origen infeccioso	22
9	Epistaxis	21
10	Hemorragia gastrointestinal, no especificada	20

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*Base de Datos, URG PED 2011

Estado de Choque

Alta Mortalidad

UTIP HIM*

- 2ª Causa de ingreso
- 1ª Causa de muerte

2007*

- 82 Casos de sepsis
- 16 Defunciones (19.5%)

*Base de Datos, UTIPHIM, 2006-2007

Estado de Choque

Epidemiología

Depende de la edad:

- Lactantes: Enf. Crónicas pulmón, cardiopatías
- 1-9 a: enf. neuromusculares
- Adolescentes: cáncer

Lactantes: bacteremia

Niños: neumonías

Recursos: $40,600 dlls (31 días)

$1.7 billones dlls (1995)-nacional-

$2.3 billones dlls (1999)

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Estado de Choque

Choque Séptico:

Mortalidad del 50%

Inwald DP: Arch Dis Child 2009;94:348

Reducción de la mortalidad mediante:

- Identificación temprana
- Manejo agresivo

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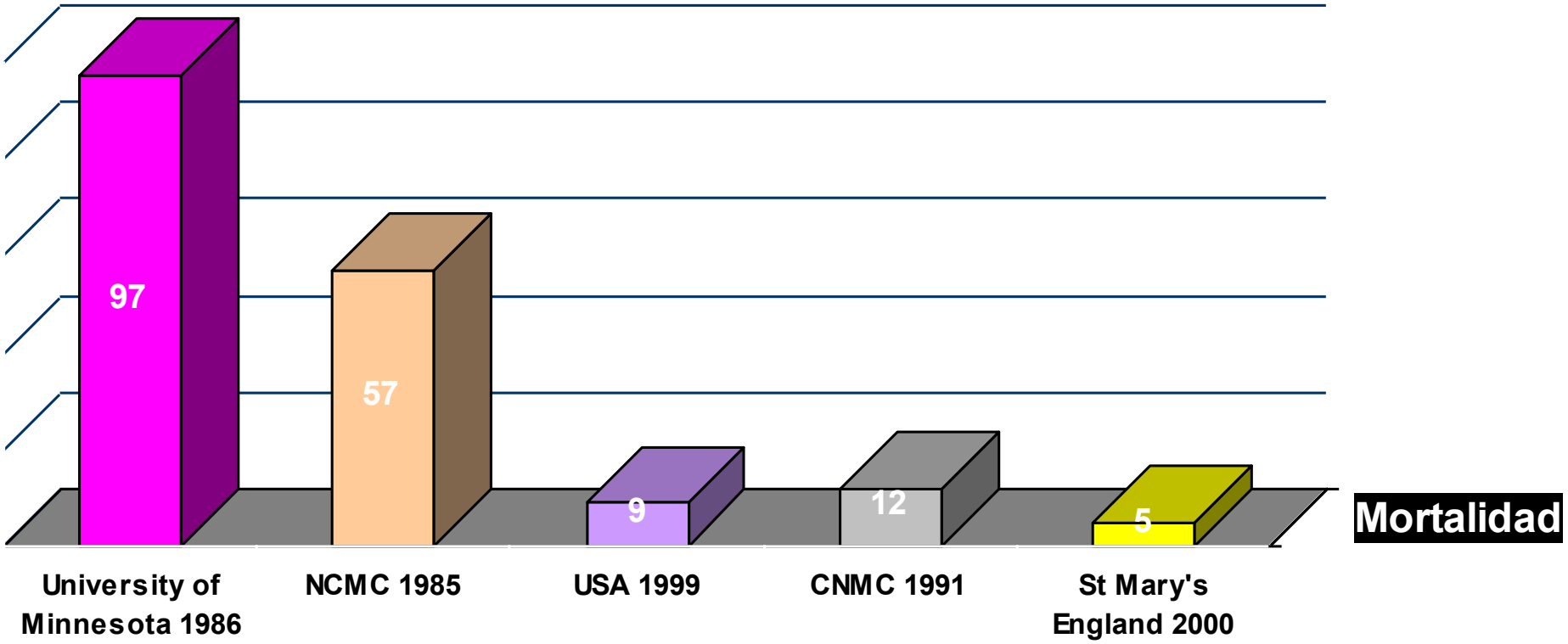
Estado de Choque

Decremento de la Mortalidad en Choque Séptico en Pediatría



Estado de Choque

Cardiovascular monitoring tools: use and misuse

Rinaldo Bellomo, MD,* and Shigehiko Uchino, MD†

Curr Opin Crit Care 9:225–229 © 2003

El efecto de las herramientas hemodinámicas en la fisiología depende de cómo las señales que proveen puedan ser utilizadas por el clínico para aplicación terapéutica

1 Algunas señales son malinterpretadas por el clínico

2 Para una señal, existen múltiples respuestas, que pueden conducir a diferente evolución clínica

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Estado de Choque

Cardiovascular monitoring tools: use and misuse
Rinaldo Bellomo, MD,* and Shigehiko Uchino, MD†
Curr Opin Crit Care 9:225–229 © 2003

-Los parámetros tradicionales (signos vitales, examen físico) correlaciona poco con:

- Gasto cardiaco bajo
- Hipovolemia
- Estado de choque
- Disfunción orgánica múltiple

-Sólo 56% de intensivistas puede describir estado hemodinámico antes de la cateterización

-Hasta el 25% de los pacientes presenta choque no detectado

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Estado de Choque

Clinical Spectrum of Shock in t
Emergency Departme

Jay D. Fisher, MD, David G. Nelson, MD,* Heidi Beyersdorf, MD,**

Age	n (%), n = 147
0–3 mo	46 (31)
3–36 mo	47 (32)
3–12 yr	31 (21)
>12 yr	23 (16)

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

TABLE 3. Shock Etiologies

	n
Septic (n = 84)	
Pathogen identified	38
RSV	7
E. coli	5
S. pneumoniae	4
Group A *Streptococcus*	4
Enterococcus	3
N. meningitidis	3
Staphylococcus aureus (toxic shock)	3
Group B *Streptococcus*	2
Pseudomonas aeruginosa	2
Enterobacter cloaca	1
Methicillin-resistant *S. aureus*	1
Acinetobacter	1
Clostridium difficile	1
Varicella	1
Hypovolemic (n = 35)	
Gastroenteritis	10
DKA/metabolic	9
Nontraumatic hemorrhage	10
Epistaxis	4
Aortoenteric fistula	2
Hemorrhagic disease of newborn	1
Upper GI bleed	2
Vaginal bleed	1
Surgical	5
Volvulus	2
Intussusception	1
Toxic megacolon	1
Appendicitis	1
Malignancy	1
Distributive (n = 21)	
Neurologic	9
Status epilepticus	4
Nonaccidental trauma	4
Encephalopathy	1
Toxin/Env	6
Collagen vascular	3
Anaphylactic	3
Cardiogenic (n = 7)	
Congenital heart disease	3
Myocarditis	3
Cardiomyopathy	1

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Hospital Infantil de México

Estado de Choque

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†*

Pediatr Emer Care 2010;26: 622–625

TABLE 5. Characteristics of Patients With Deterioration to Shock Later in ED Course (n = 21)

Age	Diagnosis	Shock Type	Precipitant	Survival	Triage Heart Rate, beats/min
2 mo	Pneumonia	Septic	No	Yes	162
2 yr	Meningococcemia	Septic	abx	Yes	188*
15 yr	Collagen vascular disease	Distributive	No	Yes	150*
2 mo	Thoracic neuroblastoma	Hypovolemic	LP	Yes	118
1 d	Upper GI bleed	Hypovolemic	No	Yes	160
2 mo	Hyperthermia/environmental	Distributive	No	Yes	100
8 mo	Intussusception	Hypovolemic	EJ line	Yes	186
2 mo	Pyelonephritis	Septic	abx	Yes	134
7 mo	Pneumonia	Septic	LP	Yes	102
8 mo	Pneumococcal meningitis	Septic	No	Yes	172
10 yr	Epistaxis	Hypovolemia	No	Yes	190*
13 yr	Pneumonia	Septic	No	Yes	112*
14 d	Hemorrhagic disease of newborn	Hypovolemic	No	Yes	150
16 yr	Terbutaline ingestion	Distributive	No	Yes	215*
11 yr	Pneumonia	Septic	abx	Yes	150*
12 yr	Acute encephalopathy	Distributive	No	Yes	200*
23 d	Pneumonia	Septic	LP	Yes	99
2 mo	RSV/sepsis	Septic	abx	Yes	119
23 d	*E. cloaca* UTI/meningitis	Septic	abx	Yes	168
2 yr	Myocarditis	Cardiogenic	No	No	120
1 mo	Meningitis	Septic	abx	Yes	158

*Patients with tachycardia at presentation as defined by Pediatric Advanced Life Support ranges for age.

UTI indicates urinary tract infection; abx, antibiotics; EJ line, external jugular line placement; LP, lumbar puncture.

Sepsis- Disfunción Orgánica -SDOM

Table 2. Characteristics of study cohort (n = 192,980)

Characteristic	Occurrence, %	Mortality, %
Site of infection		
Respiratory	44.0	32.9
Bacteremia, site unspecified	17.3	41.2
Genitourinary	9.1	16.1
Abdominal	8.6	19.5
Wound/soft tissue	6.6	20.6
Device-related	2.2	18.1
Central nervous system	0.8	29.5
Endocarditis	0.6	33.1
Other/unspecified	10.8	15.4
ICU admission	51.1	34.1
Medical condition	71.4	29.2
Surgical condition	28.6	26.2

Manejo del Estado de Choque

Special Article

Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock: 2008

R. Phillip Dellinger, MD; Mitchell M. Levy, MD; Jean M. Carlet, MD; Julian Bion, MD; Margaret M. Parker, MD; Roman Jaeschke, MD; Konrad Reinhart, MD; Derek C. Angus, MD, MPH; Christian Brun-Buisson, MD; Richard Beale, MD; Thierry Calandra, MD, PhD; Jean-Francois Dhainaut, MD; Herwig Gerlach, MD; Maurene Harvey, RN; John J. Marini, MD; John Marshall, MD; Marco Ranieri, MD; Graham Ramsay, MD; Jonathan Sevransky, MD; B. Taylor Thompson, MD; Sean Townsend, MD; Jeffrey S. Vender, MD; Janice L. Zimmerman, MD; Jean-Louis Vincent, MD, PhD; for the International Surviving Sepsis Campaign Guidelines Committee

III. Pediatric Considerations in Severe Sepsis

While sepsis in children is a major cause of mortality, the overall mortality from severe sepsis in children is much lower that that in adults, estimated at about 10% (298). The definitions for severe sepsis and septic shock in children are similar but not identical to the definitions in adults (299). In addition to

[illegible] couraging early intraosseous access (302). On the basis of a number of studies, it is accepted that aggressive fluid resuscitation with crystalloids or colloids is of fundamental importance to survival of septic shock in children (303–308). Three randomized controlled trials compared the use of colloid to crystalloid resuscitation in children with dengue shock (303, 307, 308). No difference in mortality between colloid or crystalloid

cardiac output and elevated systemic vascular resistance states (cool extremities, prolonged capillary refill, decreased urine output but normal blood pressure following fluid resuscitation) be given dobutamine (grade 2C).

The choice of vasoactive agent is determined by the clinical examination. For the child with a persistent low cardiac output state with high systemic vascular

Flujograma de manejo de soporte hemodinámico en lactantes y escolares

0 Min

Reconocer estado mental y perfusión disminuidos:
Iniciar O_2 a flujo alto. Establecer acceso IV / IO

5 Min

Reanimación inicial: iniciar carga de salina o coloide isotónico 20 ml/kg, hasta 60 ml/kg o más, hasta que mejore la perfusión o se desarrollen crépitos o hepatomegalia.
Corregir hipoglicemia e hipocalcemia. Iniciar antibióticos.

→ Con la 2a carga IV iniciar inotrópico

¿No revierte el choque?

15 Min

Choque refractario a volumen: Iniciar inotrópico IV/IO. Usar atropina/ketamina IV/IO/IM para conseguir acceso central y vía aérea si es necesario.
Revertir choque frío titulando dopamina central o, si es resistente, titular epinefrina central.
Revertir choque caliente titulando norepinefrina central.

→ Rango de dosis: Dopamina hasta 10 mcg/kg/min, epinefrina 0.05 a 0.3 mcg/kg/min

¿No revierte el choque?

60 Min

Choque resistente a catecolamina: iniciar hidrocortisona si existe riesgo de insuficiencia adrenal absoluta

¿No revierte el choque?

Monitorizar PVC en UTIP, obtener PAM-PVC normal y $S_{VC}O_2$ > 70%

Choque frío con presión arterial normal:
1as metas: titular epinefrina, $S_{VC}O_2$ > 70%, Hb > 10 g/dl
2as metas: agregar vasodilatador* (nitrovasodilatadores, milrinona, imrinona y otros) con carga de volumen, considerar levosimendan

Choque frío con hipotensión:
1as metas: titular epinefrina, $S_{VC}O_2$ > 70%, Hb > 10 g/dl
2as metas: agregar norepinefrina
Añadir dobutamina si la $S_{VC}O_2$ < 70%
Considerar milrinona, enoximona o levosimendan

Choque caliente con hipotensión:
1as metas: titular norepinefrina, $S_{VC}O_2$ > 70%
2as metas: considerar vasopresina, terlipresina o angiotensina
Agregar dobutamina o dosis baja de epinefrina si la $S_{VC}O_2$ < 70%

¿No revierte el choque?

Choque persistente resistente a catecolamina: descartar y corregir derrame pericárdico, pneumotórax y presión intraadbominal > 12 mm/Hg.
Utilizar catéter de arteria pulmonar, monitor PICCO, FATD y/o ultrasonido doppler para guiar la terapia con fluido, inotrópico, vasopresor, vasodilatador y hormonal.
Meta IC > 3.3 y < 6.0 l/min/m^2

¿No revierte el choque?

Choque refractario: ECMO (110 ml/kg/min) y/o TRRC (> 35 ml/kg/h)

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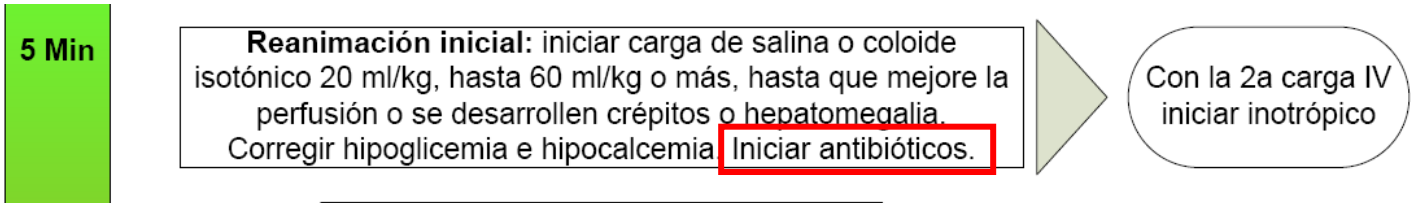
Manejo del Estado de Choque



ANTIBIOTICOS (grado 1D)

Inicio temprano (dentro de 1ª hora)

Toma de cultivos

Amplio espectro ⟶ reducción o ajustes con cultivos

Manejo del Estado de Choque

Surviving Sepsis Campaign

Search this site... SEARCH

ABOUT SSC | GUIDELINES | BUNDLES | DATA COLLECTION | RESOURCES | IMPROVEMENT | CONTACT

GUIDELINES

BUNDLES

Join The Campaign

Next Webcast - The New SSC Bundles: From Time Zero to Tomorrow
R. Phillip Dellinger, MD, MCCM, and Mitchell M. Levy, MD, FCCM, will focus on the revised SSC bundles and the rationale for the changes.

SSC Releases Statement on Time Zero
After review of evidence, discussion of practice patterns, and emphasis of the need for early recognition of sepsis, the SSC leadership re-confirmed the use of triage time as "time zero" in the emergency department.

Sepsis Measures Ratified by NQF
The NQF ratified the measures for the treatment and management of patients with severe sepsis and septic shock.

SSC Listserv
The Campaign's listserv provides an active forum for professionals to share experiences and ask questions. Join SSC Listserv

Patients and Families
The Campaign is unable to respond to individual questions from patients and families. Clinicians may wish to offer information from SCCM's Patients and Families website.

www.survivingsepsis.org

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Manejo del Estado de Choque

Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock: 2012

R. Phillip Dellinger, MD[1]; Mitchell M. Levy, MD[2]; Andrew Rhodes, MB BS[3]; Djillali Annane, MD[4]; Herwig Gerlach, MD, PhD[5]; Steven M. Opal, MD[6]; Jonathan E. Sevransky, MD[7]; Charles L. Sprung, MD[8]; Ivor S. Douglas, MD[9]; Roman Jaeschke, MD[10]; Tiffany M. Osborn, MD, MPH[11]; Mark E. Nunnally, MD[12]; Sean R. Townsend, MD[13]; Konrad Reinhart, MD[14]; Ruth M. Kleinpell, PhD, RN-CS[15]; Derek C. Angus, MD, MPH[16]; Clifford S. Deutschman, MD, MS[17]; Flavia R. Machado, MD, PhD[18]; Gordon D. Rubenfeld, MD[19]; Steven A. Webb, MB BS, PhD[20]; Richard J. Beale, MB BS[21]; Jean-Louis Vincent, MD, PhD[22]; Rui Moreno, MD, PhD[23]; and the Surviving Sepsis Campaign Guidelines Committee including the Pediatric Subgroup*

www.ccmjournal.org feb 2013;14(2)

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ADULTOS

Recommendations: Initial Resuscitation and Infection Issues*

A. Initial Resuscitation

1. Protocolized, quantitative resuscitation of patients with sepsis-induced tissue hypoperfusion (defined in this document as hypotension persisting after initial fluid challenge or blood lactate concentration ≥ 4 mmol/L). Goals during the first 6 hrs of resuscitation:
 a) Central venous pressure 8–12 mm Hg
 b) Mean arterial pressure (MAP) ≥ 65 mm Hg
 c) Urine output ≥ 0.5 mL/kg/hr
 d) Central venous (superior vena cava) or mixed venous oxygen saturation 70% or 65%, respectively (grade 1C).

2. In patients with elevated lactate levels targeting resuscitation to normalize lactate (grade 2C).

B. Screening for Sepsis and Performance Improvement

1. Routine screening of potentially infected seriously ill patients for severe sepsis to allow earlier implementation of therapy (grade 1C).

2. Hospital–based performance improvement efforts in severe sepsis (UG).

C. Diagnosis

1. Cultures as clinically appropriate before antimicrobial therapy if no significant delay (> 45 mins) in the start of antimicrobial(s) (grade 1C). At least 2 sets of blood cultures (both aerobic and anaerobic bottles) be obtained before antimicrobial therapy with at least 1 drawn percutaneously and 1 drawn through each vascular access device, unless the device was recently (<48 hrs) inserted (grade 1C).

2. Use of the 1,3 beta-D-glucan assay (grade 2B), mannan and anti-mannan antibody assays (2C), if available, and invasive candidiasis is in differential diagnosis of cause of infection.

3. Imaging studies performed promptly to confirm a potential source of infection (UG).

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ADULTOS

D. Antimicrobial Therapy

1. Administration of effective intravenous antimicrobials within the first hour of recognition of septic shock (grade 1B) and severe sepsis without septic shock (grade 1C) as the goal of therapy.

2a. Initial empiric anti-infective therapy of one or more drugs that have activity against all likely pathogens (bacterial and/or fungal or viral) and that penetrate in adequate concentrations into tissues presumed to be the source of sepsis (grade 1B).

2b. Antimicrobial regimen should be reassessed daily for potential deescalation (grade 1B).

3. Use of low procalcitonin levels or similar biomarkers to assist the clinician in the discontinuation of empiric antibiotics in patients who initially appeared septic, but have no subsequent evidence of infection (grade 2C).

4a. Combination empirical therapy for neutropenic patients with severe sepsis (grade 2B) and for patients with difficult-to-treat, multidrug-resistant bacterial pathogens such as *Acinetobacter* and *Pseudomonas* spp. (grade 2B). For patients with severe infections associated with respiratory failure and septic shock, combination therapy with an extended spectrum beta-lactam and either an aminoglycoside or a fluoroquinolone is for *P. aeruginosa* bacteremia (grade 2B). A combination of beta-lactam and macrolide for patients with septic shock from bacteremic *Streptococcus pneumoniae* infections (grade 2B).

4b. Empiric combination therapy should not be administered for more than 3–5 days. De-escalation to the most appropriate single therapy should be performed as soon as the susceptibility profile is known (grade 2B).

5. Duration of therapy typically 7–10 days; longer courses may be appropriate in patients who have a slow clinical response, undrainable foci of infection, bacteremia with *S. aureus;* some fungal and viral infections or immunologic deficiencies, including neutropenia (grade 2C).

6. Antiviral therapy initiated as early as possible in patients with severe sepsis or septic shock of viral origin (grade 2C).

7. Antimicrobial agents should not be used in patients with severe inflammatory states determined to be of noninfectious cause (UG).

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NIÑOS

Recommendations: Special Considerations in Pediatrics*

A. Initial Resuscitation

1. For respiratory distress and hypoxemia start with face mask oxygen or if needed and available, high flow nasal cannula oxygen or nasopharyngeal CPAP (NP CPAP). For improved circulation, peripheral intravenous access or intraosseus access can be used for fluid resuscitation and inotrope infusion when a central line is not available. If mechanical ventilation is required then cardiovascular instability during intubation is less likely after appropriate cardiovascular resuscitation (grade 2C).

2. Initial therapeutic end points of resuscitation of septic shock: capillary refill of ≤2 secs, normal blood pressure for age, normal pulses with no differential between peripheral and central pulses, warm extremities, urine output >1 $mL \cdot kg^{-1} \cdot hr^{-1}$, and normal mental status. Scvo2 saturation ≥70% and cardiac index between 3.3 and 6.0 L/min/m2 should be targeted thereafter (grade 2C).

3. Follow American College of Critical Care Medicine-Pediatric Life Support (ACCM-PALS) guidelines for the management of septic shock (grade 1C).

4. Evaluate for and reverse pneumothorax, pericardial tamponade, or endocrine emergencies in patients with refractory shock (grade 1C).

B. Antibiotics and Source Control

1. Empiric antibiotics be administered within 1 hr of the identification of severe sepsis. Blood cultures should be obtained before administering antibiotics when possible but this should not delay administration of antibiotics. The empiric drug choice should be changed as epidemic and endemic ecologies dictate (eg H1N1, MRSA, chloroquine resistant malaria, penicillin-resistant pneumococci, recent ICU stay, neutropenia) (grade 1D).

2. Clindamycin and anti-toxin therapies for toxic shock syndromes with refractory hypotension (grade 2D).

3. Early and aggressive source control (grade 1D).

4. *Clostridium difficile* colitis should be treated with enteral antibiotics if tolerated. Oral vancomycin is preferred for severe disease (grade 1A).

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Hospital Infantil de México

Manejo del Estado de Choque

C. Fluid Resuscitation

1. In the industrialized world with access to inotropes and mechanical ventilation, initial resuscitation of hypovolemic shock begins with infusion of isotonic crystalloids or albumin with boluses of up to 20 mL/kg crystalloids (or albumin equivalent) over 5–10 minutes, titrated to reversing hypotension, increasing urine output, and attaining normal capillary refill, peripheral pulses, and level of consciousness without inducing hepatomegaly or rales. If hepatomegaly or rales exist then inotropic support should be implemented, not fluid resuscitation. In non-hypotensive children with severe hemolytic anemia (severe malaria or sickle cell crises) blood transfusion is considered superior to crystalloid or albumin bolusing (grade 2C).

D. Inotropes/Vasopressors/Vasodilators

1. Begin peripheral inotropic support until central venous access can be attained in children who are not responsive to fluid resuscitation (grade 2C).

2. Patients with low cardiac output and elevated systemic vascular resistance states with normal blood pressure be given vasodilator therapies in addition to inotropes (grade 2C).

E. Extracorporeal Membrane Oxygenation (ECMO)

1. Consider ECMO for refractory pediatric septic shock and respiratory failure (grade 2C).

F. Corticosteroids

1. Timely hydrocortisone therapy in children with fluid refractory, catecholamine resistant shock and suspected or proven absolute (classic) adrenal insufficiency (grade 1A).

G. Protein C and Activated Protein Concentrate

No recommendation as no longer available.

H. Blood Products and Plasma Therapies

1. Similar hemoglobin targets in children as in adults. During resuscitation of low superior vena cava oxygen saturation shock (< 70%), hemoglobin levels of 10 g/dL are targeted. After stabilization and recovery from shock and hypoxemia then a lower target > 7.0 g/dL can be considered reasonable (grade 1B).

2. Similar platelet transfusion targets in children as in adults (grade 2C).

3. Use plasma therapies in children to correct sepsis-induced thrombotic purpura disorders, including progressive disseminated intravascular coagulation, secondary thrombotic microangiopathy, and thrombotic thrombocytopenic purpura (grade 2C).

I. Mechanical Ventilation

1 Lung-protective strategies during mechanical ventilation (grade 2C)

J. Sedation/Analgesia/Drug Toxicities

1. We recommend use of sedation with a sedation goal in critically ill mechanically ventilated patients with sepsis (grade 1D).

2. Monitor drug toxicity labs because drug metabolism is reduced during severe sepsis, putting children at greater risk of adverse drug-related events (grade 1C).

K. Glycemic Control

1. Control hyperglycemia using a similar target as in adults ≤ 180 mg/dL. Glucose infusion should accompany insulin therapy in newborns and children because some hyperglycemic children make no insulin whereas others are insulin resistant (grade 2C).

L. Diuretics and Renal Replacement Therapy

1. Use diuretics to reverse fluid overload when shock has resolved, and if unsuccessful then continuous venovenous hemofiltration (CVVH) or intermittent dialysis to prevent > 10% total body weight fluid overload (grade 2C).

M. Deep Vein Thrombosis Prophylaxis

No recommendation on the use of DVT prophylaxis in prepubertal children with severe sepsis.

N. Stress Ulcer Prophylaxis

No recommendation on the use of SU prophylaxis in prepubertal children with severe sepsis.

O. Nutrition

1. Enteral nutrition given to children who can be fed enterally, and parenteral feeding in those who cannot (grade 2C).

Flujograma de manejo de soporte hemodinámico en lactantes y escolares

0 Min

Reconocer estado mental y perfusión disminuidos:
Iniciar O_2 a flujo alto. Establecer acceso IV / IO

5 Min

Reanimación inicial: iniciar carga de salina o coloide isotónico 20 ml/kg, hasta 60 ml/kg o más, hasta que mejore la perfusión o se desarrollen crépitos o hepatomegalia
Corregir hipoglicemia e hipocalcemia
Iniciar antibióticos.

→ Con la 2a carga IV iniciar inotrópico

¿No revierte el choque?

15 Min

Choque refractario a volumen: Iniciar inotrópico IV/IO. Usar atropina/ketamina IV/IO/IM para conseguir acceso central y vía aérea si es necesario.
Revertir choque frío titulando dopamina central o, si es resistente, titular epinefrina central.
Revertir choque caliente titulando norepinefrina central.

→ Rango de dosis: Dopamina hasta 10 mcg/kg/min, epinefrina 0.05 a 0.3 mcg/kg/min

¿No revierte el choque?

60 Min

Choque resistente a catecolamina: iniciar hidrocortisona si existe riesgo de insuficiencia adrenal absoluta

¿No revierte el choque?

Monitorizar PVC en UTIP, obtener PAM-PVC normal y $S_{VC}O_2$ > 70%

Choque frío con presión arterial normal:
1as metas: titular epinefrina, $S_{VC}O_2$ > 70%, Hb > 10 g/dl
2as metas: agregar vasodilatador* (nitrovasodilatadores, milrinona, imrinona y otros) con carga de volumen, considerar levosimendan

Choque frío con hipotensión:
1as metas: titular epinefrina, $S_{VC}O_2$ > 70%, Hb > 10 g/dl
2as metas: agregar norepinefrina
Añadir dobutamina si la $S_{VC}O_2$ < 70%
Considerar milrinona, enoximona o levosimendan

Choque caliente con hipotensión:
1as metas: titular norepinefrina, $S_{VC}O_2$ > 70%
2as metas: considerar vasopresina, terlipresina o angiotensina
Agregar dobutamina o dosis baja de epinefrina si la $S_{VC}O_2$ < 70%

¿No revierte el choque?

Choque persistente resistente a catecolamina: descartar y corregir derrame pericárdico, pneumotórax y presión intraadbominal > 12 mm/Hg.
Utilizar catéter de arteria pulmonar, monitor PICCO, FATD y/o ultrasonido doppler para guiar la terapia con fluido, inotrópico, vasopresor, vasodilatador y hormonal.
Meta IC > 3.3 y < 6.0 l/min/m^2

¿No revierte el choque?

Choque refractario: ECMO (110 ml/kg/min) y/o TRRC (> 35 ml/kg/h)

Urgencias Pediátricas
Hospital Infantil de México

Manejo del Estado de Choque

Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock*

Anand Kumar, MD; Daniel Roberts, MD; Kenneth E. Wood, DO; Bruce Light, MD; Joseph E. Parrillo, MD; Satendra Sharma, MD; Robert Suppes, BSc; Daniel Feinstein, MD; Sergio Zanotti, MD; Leo Taiberg, MD; David Gurka, MD; Aseem Kumar, PhD; Mary Cheang, MSc

Crit Care Med 2006 Vol. 34, No. 6

Table 2. Clinical site infections

	No.	% Total
Lung	1016	37.2
Intraabdominal	801	29.3
Bowel perforation/peritonitis	226	8.3
Postoperative bowel perforation/anastomotic dehiscence	65	2.4
Spontaneous bacterial peritonitis	50	1.8
Other peritonitis	18	0.7
Intraabdominal abscess	44	1.6
Cholecystitis	40	1.5
Ascending cholangitis	43	1.6
Ischemic bowel/bowel infarction	166	6.1
Clostridium difficile enterocolitis/toxic megacolon	47	1.7
Genitourinary	293	10.7
Skin and soft tissue	197	7.2
Necrotizing soft tissue infections	74	2.7
Cellulitis	46	1.7
Operative wound infection	22	0.8
Soft tissue abscess	20	0.7
Decubitus ulcer	16	0.6
Diabetic lower extremity ulcer/cellulitis	13	0.5
Surgical site infection	31	1.1
Central nervous system infection (meningitis/abscess)	20	0.7
Intravascular catheter infection	100	3.7
Primary bloodstream infection (bacteremia without identifiable source)	120	4.4
Systemically disseminated infection (including yeast and tuberculosis)	58	2.1
Septic arthritis	21	0.8
Mediastinitis	15	0.5
Other	59	2.1

2731 Casos

Manejo del Estado de Choque

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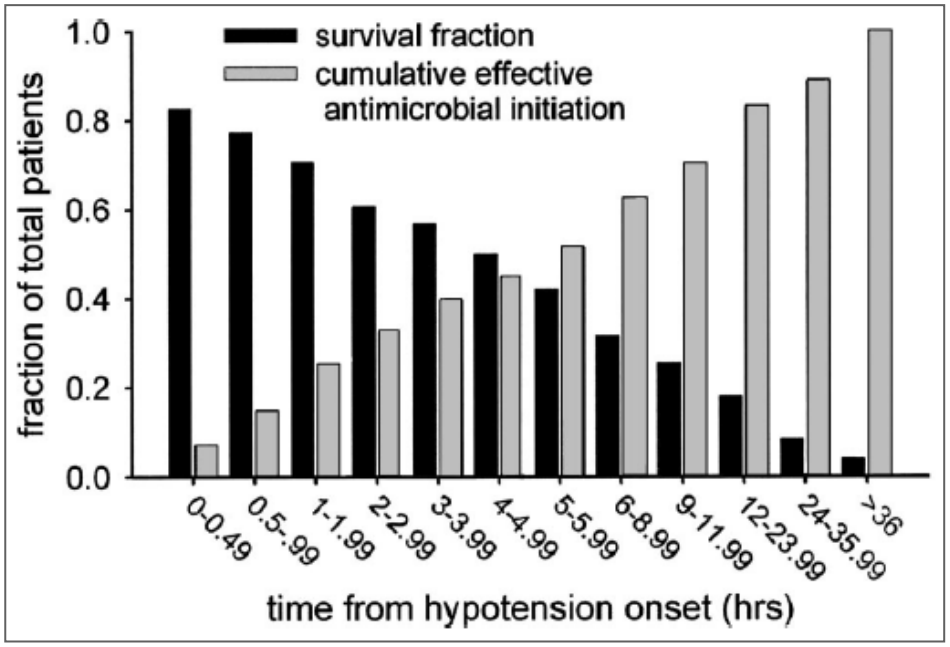
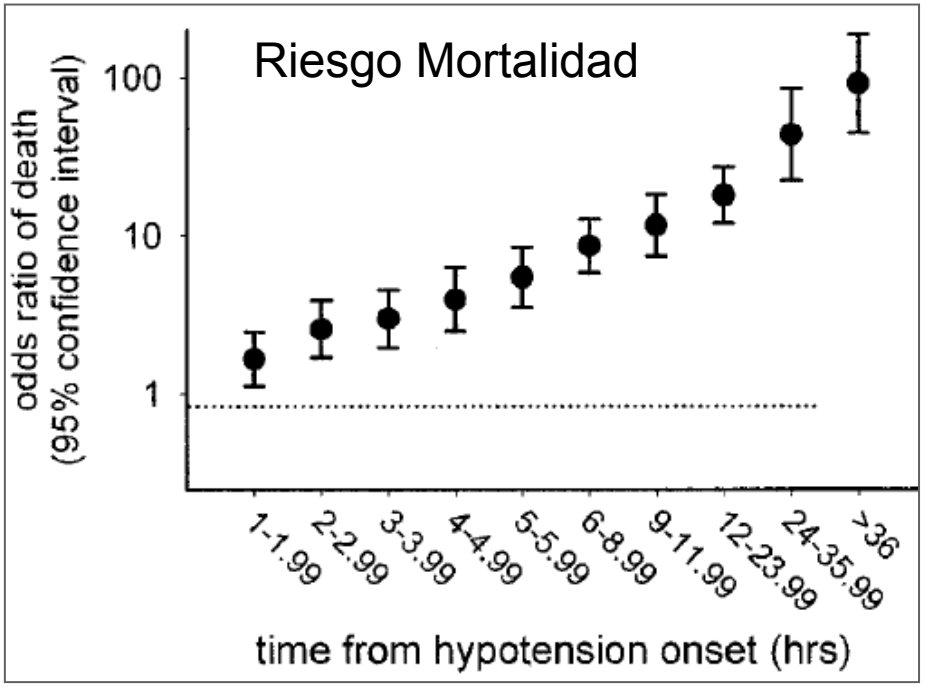
Crit Care Med 2006 Vol. 34, No. 6





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Crit Care Med 2006 Vol. 34, No. 6

Inicio temprano: 79.9% sobrevida

Por cada hora de retraso: 7.6% disminuye sobrevida

Predictor de sobrevida

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Manejo del Estado de Choque

Causas del Retraso en Inicio de Antibióticos

-Retraso en diagnóstico/identificación

-Retraso en indicación

-Retraso en la entrega de la farmacia

-Retraso en la administración

-Pobre comunicación

médicos-enfermeras-enfermeras, traslados

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Manejo del Estado de Choque

Suboptimal care in the initial management of children who died from severe bacterial infection: A population-based confidential inquiry

Elise Launay, MD; Christèle Gras-Le Guen, MD, PhD; Alain Martinot, MD, PhD; Rémi Assathiany, MD; Thomas Blanchais, MD; Nadjette Mourdi, MPH; Albertine Aouba, MD; Marie-Hélène Bouvier-Colle, PhD; Jean-Christophe Rozé, MD, PhD; Martin Chalumeau, MD, PhD

Pediatr Crit Care Med 2010 Vol. 11, No. 4

Table 1. Description of the age, the final diagnosis, bacterial documentation, and cause of death for each patient

Patient	Age (yrs)	Final Diagnosis	Bacteria Identified	Cause of Death
1	4.8	Purpura fulminans	*Neisseria meningitis* (serotype B)	Septic shock
2	0.3	Meningitis	*Streptococcus pneumoniae*	Septic shock
3	0.4	Meningitis	*Salmonella enterica*	Septic shock
4	2	Meningitis	*Streptococcus pneumoniae*	Intracranial hypertension
5	1.6	Purpura fulminans	No bacteria documented	Septic shock
6	2.4	Meningitis	*Streptococcus pneumoniae*	Intracranial hypertension
7	0.6	Purpura fulminans	*Neisseria meningitis* (serotype B)	Septic shock
8	0.4	Purpura fulminans	*Neisseria meningitis*	Septic shock
9	10.3	Meningitis	*Neisseria meningitis* (undefined serotype)	Septic shock
10	3.9	Pneumonia with empyema	*Mycoplasma pneumoniae*	Refractory hypoxemia and multiple organ failure
11	2.8	Pneumonia with empyema	*Streptococcus pyogenes*	Septic shock
12	2.8	Purpura fulminans	*Neisseria meningitis* (serotype C)	Septic shock
13	0.8	Purpura fulminans	*Neisseria meningitis* (undefined serotype)	Septic shock
14	2	Meningitis	*Neisseria meningitis* (undefined serotype)	Septic shock
15	4.9	Purpura fulminans	*Neisseria meningitis* (serotype C)	Septic shock
16	0.9	Purpura fulminans	*Neisseria meningitis* (serotype C)	Septic shock
17	2.4	Purpura fulminans	*Neisseria meningitis* (serotype B)	Septic shock
18	1.2	Purpura fulminans	*Neisseria meningitis* (serotype B)	Septic shock
19	4.7	Meningitis	No bacteria documented	Septic shock and intracranial hypertension
20	0.3	Purpura fulminans	*Neisseria meningitis* (serotype B)	Septic shock
21	1.1	Pyelonephritis and septic shock	*Escherichia coli*	Septic shock

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Table 2. Classification of errors in management causing suboptimal care of 21 children who died of a severe bacterial infection

Classification According to the Institute Of Medicine		Errors in Management Identified by Experts	Number of Patients (% of Total Errors, n = 35) [% of Deaths, n = 21]
Diagnostic errors	Underestimation of severity	Signs of preshock not taken into account	5 (14) [24]
		Lack of use of mobile medical teams despite signs of sepsis or purpura	4 (11) [19]
		Delay in decision to transfer to intensive care	1 (3) [5]
	Failure to act on results of test	Erroneous interpretation of CRP	1 (3) [5]
Treatment errors	Error in the dose or method of using a drug or treatment	Insufficient dose of fluid resuscitation	5 (14) [24]
		Error in dose of antibiotic treatment	1 (3) [5]
	Avoidable delay in treatment after diagnosis	Antibiotics not administered to patients with purpura	4 (11) [19]
		Delay in antibiotic administration	3 (9) [14]
		Delay in administration of fluid resuscitation	1 (3) [5]
		Absence of second fluid resuscitation	3 (9) [14]
		Failure to administer inotropic agent	2 (5) [10]
		Absence of intubation and mechanical ventilation	1 (3) [5]
	Error in the performance of a procedure	Failure in placement of a catheter	1 (3) [5]
Other (other system failure)		Excessive delay in arrival of physician (private practice or mobile medical teams)	2 (5) [10]
Other (failure of communication)		Error in coordination of medical teams	1 (3) [5]

CRP, ————.

Some cases involved several different errors in any of the three categories (diagnostic, treatment, or other).

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Manejo del Estado de Choque

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Resultados

Búsqueda de ayuda tardía	33%
Tratamiento antimicrobiano deficiente	38%
Reanimación hídrica insuficiente	24%
Subestimación de la gravedad	38%

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Manejo del Estado de Choque

Impacto del Manejo Antibiótico Adecuado

en la Evolución de los Pacientes con Sepsis

-El manejo antibiótico **empírico** inicial deberá incluir uno o mas medicamentos que contengan actividad en contra de los patógenos ms frecuentes enfocado al foco inicial de la sepsis.

-La elección del medicamento se guiará de acuerdo a los patrones de susceptibilidad del microorganismo

Crit Care Med 2004 Vol. 32, No. 11 (Suppl.)

Manejo del Estado de Choque

Tratamiento Antibiótico Empírico

-El empleo de la menos un antibiótico con actividad in vitro contra todos los microorganismos aislados en el paciente

-El uso de al menos un antibiótico con actividad in vitro en contra de la bacteria causal, reduciendo la mortalidad cuando es comparada con aquellos pacientes que no recibieron la terapia adecuada

Net: Sepsis en el paciente crítico, Ars XXI; 2006
Crit Care Med 2004;32, Suppl

Manejo del Estado de Choque

Tratamiento Antibiótico Empírico

-Reducción de 50% de choque séptico en pacientes que han recibido tratamiento (Ab's) inicial adecuado

-Factores: dosis, penetración en los tejidos, condición del paciente crítico

-En pacientes con choque séptico:

mayor cantidad de muertes en pacientes con gram negativos

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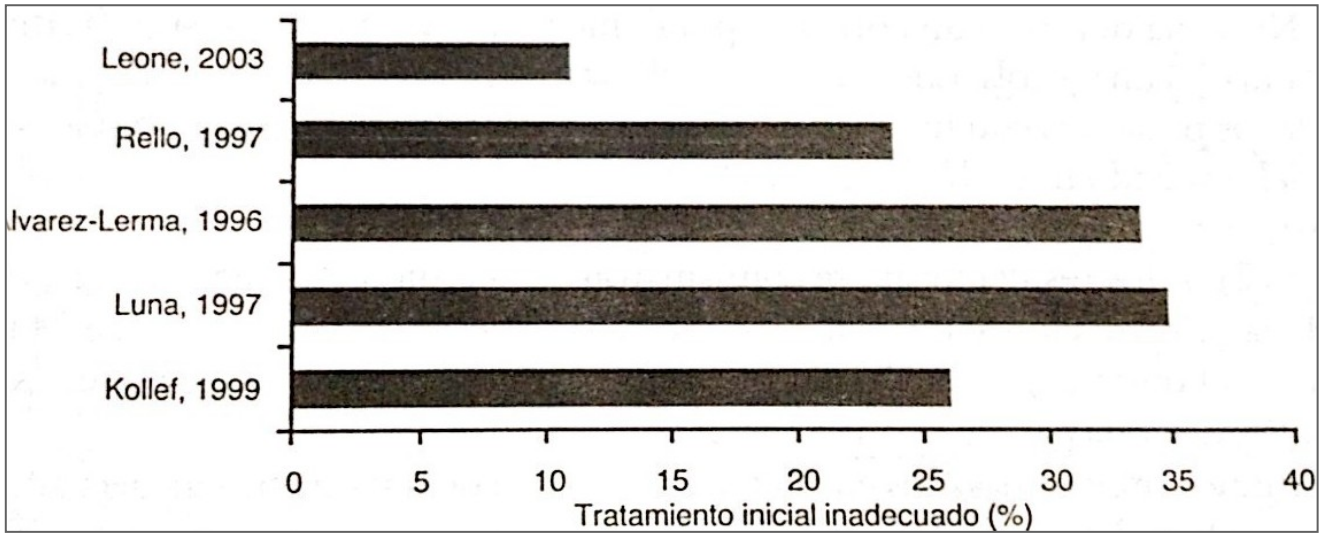
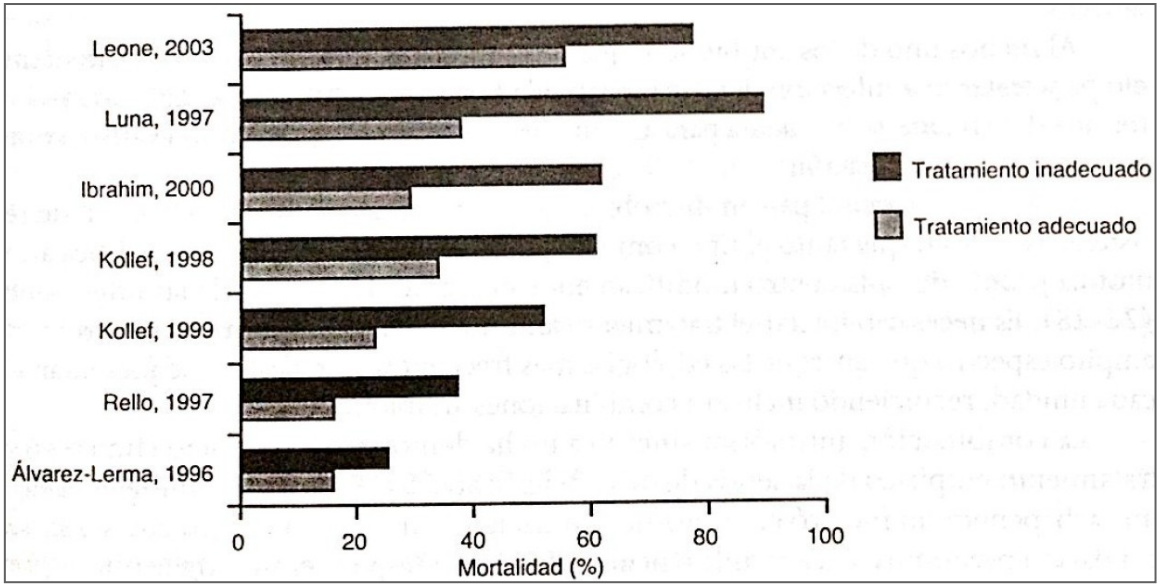
Net: Sepsis en el paciente crítico, Ars XXI; 2006
Crit Care Med 2004;32, Suppl

Tratamiento Antibiótico Empírico





Manejo del Estado de Choque

Tratamiento Antibiótico Empírico

-173 pacientes, gram (-):

rápidamente fatal, fatal y no fatal.

Terapia adecuada: reduce mortalidad 48 a 22%

-2124 pacientes: bacteremia gram (-). Mortalidad:

Terapia inadecuada 34%, terapia adecuada 18%

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Hospital Infantil de México

Crit Care Med 2004;32, Suppl

Manejo del Estado de Choque

Tratamiento Antibiótico Empírico en

Sepsis-Choque Séptico

-Sepsis

-Neumonía (comunidad y aduisición hospitalaria)

-Abdominal

-Tratamiento inicial inadecuado:

Retraso en prescripción

Resistencia (20%)

Net: Sepsis en el paciente crítico, Ars XXI; 2006

Manejo del Estado de Choque

Tratamiento Antibiótico Empírico en Sepsis-Choque Séptico; Actividad *in Vitro*

-Conocer patrón de resistencias (comunidad, hospital)

-Iniciar con Ab's de **amplio espectro**

-Monoterapia vs Combinación (Aminoglicósido ???)

-Resistencias y sobreinfecciones bacterianas

-CULTIVOS

Net: Sepsis en el paciente crítico, Ars XXI; 2006

Manejo del Estado de Choque

Tratamiento Antibiótico Empírico en Sepsis-Choque Séptico; Desescalamiento

-Terapia dirigida (24 a 72hrs): ajustar a cultivos
Reducir toxicidad farmacológica, inducción a resistencias y costes
-Duración del tratamiento:
72hrs, 7 días, 10 días ???
(valorar cada infección, guías clínica)
-Monoterapia vs terapia combinada ???
-No ensayos clínicos

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Net: Sepsis en el paciente crítico, Ars XXI; 2006
Crit Care Med 2004;32, Suppl

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Table 4. Criteria for CAP Severity of Illness in Children with Community-Acquired Pneumonia

Criteria
Major criteria
Invasive mechanical ventilation
Fluid refractory shock
Acute need for NIPPV
Hypoxemia requiring FiO_2 greater than inspired concentration or flow feasible in general care area
Minor criteria
Respiratory rate higher than WHO classification for age
Apnea
Increased work of breathing (eg, retractions, dyspnea, nasal flaring, grunting)
PaO2/FiO2 ratio <250
Multilobar infiltrates
PEWS score >6
Altered mental status
Hypotension
Presence of effusion
Comorbid conditions (eg, HgbSS, immunosuppression, immunodeficiency)
Unexplained metabolic acidosis

The Manag ed
Pneumonia r Than
3 Months lines by
the Pediatr and the
Infectious

John S. Bradley,[1,a] Carrie pher Harrison,[6]
Sheldon L. Kaplan,[7] Sharo Peter,[11]
Jana A. Stockwell,[12] and

DELINES

s 2011;53(7):e25–e76

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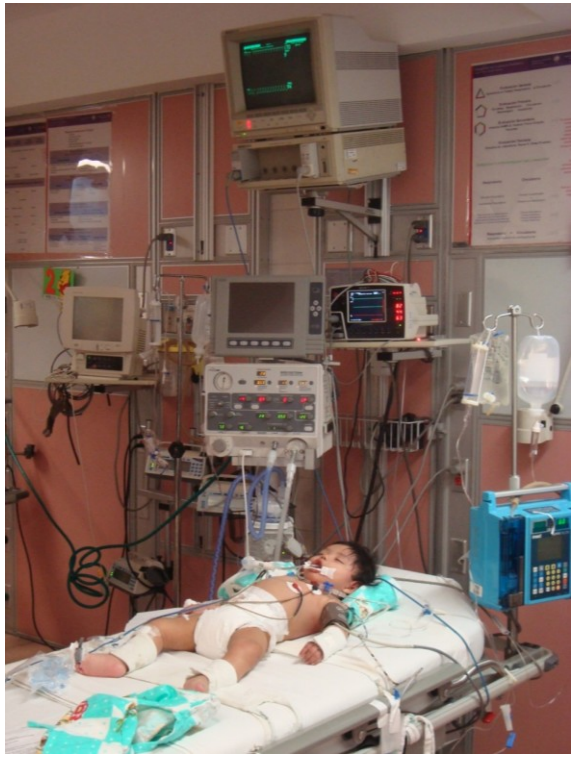
Table 5. Selection of Antimicrobial Therapy for Specific Pathogens

Pathogen	Parenteral therapy	Oral therapy (step-down therapy or mild infection)
Streptococcus pneumoniae with MICs for penicillin ≤2.0 μg/mL	Preferred: ampicillin (150–200 mg/kg/day every 6 hours) or penicillin (200 000–250 000 U/kg/day every 4–6 h); Alternatives: ceftriaxone (50–100 mg/kg/day every 12–24 hours) (preferred for parenteral outpatient therapy) or cefotaxime (150 mg/kg/day every 8 hours); may also be effective: clindamycin (40 mg/kg/day every 6–8 hours) or vancomycin (40–60 mg/kg/day every 6–8 hours)	Preferred: amoxicillin (90 mg/kg/day in 2 doses or 45 mg/kg/day in 3 doses); Alternatives: second- or third-generation cephalosporin (cefpodoxime, cefuroxime, cefprozil); oral levofloxacin, if susceptible (16–20 mg/kg/day in 2 doses for children 6 months to 5 years old and 8–10 mg/kg/day once daily for children 5 to 16 years old; maximum daily dose, 750 mg) or oral linezolid (30 mg/kg/day in 3 doses for children <12 years old and 20 mg/kg/day in 2 doses for children ≥12 years old)
S. pneumoniae resistant to penicillin, with MICs ≥4.0 μg/mL	Preferred: ceftriaxone (100 mg/kg/day every 12–24 hours); Alternatives: ampicillin (300–400 mg/kg/day every 6 hours), levofloxacin (16–20 mg/kg/day every 12 hours for children 6 months to 5 years old and 8–10 mg/kg/day once daily for children 5–16 years old; maximum daily dose, 750 mg), or linezolid (30 mg/kg/day every 8 hours for children <12 years old and 20 mg/kg/day every 12 hours for children ≥12 years old); may also be effective: clindamycin[a] (40 mg/kg/day every 6–8 hours) or vancomycin (40–60 mg/kg/day every 6–8 hours)	Preferred: oral levofloxacin (16–20 mg/kg/day in 2 doses for children 6 months to 5 years and 8–10 mg/kg/day once daily for children 5–16 years, maximum daily dose, 750 mg), if susceptible, or oral linezolid (30 mg/kg/day in 3 doses for children <12 years and 20 mg/kg/day in 2 doses for children ≥12 years); Alternative: oral clindamycin[a] (30–40 mg/kg/day in 3 doses)
Group A *Streptococcus*	Preferred: intravenous penicillin (100 000–250 000 U/kg/day every 4–6 hours) or ampicillin (200 mg/kg/day every 6 hours); Alternatives: ceftriaxone (50–100 mg/kg/day every 12–24 hours) or cefotaxime (150 mg/kg/day every 8 hours); may also be effective: clindamycin, if susceptible (40 mg/kg/day every 6–8 hours) or vancomycin[b] (40–60 mg/kg/day every 6–8 hours)	Preferred: amoxicillin (50–75 mg/kg/day in 2 doses), or penicillin V (50–75 mg/kg/day in 3 or 4 doses); Alternative: oral clindamycin[a] (40 mg/kg/day in 3 doses)
Stapyhylococcus aureus, methicillin susceptible (combination therapy not well studied)	Preferred: cefazolin (150 mg/kg/day every 8 hours) or semisynthetic penicillin, eg oxacillin (150–200 mg/kg/day every 6–8 hours); Alternatives: clindamycin[a] (40 mg/kg/day every 6–8 hours) or >vancomycin (40–60 mg/kg/day every 6–8 hours)	Preferred: oral cephalexin (75–100 mg/kg/day in 3 or 4 doses); Alternative: oral clindamycin[a] (30–40 mg/kg/day in 3 or 4 doses)
S. aureus, methicillin resistant, susceptible to clindamycin (combination therapy not well-studied)	Preferred: vancomycin (40–60 mg/kg/day every 6–8 hours or dosing to achieve an AUC/MIC ratio of >400) or clindamycin (40 mg/kg/day every 6–8 hours); Alternatives: linezolid (30 mg/kg/day every 8 hours for children <12 years old and 20 mg/kg/day every 12 hours for children ≥12 years old)	Preferred: oral clindamycin (30–40 mg/kg/day in 3 or 4 doses); Alternatives: oral linezolid (30 mg/kg/day in 3 doses for children <12 years and 20 mg/kg/day in 2 doses for children ≥12 years)
S. aureus, methicillin resistant, resistant to clindamycin (combination therapy not well studied)	Preferred: vancomycin (40–60 mg/kg/day every 6-8 hours or dosing to achieve an AUC/MIC ratio of >400); Alternatives: linezolid (30 mg/kg/day every 8 hours for children <12 years old and 20 mg/kg/day every 12 hours for children ≥12 years old)	Preferred: oral linezolid (30 mg/kg/day in 3 doses for children <12 years and 20 mg/kg/day in 2 doses for children ≥12 years old); Alternatives: none; entire treatment course with parenteral therapy may be required

The Management of Community-Acquired Pneumonia in Infants and Children Older Than 3 Months of Age: Clinical Practice Guidelines by the Pediatric Infectious Diseases Society and the Infectious Diseases Society of America

John S. Bradley,[1,a] Carrie L. Byington,[2,a] Samir S. Shah,[3,a] Brian Alverson,[4] Edward R. Carter,[5] Christopher Harrison,[6] Sheldon L. Kaplan,[7] Sharon E. Mace,[8] George H. McCracken Jr,[9] Matthew R. Moore,[10] Shawn D. St Peter,[11] Jana A. Stockwell,[12] and Jack T. Swanson[13]

Clinical Infectious Diseases 2011;53(7):e25–e76



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Hospital Infantil de México

Manejo del Estado de Choque

Pathogen	Parenteral therapy	or mild infection)
Haemophilus influenza, typeable (A-F) or nontypeable	Preferred: intravenous ampicillin (150-200 mg/kg/day every 6 hours) if β-lactamase negative, ceftriaxone (50–100 mg/kg/day every 12-24 hours) if β-lactamase producing, or cefotaxime (150 mg/kg/day every 8 hours); Alternatives: intravenous ciprofloxacin (30 mg/kg/day every 12 hours) or intravenous levofloxacin (16-20 mg/kg/day every 12 hours for children 6 months to 5 years old and 8-10 mg/kg/day once daily for children 5 to 16 years old; maximum daily dose, 750 mg)	Preferred: amoxicillin (75-100 mg/kg/day in 3 doses) if β-lactamase negative) or amoxicillin clavulanate (amoxicillin component, 45 mg/kg/day in 3 doses or 90 mg/kg/day in 2 doses) if β-lactamase producing; Alternatives: cefdinir, cefixime, cefpodoxime, or ceftibuten
Mycoplasma pneumoniae	Preferred: intravenous azithromycin (10 mg/kg on days 1 and 2 of therapy; transition to oral therapy if possible); Alternatives: intravenous erythromycin lactobionate (20 mg/kg/day every 6 hours) or levofloxacin (16-20 mg/kg/day every 12 hours; maximum daily dose, 750 mg)	Preferred: azithromycin (10 mg/kg on day 1, followed by 5 mg/kg/day once daily on days 2–5); Alternatives: clarithromycin (15 mg/kg/day in 2 doses) or oral erythromycin (40 mg/kg/day in 4 doses); for children >7 years old, doxycycline (2–4 mg/kg/day in 2 doses; for adolescents with skeletal maturity, levofloxacin (500 mg once daily) or moxifloxacin (400 mg once daily)
Chlamydia trachomatis or *Chlamydophila pneumoniae*	Preferred: intravenous azithromycin (10 mg/kg on days 1 and 2 of therapy; transition to oral therapy if possible); Alternatives: intravenous erythromycin lactobionate (20 mg/kg/day every 6 hours) or levofloxacin (16-20 mg/kg/day in 2 doses for children 6 months to 5 years old and 8-10 mg/kg/day once daily for children 5 to 16 years old; maximum daily dose, 750 mg)	Preferred: azithromycin (10 mg/kg on day 1, followed by 5 mg/kg/day once daily days 2–5); Alternatives: clarithromycin (15 mg/kg/day in 2 doses) or oral erythromycin (40 mg/kg/day in 4 doses); for children >7 years old, doxycycline (2-4 mg/kg/day in 2 doses); for adolescents with skeletal maturity, levofloxacin (500 mg once daily) or moxifloxacin (400 mg once daily)

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