37º Congreso Argentino de Pediatría
Mendoza – Argentina - 2015
29 y 30 de Septiembre-1 y 2 de octubre

Shock Séptico

¿Es sólo del intensivista?

Silvia Santos
Comité de Emergencias y Cuidados Críticos
Sociedad Argentina de Pediatría

- Definición
- Epidemiología
- Pronóstico
- Diagnóstico
- Prioridades
- Tratamiento
- Evaluación de la Respuesta
- Errores Frecuentes
- Conclusiones

Definición

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

Table 2. Definitions of systemic inflammatory response syndrome (SIRS), infection, sepsis, severe sepsis, and septic shock

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.**

(Pediatr Crit Care Med 2005; 6:2–8)

Definición

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Table 3. Age-specific vital signs and laboratory variables (lower values for heart rate, leukocyte count, and systolic blood pressure are for the 5th and upper values for heart rate, respiration rate, or leukocyte count for the 95th percentile)

Age Group[a]	Heart Rate, Beats/Min[b,c]		Respiratory Rate, Breaths/Min[d]	Leukocyte Count, Leukocytes × 10^3/mm^3[b,c]	Systolic Blood Pressure, mm Hg[b,c,e,f]
	Tachycardia	Bradycardia			
0 days to 1 wk	>180	<100	>50	>34	<65
1 wk to 1 mo	>180	<100	>40	>19.5 or <5	<75
1 mo to 1 yr	>180	<90	>34	>17.5 or <5	<100
2–5 yrs	>140	NA	>22	>15.5 or <6	<94
6–12 yrs	>130	NA	>18	>13.5 or <4.5	<105
13 to <18 yrs	>110	NA	>14	>11 or <4.5	<117

NA, not applicable.
[a]Modified from Ref. 24; [b]modified from Ref. 25; [c]modified from Ref. 22; [d]modified from Ref. 55; [e]Ref. 26; [f]Ref. 56.

(Pediatr Crit Care Med 2005; 6:2–8)

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Table 4. Organ dysfunction criteria

Cardiovascular dysfunction

Despite administration of isotonic intravenous fluid bolus ≥40 mL/kg in 1 hr

- Decrease in BP (hypotension) <5th percentile for age or systolic BP <2 SD below normal for age[a]

OR

- Need for vasoactive drug to maintain BP in normal range (dopamine >5 μg/kg/min or dobutamine, epinephrine, or norepinephrine at any dose)

OR

- Two of the following
  - Unexplained metabolic acidosis: base deficit >5.0 mEq/L
  - Increased arterial lactate >2 times upper limit of normal
  - Oliguria: urine output <0.5 mL/kg/hr
  - Prolonged capillary refill: >5 secs
  - Core to peripheral temperature gap >3°C

Respiratory[b]

- Pa_{O_2}/Fi_{O_2} <300 in absence of cyanotic heart disease or preexisting lung disease

OR

- Pa_{CO_2} >65 torr or 20 mm Hg over baseline Pa_{CO_2}

OR

- Proven need[c] or >50% Fi_{O_2} to maintain saturation ≥92%

OR

- Need for nonelective invasive or noninvasive mechanical ventilation[d]

Neurologic

- Glasgow Coma Score ≤11 (57)

OR

- Acute change in mental status with a decrease in Glasgow Coma Score ≥3 points from abnormal baseline

Hematologic

- Platelet count <80,000/mm^3 or a decline of 50% in platelet count from highest value recorded over the past 3 days (for chronic hematology/oncology patients)

OR

- International normalized ratio >2

Renal

- Serum creatinine ≥2 times upper limit of normal for age or 2-fold increase in baseline creatinine

Hepatic

- Total bilirubin ≥4 mg/dL (not applicable for newborn)

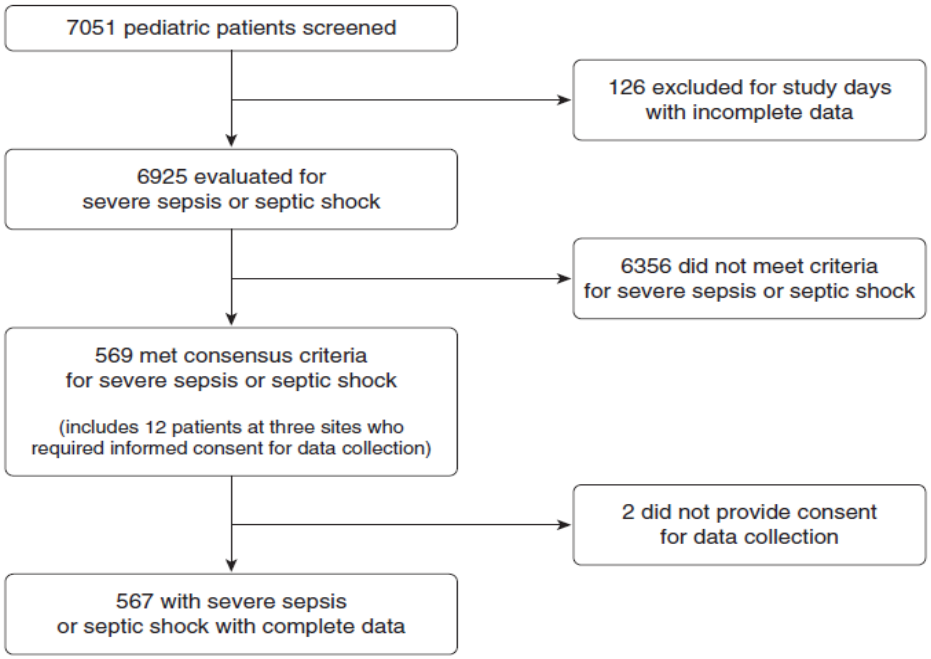
OR

- ALT 2 times upper limit of normal for age

(Pediatr Crit Care Med 2005; 6:2–8)

Epidemiología

- Prevalencia: 8.2%



128 UCIPs

26 países

Global Epidemiology of Pediatric Severe Sepsis: The Sepsis Prevalence, Outcomes, and Therapies Study

Scott L. Weiss[1*], Julie C. Fitzgerald[1*], John Pappachan[2,3], Derek Wheeler[4,5], Juan C. Jaramillo-Bustamante[6], Asma Salloo[7], Sunit C. Singhi[8], Simon Erickson[9], Jason A. Roy[10], Jenny L. Bush[1], Vinay M. Nadkarni[1], and Neal J. Thomas[1,11]; for the Sepsis Prevalence, Outcomes, and Therapies (SPROUT) Study Investigators and the Pediatric Acute Lung Injury and Sepsis Investigators (PALISI) Network

Am J Respir Crit Care Med Vol 191, Iss 10, pp 1147–1157, May 15, 2015

SPROUT Pediatric Severe Sepsis Study

Epidemiologia

Variable	No. of raw observations	Total ED visits 2001–2009 (estimated 1000s)	Annual ED visits (estimated 1000s)	Percentage of pediatric ED visits (95% CI)
Total ED visits	322,745	1,052,914	116,990	NA
Pediatric (age <18 years) ED visits 2001–2009	76,444	253,417	28,157	NA
ED visits with "Infection"	26,059	86,906	9,656	34.3 (33.5–35.1)
ED visits with "Organ Dysfunction"	794	2,640	293	1.04 (0.94–1.15)
ED visits with severe sepsis ("Infection" + "Organ Dysfunction")	266	855	95	0.34 (0.29–0.39)

CI = Confidence Interval; NA = Not applicable. "Infection" was defined as the presence of fever or hypothermia (T < 36 or ≥ 38°C), or an ICD-9 diagnosis cod for infection. "Organ Dysfunction" was defined as the presence of hypotension (based upon age-appropriate ED systolic blood pressure), provision of endotrache intubation, or an ICD-9 diagnosis code for organ dysfunction.

Table 1 Emergency department (ED) visits by pediatric patients for severe sepsis.

National estimates of emergency department visits for pediatric severe sepsis in the United States

Sara Singhal[1], Mathias W. Allen[2], John-Ryan McAnnally[3], Kenneth S. Smith[4], John P. Donnelly[5] and Henry E. Wang[6]

(2013)

PeerJ 1:e79; DOI 10.7717/peerJ.79

100,000 niños se presentan anualmente en el Servicio de Emergencias con sepsis severa en EU

Epidemiologia

Source of admission, n (%)	
Emergency department[¶]	167 (29.5)
Hospital floor	158 (27.9)
Operating room	50 (8.8)
Other hospital[**]	166 (29.3)
Other	26 (4.6)

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SPROUT Pediatric Severe Sepsis Study

Epidemiología

TABLE 4. Timing (in min) of Initial Antimicrobial Administration by Location and Sepsis Pathway

Time Interval	Emergency Department ($n = 64$)	Inpatient ($n = 66$)	p
Onset to order	89 (43–129)	58 (6–410)	0.62
Order to administration	22 (13–42)	71 (42–131)	< 0.001
Onset to administration	123 (67–180)	214 (78–678)	< 0.01

Delayed Antimicrobial Therapy Increases Mortality and Organ Dysfunction Duration in Pediatric Sepsis*

Scott L. Weiss, MD[1]; Julie C. Fitzgerald, MD, PhD[1]; Fran Balamuth, MD, PhD[2]; Elizabeth R. Alpern, MD, MSCE[3]; Jane Lavelle, MD[2]; Marianne Chilutti, MS[4]; Robert Grundmeier, MD[4,5]; Vinay M. Nadkarni, MD, MS[1]; Neal J. Thomas, MD, MSc[6]

Critical Care Medicine

November 2014 • Volume 42 • Number 11

Epidemiologia

Table 4. Outcomes for Total Cohort and by Age Category

	Total	Age Categories						*P* Value*
		0–28 d	29 d to <1 yr	1 to <5 yr	5 to <10 yr	10 to <15 yr	15 to <18 yr	
Vasoactive-free days, median (IQR)	23 (12–28)	20 (5–26)	21 (1–27)	25 (19–28)	26 (20–28)	25 (16–28)	22 (12–28)	<0.001
Ventilator-free days, median (IQR)	16 (0–25)	14 (0–23)	4 (0–21)	19 (2–25)	22 (7–28)	16 (0–28)	16 (1–28)	<0.001
New or progressive MODS†	171 (30)	10 (29)	48 (34)	37 (27)	25 (29)	32 (30)	19 (31)	0.89
PICU mortality	139 (24)	9 (26)	43 (31)	26 (19)	20 (23)	26 (25)	15 (24)	0.42
Hospital mortality	145 (25)	9 (26)	43 (31)	28 (21)	20 (23)	28 (26)	17 (27)	0.54
At least mild disability‡	116 (28)	8 (31)	29 (30)	31 (29)	18 (27)	16 (21)	14 (31)	0.73
At least moderate disability§	73 (17)	5 (19)	17 (17)	17 (16)	13 (19)	9 (12)	12 (27)	0.40
Death or disability‖	218 (38)	14 (40)	60 (43)	45 (33)	33 (38)	37 (35)	29 (47)	0.41

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SPROUT Pediatric Severe Sepsis Study

Pronóstico

- El reconocimiento temprano de la sepsis es la clave para mejorar la sobrevida.

Pronóstico

- El pronóstico de un niño con shock séptico es "*tiempo sensible*"

Pronóstico

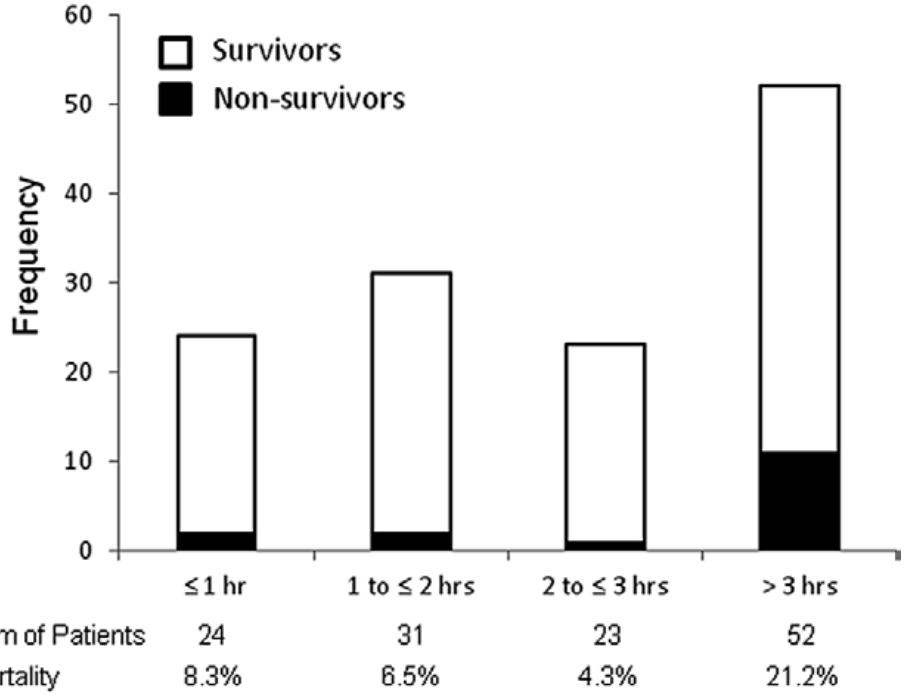
- Cada hora que progresa el shock séptico sin la administración agresiva de fluidos intravenosos y sin soporte inotrópico incrementa la mortalidad un 40%

Early Reversal of Pediatric-Neonatal Septic Shock by Community Physicians Is Associated With Improved Outcome

Yong Y. Han, MD*§; Joseph A. Carcillo, MD*‡§; Michelle A. Dragotta, RN§; Debra M. Bills, RN§; R. Scott Watson, MD, MPH*‡§; Mark E. Westerman, RT§; and Richard A. Orr, MD*‡§

Pediatrics 2003;112;793-799

Pronóstico



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Critical Care Medicine
November 2014 • Volume 42 • Number 11

Figure 1. Time from sepsis recognition to initial antimicrobial administration with survival fraction. Total number of patients at hourly intervals from sepsis recognition to administration of initial antimicrobial therapy. The shaded portion of each bar indicates the number of nonsurvivors in each time interval.

Pronóstico

- "Dado que el outcome en el shock séptico es "*tiempo sensible*" el mayor efecto de la reanimación se logra en el departamento de emergencia"

Reducing the global burden of sepsis in infants and children: A clinical practice research agenda

Joseph A. Carcillo, MD

(Pediatr Crit Care Med 2005; 6[Suppl.]:S157–S164)

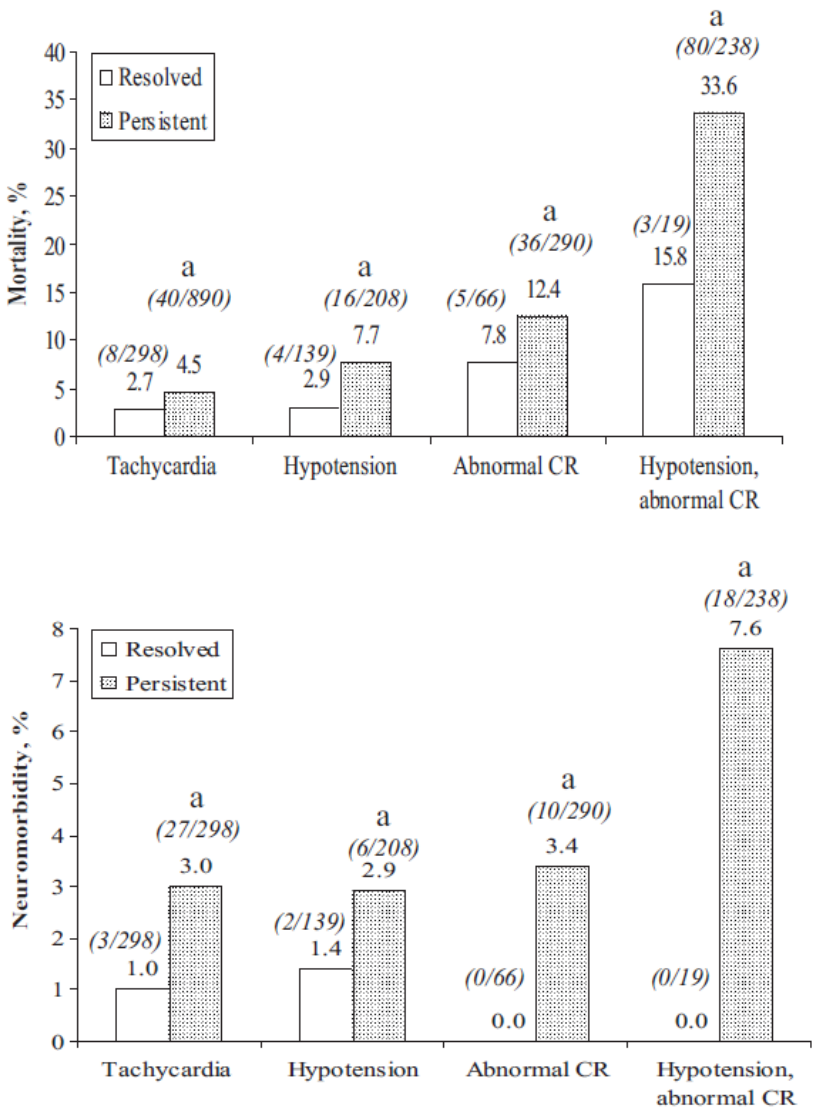

FIGURE 2

Early reversal of any hemodynamic abnormality in the community hospital was associated with improved outcome. [a] $P < .05$ (χ^2 analysis), resolved versus persistent shock.

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;124;500-508; originally published online Jul 27, 2009;
DOI: 10.1542/peds.2008-1967

Pronóstico

- El reconocimiento de los signos y síntomas de SRIS en el contexto de una infección permite al clínico reconocer la enfermedad tempranamente y mejorar el pronóstico.

Diagnóstico

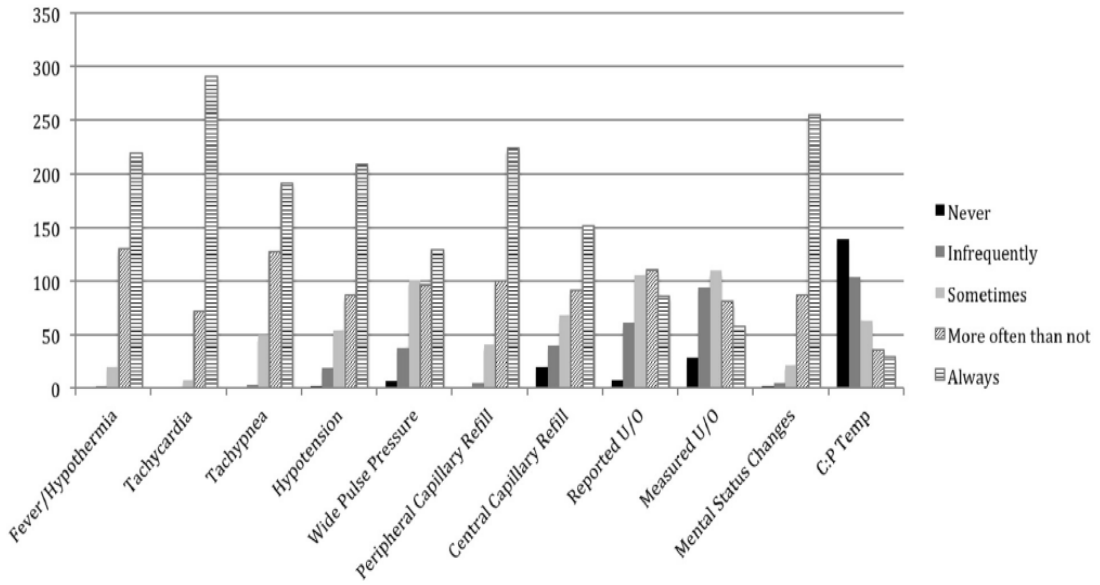

Figure 1. Utilization of clinical signs and symptoms for the recognition of a child with sepsis. U/O = urine output; C:P Temp = central to peripheral temperature difference.

RECOGNITION AND MANAGEMENT OF SEPSIS IN CHILDREN: PRACTICE PATTERNS IN THE EMERGENCY DEPARTMENT

Graham C. Thompson, MD, FRCPC* and Charles G. Macias, MD, MPH†

The Journal of Emergency Medicine, Vol. ■, No. ■, pp. 1–9, 2015

Diagnóstico

Table 2. Top 5 Clinical and Laboratory Elements used in the Diagnosis and Monitoring of a Child with Sepsis

	Overall	PERC	AAP-SOEM
Clinical signs and symptoms used to assist in recognizing a child with sepsis*			
Tachycardia	83.7	80.3 (1)	85.6 (1)
Altered mental status	80.6	76.5 (3)	82.9 (2)
Abnormal temperature	79.6	*77.3 (2)*	*80.8 (4)*
Peripheral capillary refill	78.4	*73.4 (5)*	*81.1 (3)*
Tachypnea	76.7	75.8 (4)	77.2 (5)
Laboratory investigations used to assist in recognizing a child with sepsis†			
Leukocyte count	73.5	73.6 (1)	73.4 (1)
Neutrophil count	70.9	71.1 (3)	70.8 (2)
Band count	69.1	68.7 (4)	69.2 (3)
Lactate	68.1	*72.1 (2)*	*65.9 (5)*
Renal function tests	67.2	67.2 (5)	67.1 (4)
Elements used to monitor resuscitation efforts in a child with severe sepsis‡			
Heart rate	86.1	83.0 (1)	87.8 (1)
Mental status	84.6	79.7 (3)	87.3 (2)
Systolic blood pressure	84.4	81.5 (2)	86.0 (3)
Diastolic blood pressure	80.8	76.5 (4)	82.9 (5)
Peripheral capillary refill	79.6	73.3 (5)	83.0 (4)

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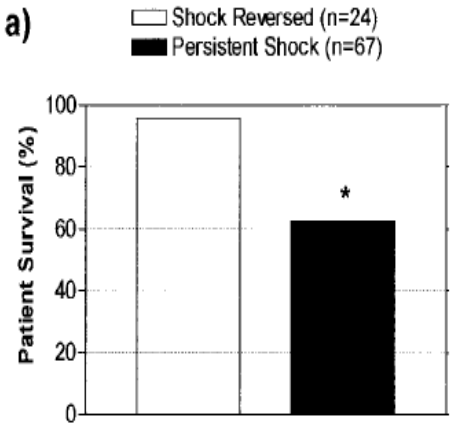
The Journal of Emergency Medicine, Vol. ■, No. ■, pp. 1–9, 2015

Prioridades

- ¿Es una prioridad el traslado a UCIP?

Prioridades



La reanimación agresiva inmediata del niño con shock séptico debe ser la primera prioridad del médico, más que demorar la reanimación mientras espera el traslado a un centro pediátrico de referencia

Fig 2. A, Shock reversal from resuscitative efforts by community hospital physicians resulted in 96% survival versus 63% survival among patients who remained in persistent shock state. B, Resuscitation consistent with the new *ACCM-PALS Guidelines* resulted in 92% survival versus 62% survival among patients who did not receive resuscitation consistent with the new *ACCM-PALS Guidelines*. *$P < .001$ versus shock reversed; †$P < .001$ versus resuscitation consistent with *ACCM-PALS Guidelines*.

Early Reversal of Pediatric-Neonatal Septic Shock by Community Physicians Is Associated With Improved Outcome

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Pediatrics 2003;112;793-799

Prioridades

- ¿Es una prioridad el acceso vascular central?

Prioridades

- Los inotrópicos pueden ser administrados a través de una vena periférica, una vía intraósea o un acceso venoso central.

Early Reversal of Pediatric-Neonatal Septic Shock by Community Physicians Is Associated With Improved Outcome

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Pediatrics 2003;112;793-799

Prioridades

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; Karen Choong, MD; Tim Cornell, MD; Allan DeCaen, MD; Andreas Deymann, MD; Allan Doctor, MD; Alan Davis, MD; John Duff, MD; Marc-Andre Dugas, MD; Alan Duncan, MD; Barry Evans, MD; Jonathan Feldman, MD; Kathryn Felmet, MD; Gene Fisher, MD; Lorry Frankel, MD; Howard Jeffries, MD; Bruce Greenwald, MD; Juan Gutierrez, MD; Mark Hall, MD; Yong Y. Han, MD; James Hanson, MD; Jan Hazelzet, MD; Lynn Hernan, MD; Jane Kiff, MD; Niranjan Kissoon, MD; Alexander Kon, MD; Jose Irazusta, MD; John Lin, MD; Angie Lorts, MD; Michelle Mariscalco, MD; Renuka Mehta, MD; Simon Nadel, MD; Trung Nguyen, MD; Carol Nicholson, MD; Mark Peters, MD; Regina Okhuysen-Cawley, MD; Tom Poulton, MD; Monica Relves, MD; Agustin Rodriguez, MD; Ranna Rozenfeld, MD; Eduardo Schnitzler, MD; Tom Shanley, MD; Sara Skache, MD; Peter Skippen, MD; Adalberto Torres, MD; Bettina von Dessauer, MD; Jacki Weingarten, MD; Timothy Yeh, MD; Arno Zaritsky, MD; Bonnie Stojadinovic, MD; Jerry Zimmerman, MD; Aaron Zuckerberg, MD

10% in chronically ill children). Early use of 2002 guidelines was associated with improved outcome in the community hospital emergency department (number needed to treat = 3.3) and tertiary pediatric intensive care setting (number needed to treat = 3.6); every hour that went by without guideline adherence was associated with a 1.4-fold increased mortality risk. The updated 2007 guidelines continue to recognize an increased likelihood that children with septic shock, compared with adults, require 1) proportionally larger quantities of fluid, 2) inotrope and vasodilator therapies, 3) hydrocortisone for absolute adrenal insufficiency, and 4) ECMO for refractory shock. The major new recommendation in the 2007 update is earlier use of inotrope support through peripheral access until central access is attained.

Conclusion: The 2007 update continues to emphasize early use of age-specific therapies to attain time-sensitive goals, specifically recommending 1) first hour fluid resuscitation and inotrope therapy directed to goals of threshold heart rates, normal blood pressure, and capillary refill ≤2 secs, and 2) subsequent intensive care unit hemodynamic support directed to goals of central venous oxygen saturation >70% and cardiac index 3.3–6.0 L/min/m^2. (Crit Care Med 2009; 37:666–688)

(Crit Care Med 2009; 37:666–688)

Society of Critical Care Medicine

European Society of Intensive Care Medicine

Tratamiento

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*

(*Crit Care Med* 2013; 41:580–637)

Tratamiento

- Reanimación Inicial
- Antibióticos y Control de la fuente de infección
- Reanimación con fluidos
- Inotrópicos/vasopresores/vasodilatadores
- Corticoides

Tratamiento

- Hemoderivados
- Ventilación Mecánica
- Sedación/Analgesia/Monitoreo de Toxicidad por drogas
- Control de Glucemia
- Diuréticos y terapias de reemplazo renal

Tratamiento

Reanimación Inicial

Administración de O2

- Máscara Facial
- Cánula de alto flujo
- CPAP

Reanimación Inicial

Acceso Vascular

- Acceso Periférico
- Acceso Intraóseo

Reanimación Inicial

Objetivos Terapéuticos

- Relleno capilar ≤2seg
- Diuresis 1 ml/ k g/hr
- TA normal p/edad
- Sensorio normal
- Extremidades calientes
- Índice Cardíaco entre 3 . 3 y 6 L/min/m2

ScvO2 ≥ 70 %

- Pulsos centrales y periféricos normales e iguales

Tratamiento

Reanimación Inicial

Seguir el algoritmo ACCM PALS

Reanimación Inicial

Evaluar en shock refractario

- Neumotórax
- Taponamiento Cardíaco
- Emergencias endocrinológicas

Tratamiento

ATB
Control de
Infección

ATB

- Administrado antes de la hora del diagnóstico
- Obtener hemocultivos antes pero no demorar los ATB

ATB
Control de
Infección

ATB

- Debe adecuarse a la epidemiología
- En shock tóxico con hipotensión refractaria: clindamicina y tto anti-toxina

ATB
Control de
Infección

Control agresivo y temprano de la fuente de infección

Tratamiento

Fluidos

Shock Hipovolémico, inicio

- Cristaloides 20 ml/kg o equiv de albúmina en 5-10 min.
- Hasta revertir hipotensión, aum diuresis, relleno capilar normal, pulsos periféricos presentes y recup conciencia

Fluidos

Si hay hepatomegalia o rales

- Inotrópicos

Fluidos

Anemia Hemolítica severa sin hipotensión

- TGR superior a cristaloides

Tratamiento

Inotrópicos Vasopresores	Comenzar con **vía periférica** hasta obtener vía central en niños que no responden a reanimación con volumen
Vasodilatadores	En niños con bajo gasto cardíaco y resistencia vascular sistémica elevada agregar a los inotrópicos un vasodilatador
Corticoide	Hidrocortisona • Shock refractario a volumen • Shock resistente a catecolaminas • Insuficiencia suprarrenal sospechada o probada

Tratamiento

Hemo derivados	Durante la reanimación: objetivo Hb 10 g/dl Estabilizado y en recuperación: Hb >7g/dl
ARM	Estrategia de protección pulmonar
Sedación Analgesia Toxicidad	Utilizar sedación en pacientes ventilados •Monitorear toxicidad de drogas por reducción del metabolismo

Tratamiento

Glucemia	Objetivo: glucemia 180mg/dl Insulina/Glucosa
Diuréticos TRR	Use diuréticos para revertir la sobrecarga de volumen cuando se resuelva el shock y TRR si no es exitoso.

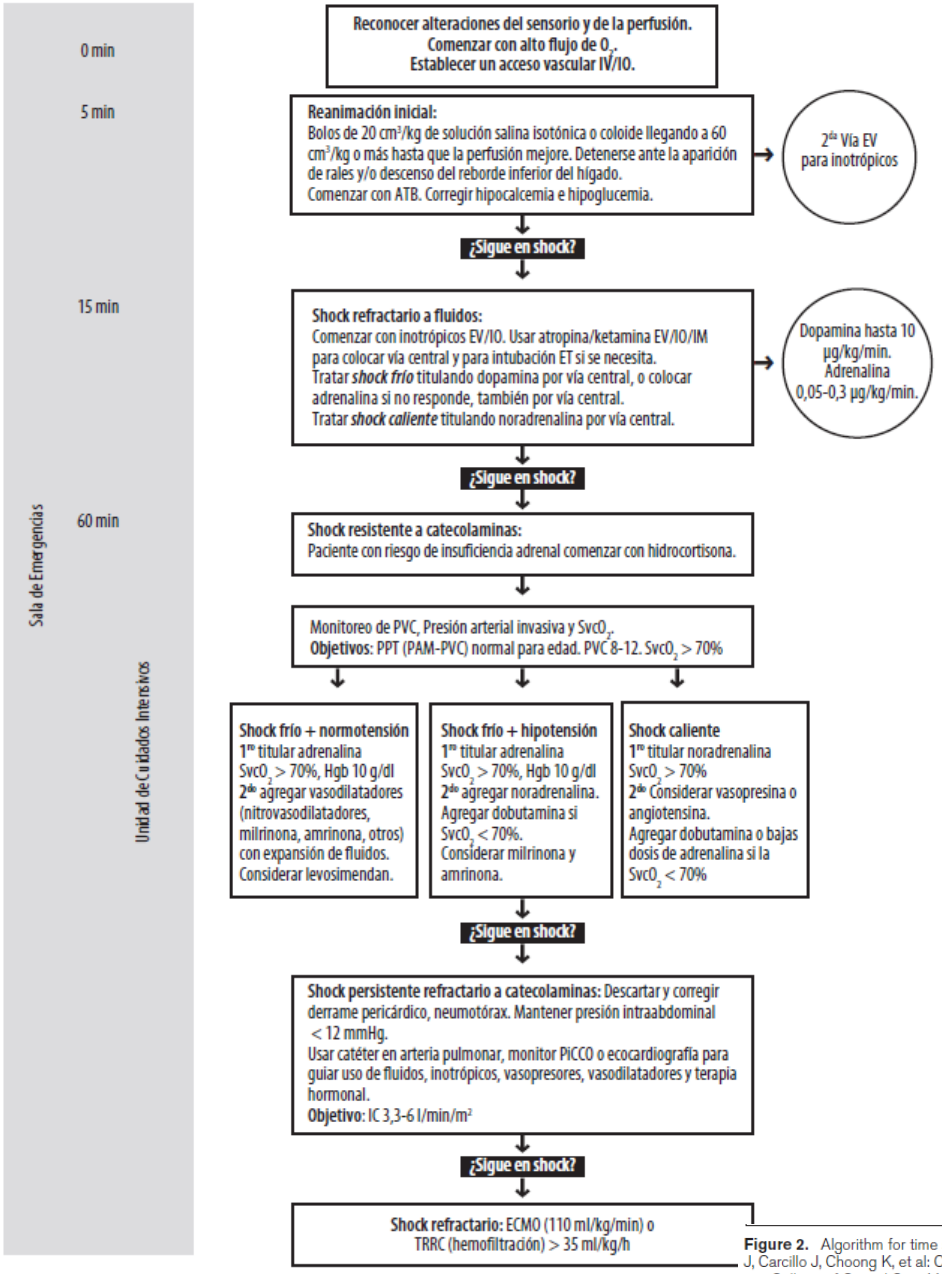

Figure 2. Algorithm for time sensitive, goal-directed stepwise management of hemodynamic support in infants and children. Reproduced from Brierley J, Carcillo J, Choong K, et al: Clinical practice parameters for hemodynamic support of pediatric and neonatal septic shock: 2007 update from the American College of Critical Care Medicine. *Crit Care Med* 2009; 37:666–688.

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*

(*Crit Care Med* 2013; 41:580–637)

Tratamiento

Surviving Sepsis Campaign

Updated Bundles in Response to New Evidence

Revised 4/2015 by the
SSC Executive Committee

- ProCESS Investigators, Yealy DM, Kellum JA, Juang DT, et al. A randomized trial of protocol-based care for early septic shock. N Engl J Med 2014; 370(18):1683-1693
- The ARISE Investigators and the ANZICS Clinical Trials Group. Goal-directed resuscitation for patients with early septic shock. N Engl J Med 2014; 371:1496-1506
- Mouncey PR, Osborn TM, Power GS, et al for the ProMISe trial investigators. Trial of early, goal-directed resuscitation for septic shock. N Engl J Med 2015: DOI: 10.1056/NEJMoa1500896

- Si han recibido:
  - **ATB oportunos**
  - **reanimación con líquidos**
- CVC para PVC y ScvO2 no es superior en comparación con controles
- o en todos los pacientes con lactato > 4 mmol / L

Tratamiento

Para ser realizado dentro de las 3 hrs de presentación *

1. Medición del nivel de lactato
2. Obtención de hemocultivos previo a los ATB
3. Administración de ATB de amplio espectro
4. Administración de 30ml/kg de cristaloides en hipotensión o con lactato > 4 mmol/L

* *"Tiempo de presentación" es definido como el tiempo del triage en el departamento de emergencia o desde el primer registro de SS.*

Tratamiento

Para ser realizado dentro de las 6 hrs de presentación

- Indicar vasopresores (en hipoTA si rpta. a fluidos) para TAM ≥ 65mmHG

- Si persiste hipotenso luego de fluidos o el lactato era≥ 4 mmol/l reevaluar la perfusión tisular mediante ex físico focalizado con signos vitales, relleno capilar, pulso, piel o 2 de los siguientes:
  - PVC
  - SCVO2
  - Ecografía
  - Evaluaciones dinámicas de la respuesta a fluido

- Medir nuevamente lactato si el inicial fue elevado

Evaluación de la Respuesta

- Relleno capilar $\leq$ 2 segundos
- TA normal para la edad
- Pulsos normales sin diferencias entre centrales y periféricos
- Extremidades calientes
- Diuresis> 1ml/kg/hora
- Sensorio normal

Evaluación de la Respuesta

- Índice de Shock
  - FC /TAS
  - ≥ 1 : predice paciente de riesgo en SE

Shock Index and Early Recognition of Sepsis

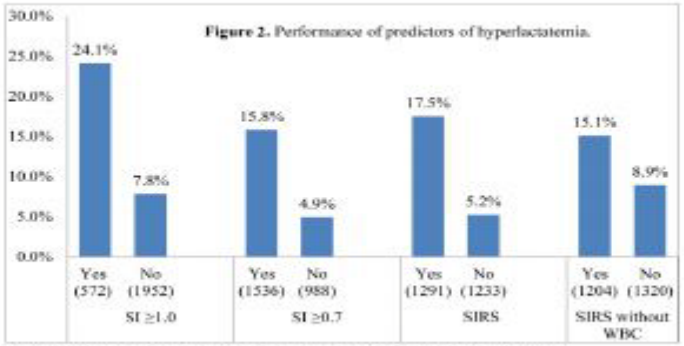

Figure 2. Performance of predictors of hyperlactatemia. *SI*, shock index; *SIRS*, systemic inflammatory response syndrome; *WBC*, white blood cell count

Shock Index and Early Recognition of Sepsis in the Emergency Department: Pilot Study

Tony Berger, MD, MS*
Jeffrey Green, MD*
Timothy Horeczko, MD, MSCR*
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Western Journal *of* Emergency Medicine Volume XIV, no. 2 : March 2013

Evaluación de la Respuesta

- Índice de Shock
  - Shock Index, Pediatric Adjusted (SIPA)

Normal pediatric vital sign ranges based on patient age.

Age	Heart rate	Systolic blood pressure	Diastolic blood pressure	Respiratory rate	Maximum normal SIPA
4–6 years	65–110	90–110	60–75	20–25	1.222222222
6–12 years	60–100	100–120	60–75	14–22	1
>12 years	55–90	100–135	65–85	12–20	0.9

SIPA—shock index, pediatric age adjusted; equal to maximum normal heart rate/minimum normal SBP.

Pediatric specific shock index accurately identifies severely injured children☆

Shannon N. Acker [a,*], James T. Ross [a], David A. Partrick [a], Suhong Tong [b], Denis D. Bensard [a,c]

Journal of Pediatric Surgery 50 (2015) 331–334

Evaluación de la Respuesta

- Índice de Shock

TABLE 1. The Range of Normal Vital Sign Values and Shock Index

Age	Heart Rate	Systolic Blood Pressure	Shock Index
< 1 yr	80–150	65–100	0.8–2.3
1–3 yr	70–110	90–105	0.7–1.2
4–11 yr	60–110	95–120	0.5–1.2
≥ 12 yr	55–85	110–135	0.4–0.8

Is Shock Index Associated With Outcome in Children With Sepsis/Septic Shock?*

Yuki Yasaka, MD[1]; Robinder G. Khemani, MD, MSCI[2,3]; Barry P. Markovitz, MD, MPH[2,3]

(*Pediatr Crit Care Med* 2013; 14:e372–e379)

Evaluación de la Respuesta

Cutoff SI Point	Positive Likelihood Ratio
All patients ($n = 544$)	
SI > 1.3	1.2
SI > 1.6	1.6
SI > 2.0	1.7
SI > 2.3	3.6

TABLE 4. Likelihood Ratios of PICU Mortality Based on Different Cutoff Shock Index Points at Admission

Is Shock Index Associated With Outcome in Children With Sepsis/Septic Shock?*

Yuki Yasaka, MD[1]; Robinder G. Khemani, MD, MSCI[2,3]; Barry P. Markovitz, MD, MPH[2,3]

(*Pediatr Crit Care Med* 2013; 14:e372–e379)

Errores frecuentes

- 76% de las muertes por SS: cuidados subóptimos
  - 33% demoras de los padres en consultar
  - 38% demoras del médico en el tratamiento
  - 24% insuficientes fluidos
  - 38%,subestimación de la gravedad

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

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

Pediatric Critical Care Medicine:
July 2010 - Volume 11 - Issue 4 - pp 469-474

Conclusiones

El tratamiento exitoso de l shock séptico no puede comenzar en la UTI en los pacientes que se presentan en la SE. Debe comenzar en el momento del triage en la SE.

An Emergency Department Septic Shock Protocol and Care Guideline for Children Initiated at Triage

AUTHORS: Gitte Y. Larsen, MD, MPH,[a,b] Nancy Mecham, APRN, FNP,[c] and Richard Greenberg, MD[b,c]

PEDIATRICS Volume 127, Number 6, June 2011

Conclusiones

- Los pacientes pediátricos en SS deben ser reconocidos al ingreso al SE.
- El reconocimeinto temprano mejora la sobrevida del niño.
- Los objetivos de tratamiento “tiempo sensible” incluyen:
  - Relleno capilar normal
  - TA normal para la edad
  - Indice de shock normal para la edad
- La planificación y el entrenamiento del personal permitirá el reconocimiento en tiempo y el tratamiento adecuado para reducir la mortalidad y la morbilidad.

Goal-Directed Management of Pediatric Shock in the Emergency Department

Joseph A. Carcillo, MD, Kato Han, MD, John Lin, MD, Richard Orr, MD

Clin Ped Emerg Med 8:165-175 © 2007

Muchas Gracias!!!