Sepsis
Two-thousand sixteen

Tom Ahrens PhD RN FAAN
&
Michael Ackerman DNS RN FCCM

Rory's Regulation

NYS Regulation

Prevention

- VAP, what do we know. The bundle works, use it. There was a recent Cochrane that showed that NNT with an aggressive oral care product with CHG was 15.
- CAUTI, everyone is struggling. There is a bundle that works. Compliance is difficult. The new definitions should help as we were counting things that were not truly infections.
- CLABSI, insertion and maintenance bundles do work with rigorous oversight and "staying on it".

CHG Bathing

- Well we thought we had the answer to this and that it worked…..

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Effect of Daily Chlorhexidine Bathing on Hospital-Acquired Infection

Michael W. Climo, M.D., Deborah S. Yokoe, M.D., M.P.H., David K. Warren, M.D., Trish M. Perl, M.D., Maureen Bolon, M.D., Loreen A. Herwaldt, M.D., Robert A. Weinstein, M.D., Kent A. Sepkowitz, M.D., John A. Jernigan, M.D., Kakotan Sanogo, M.S., and Edward S. Wong, M.D.

n engl j med 368;6 nejm.org february 7, 2013

And then this came out….

JAMA. 2015 Jan 27;313(4):369-78. doi: 10.1001/jama.2014.18400.
Chlorhexidine bathing and health care-associated infections: a randomized clinical trial.
Noto MJ1, Domenico HJ2, Byrne DW2, Talbot T1, Rice TW1, Bernard GR1, Wheeler AP1.

OBJECTIVE:
To determine if daily bathing of critically ill patients with chlorhexidine decreases the incidence of health care-associated infections.

RESULTS:
During the chlorhexidine bathing period, 55 infections occurred: 4 CLABSI, 21 CAUTI, 17 VAP, and 13 C difficile. During the control bathing period, 60 infections occurred: 4 CLABSI, 32 CAUTI, 8 VAP, and 16 C difficile. The primary outcome rate was 2.86 per 1000 patient-days during the chlorhexidine and 2.90 per 1000 patient-days during the control bathing periods (rate difference, -0.04; 95% CI, -1.10 to 1.01; P = .95). After adjusting for baseline variables, no difference between groups in the rate of the primary outcome was detected. Chlorhexidine bathing did not change rates of infection-related secondary outcomes including hospital-acquired bloodstream infections, blood culture contamination, or clinical cultures yielding multidrug-resistant organisms. In a prespecified subgroup analysis, no difference in the primary outcome was detected in any individual intensive care unit.

CONCLUSION AND RELEVANCE:
In this pragmatic trial, daily bathing with chlorhexidine did not reduce the incidence of health care-associated infections including CLABSIs, CAUTIs, VAP, or C difficile. These findings do not support daily bathing of critically ill patients with chlorhexidine.

Use of a Patient Hand Hygiene Protocol to Reduce Hospital-Acquired Infections and Improve Nurses' Hand Washing

By Cherie Fox, RN, MSN, CCRN-CSC, Teresa Wavra, RN, MSN, CNS, CCRN, Diane Ash Drake, RN, PhD, Debbie Mulligan, RN, MSN, PHN, CIC, Yvonne Pacheco Bennett, RN, BSN, JD, CCRN, Carla Nelson, BSN, CIC, Peggy Kirkwood, RN, MSN, ACNPC, CHFN, AACC, Louise Jones, RN, MSN, CCRN, and Mary Kay Bader RN, MSN, CCNS

AMERICAN JOURNAL OF CRITICAL CARE, May 2015, Volume 24, No. 3

So what are we talking about?

Sepsis can be subtle until it is so obvious you can't miss it

Pathophysiology of Sepsis

What do we need to know

Sepsis

- *Sepsis is a genus of flies. See Sepsidae.*
- **Sepsis From Wikipedia, the free encyclopedia**
- **Sepsis/Septicaemia**
  Classification & external resources **ICD-10**A40. - A41.0**ICD-9**038 **Sepsis** (in Greek *Σήψις*, putrefaction) is a serious medical condition, resulting from the immune response to a severe infection. **Septicaemia** is sepsis of the bloodstream caused by bacteremia, which is the presence of bacteria in the bloodstream. The term *septicaemia* is also used to refer to sepsis in general.
- http://www.youtube.com/watch?v=hNoBF6bsNUU

"Except on few occasions, the patient appears to die from the body's response to infection rather than from it."

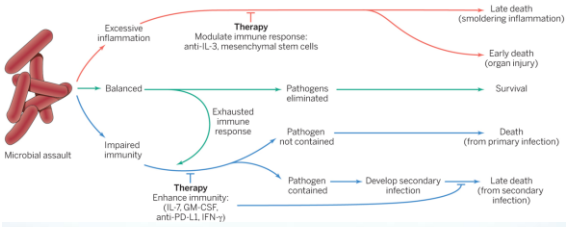
Sir William Osler – 1904
The Evolution of Modern Medicine

Immune Response

- Initial Response (Innate)
  - Neutrophils
  - Monocytes
  - Survival depends on success of neutrophils
- Secondary response (Adaptive)
  - Antibody production
  - Takes 4-7 days for initial exposure
    - 1-2 days for subsequent exposures

http://missinglink.ucsf.edu/lm/immunology_module/prologue/objectives/obj02.html **Module created by Patrick Fisher MS2**

Immunoinflammatory response in sepsis



Inflammatory response to sepsis.

Potential immune therapies can modulate immune responses that provoke excessive inflammation or enhance immunity if there is an impaired immune response to microbial infection. IFN-γ, interferon-γ. "ILLUSTRATION: ADAPTED BY P. HUEY/SCIENCE"

Immune Response

- Initial Response (Innate)
  - Neutrophils
  - Monocytes
  - Survival depends on success of neutrophils
- Secondary response (Adaptive)
  - Antibody production
  - Takes 4-7 days for initial exposure
    - 1-2 days for subsequent exposures

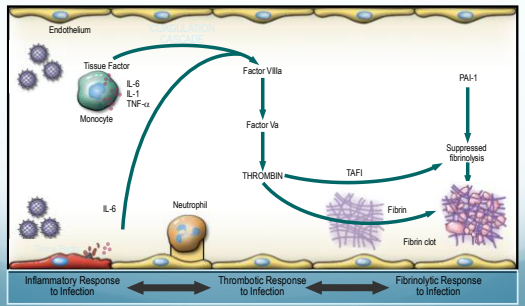
The Power of Our Immune System

"Our arsenals for fighting off bacteria are so powerful, and involve so many different defense mechanisms, that we are more in danger from them than from the invaders.

"We live in the midst of explosive devices; we are mined!"

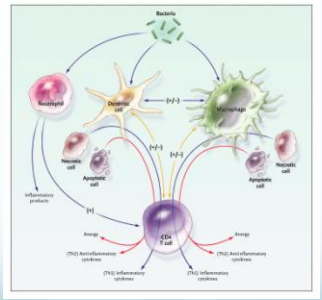
Lewis Thomas - 1972
Germs, *New England Journal Of Medicine*

Coagulation and Impaired Fibrinolysis In Severe Sepsis



Reprinted with permission from the National Initiative in Sepsis Education (NISE).

The Response to Pathogens, Involving "Cross-Talk" Among Mast Immune Cells, Recruiting Macrophages, Dendritic Cells, and CD4 + Cells



Hotchkiss, R. S. et al. N Engl J Med 2003;348:138-150

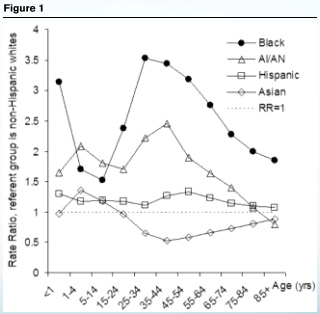
The NEW ENGLAND JOURNAL of MEDICINE

"Sepsis" referring to the "decomposition of animal or vegetable organic matter in the presence of bacteria" 1 first appeared over 2700 years ago in the poems of Homer

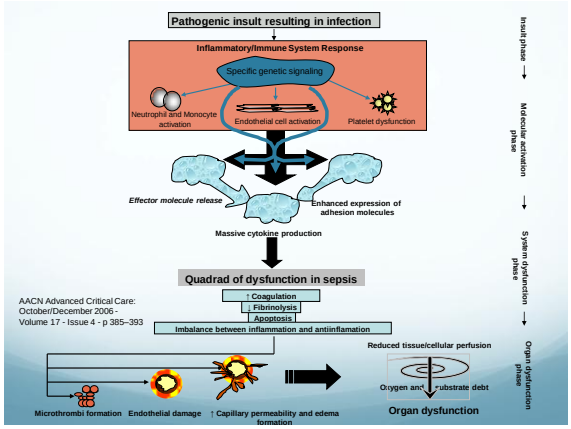
The burden of sepsis-associated mortality in the United States from 1999 to 2005: an analysis of multiple-cause-of-death data

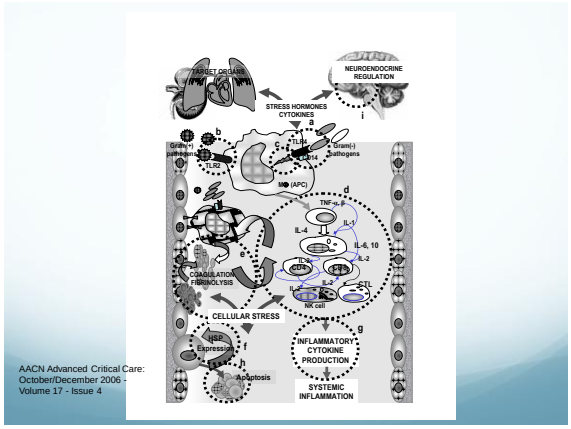
Abstract-Introd-Method-Results-Discussion

Figure 1



Age-specific rate-ratios for sepsis-associated death by race/ethnicity category in the United States, 1999 to 2005. Non-Hispanic whites were used as the referent group. AI/AN = American Indian/Alaska Native.


Pathogenic insult resulting in infection
Inflammatory/Immune System Response
Specific genetic signaling
Neutrophil and Monocyte activation
Endothelial cell activation
Platelet dysfunction
Effector molecule release
Enhanced expression of adhesion molecules
Massive cytokine production
Quadrad of dysfunction in sepsis
↑ Coagulation
↓ Fibrinolysis
Apoptosis
Imbalance between inflammation and antiinflamation
Reduced tissue/cellular perfusion
Oxygen and substrate debt
Organ dysfunction
Microthrombi formation
Endothelial damage
↑ Capillary permeability and edema formation
Insult phase
Molecular activation phase
System dysfunction phase
Organ dysfunction phase
AACN Advanced Critical Care:
October/December 2006 -
Volume 17 - Issue 4 - p 385–393


TARGET ORGANS
NEUROENDOCRINE REGULATION
STRESS HORMONES
CYTOKINES
Gram(+) pathogens
Gram(-) pathogens
TLR2
TLR4
CD14
MΦ (APC)
TNF-α, β
IL-1
IL-4
IL-6, 10
IL-2
CD4
CD8
CTL
NK cell
COAGULATION
FIBRINOLYSIS
CELLULAR STRESS
HSP Expression
Apoptosis
INFLAMMATORY CYTOKINE PRODUCTION
SYSTEMIC INFLAMMATION
AACN Advanced Critical Care:
October/December 2006 -
Volume 17 - Issue 4


THE PRECISION MEDICINE INITIATIVE

WHAT IS IT?

Precision medicine is an emerging approach for disease prevention and treatment that takes into account people's individual variations in genes, environment, and lifestyle.

The Precision Medicine Initiative will generate the scientific evidence needed to **move the concept of precision medicine into clinical practice.**

WHY NOW?

The **time is right** because of:

- Sequencing of the human genome
- Improved technologies for biomedical analysis
- New tools for using large datasets

NEAR TERM GOALS

Intensify efforts to apply precision medicine to **cancer.**

- Innovative **clinical trials** of targeted drugs for adult, pediatric cancers
- Use of **combination therapies**
- Knowledge to overcome **drug resistance**

LONGER TERM GOALS

Create a research cohort of **> 1 million American volunteers** who will share genetic data, biological samples, and diet/lifestyle information, all linked to their electronic health records if they choose.

Pioneer **a new model for doing science** that emphasizes **engaged participants, responsible data sharing, and privacy protection.**

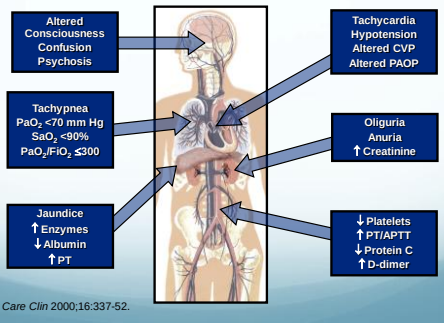
Google™ X

Impact of Sepsis Acute Organ System Dysfunction

Group Question

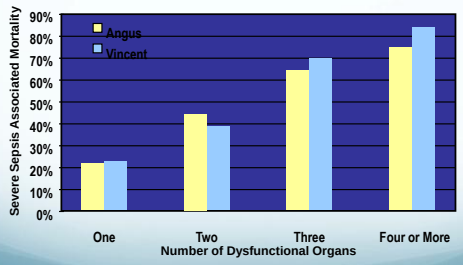
- What does the typical sepsis patient look like?

Identifying Acute Organ Dysfunction as a Marker of Severe Sepsis



Balk RA. *Crit Care Clin* 2000;16:337-52.

Severe Sepsis-Associated Mortality Increases With the Number of Dysfunctional Organs



Vincent JL, et al. *Crit Care Med* 1998;21:1793-800; Angus DC et al. *Crit Care Med* 2001;29:1303-10.

2015 Guidelines

Hot off the presses…… (kind of)

SURVIVING SEPSIS CAMPAIGN BUNDLES

TO BE COMPLETED WITHIN 3 HOURS:
1) Measure lactate level
2) Obtain blood cultures prior to administration of antibiotics
3) Administer broad spectrum antibiotics
4) Administer 30 ml/kg crystalloid for hypotension or lactate ≥4mmol/L

TO BE COMPLETED WITHIN 6 HOURS:
5) Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥65 mm Hg
6) In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate ≥4 mmol/L (36 mg/dL):
--Measure central venous pressure (CVP)*
--Measure central venous oxygen saturation (ScvO2)*
7) Remeasure lactate if initial lactate was elevated*

*Targets for quantitative resuscitation included in the guidelines are CVP of ≥8 mm Hg; ScvOs of ≥70%, and normalization of lactate.

Screening

- Routine screening of potentially infected seriously ill patients for severe sepsis to allow earlier implementation of therapy (grade 1C).
- Hospital based performance improvement efforts in severe sepsis

Initially

- 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).
- In patients with elevated lactate levels targeting resuscitation to normalize lactate

Antibiotics

- 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.
- 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

Antibiotics (cont.)

- 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).
- 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, includingneutropenia (grade 2C).
- Antiviral therapy initiated as early as possible in patients with severe sepsis or septic shock of viral origin (grade 2C).
- Antimicrobial agents should not be used in patients with severe inflammatory states determined to be of noninfectious cause

Source control

- A specific anatomical diagnosis of infection requiring consideration for emergent source control be sought and diagnosed or excluded as rapidly as possible, and intervention be undertaken for source control within the first 12 hr after the diagnosis is made, if feasible (grade 1C).
- When infected peripancreatic necrosis is identified as a potential source of infection, definitive intervention is best delayed until adequate demarcation of viable and nonviable tissues has occurred (grade 2B).
- When source control in a severely septic patient is required, the effective intervention associated with the least physiologic insult should be used (eg, percutaneous rather than surgical drainage of an abscess) (UG).
- 4. If intravascular access devices are a possible source of severe sepsis or septic shock, they should be removed promptly after other vascular access has been established

Resuscitation

- Crystalloids as the initial fluid of choice in the resuscitation of severe sepsis and septic shock (grade 1B).
- Against the use of hydroxyethyl starches for fluid resuscitation of severe sepsis and septic shock (grade 1B).
- Albumin in the fluid resuscitation of severe sepsis and septic shock when patients require substantial amounts of crystalloids (grade 2C).
- Initial fluid challenge in patients with sepsis induced tissue hypoperfusion with suspicion of hypovolemia to achieve a minimum of 30 mL/kg of crystalloids (a portion of this may be albumin equivalent). More rapid administration and greater amounts of fluid may be needed in some patients (grade 1C).
- Fluid challenge technique be applied where in fluid administration is continued as long as there is hemodynamic improvement either based on dynamic (eg, change in pulse pressure, stroke volume variation) or static (eg, arterial pressure, heart rate) variables

Vasopressors

- Vasopressor therapy initially to target a mean arterial pressure (MAP) of 65 mm Hg .
- Norepinephrine as the first choice vasopressor (grade 1B).
- Epinephrine (added to and potentially substituted for norepinephrine) when an additional agent is needed to maintain adequate blood pressure (grade 2B).
- Vasopressin 0.03 units/minute can be added to norepinephrine (NE) with intent of either raising MAP or decreasing NE dosage (UG).
- Low dose vasopressin is not recommended as the single initial vasopressor for treatment of sepsis induced hypotension and vasopressin doses higher than 0.03-0.04 units/minute should be reserved for salvage therapy (failure to achieve adequate MAP with other vasopressor agents) .
- Dopamine as an alternative vasopressor agent to norepinephrine only in highly selected patients (eg, patients with low risk of tachyarrhythmias and absolute or relative bradycardia)

Vasopressors (cont.)

- Phenylephrine is not recommended in the treatment of septic shock except in circumstances where (a) norepinephrine is associated with serious arrhythmias,(b) cardiac output is known to be high and blood pressure persistently low or (c) as salvage therapy when combined inotrope/vasopressor drugs and low dose vasopressin have failed to achieve MAP target.
- Low-dose dopamine should not be used for renal protection (grade 1A).
- All patients requiring vasopressors have an arterial catheter placed as soon as practical if resources are available

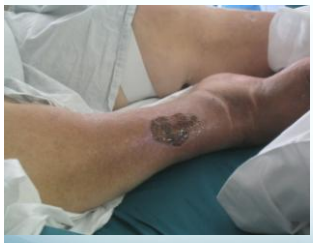
Inotropic therapy

- A trial of dobutamine infusion up to 20 micrograms/kg/min be administered or added to vasopressor (if in use) in the presence of (a) myocardial dysfunction as suggested by elevated cardiac filling pressures and low cardiac output, or (b) ongoing signs of hypoperfusion, despite achieving adequate intravascular volume and adequate MAP (grade 1C).
- Not using a strategy to increase cardiac index to predetermined supranormal levels

Corticosteroids

- Not using intravenous hydrocortisone to treat adult septic shock patients if adequate fluid resuscitation and vasopressor therapy are able to restore hemodynamic stability (see goals for Initial Resuscitation). In case this is not achievable, we suggest intravenous hydrocortisone alone at a dose of 200 mg per day (grade 2C).
- Not using the ACTH stimulation test to identify adults with septic shock who should receive hydrocortisone (grade 2B).
- In treated patients hydrocortisone tapered when vasopressors are no longer required
- Corticosteroids not be administered for the treatment of sepsis in the absence of shock.
- When hydrocortisone is given, use continuous flow

Rapid Identification



- Nursing's role in identifying and helping in the treatment of sepsis is more important than ever before

How do We Identify Sepsis Now?

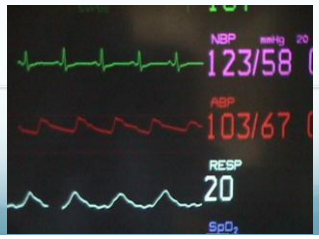
In absence of biomarkers, must rely on crude physical indicators

Equipment to Evaluate Patient

- Don't take vital signs, take a lactate
  - Point of care
- Evaluation of ventilation
  - Capnography
  - Blood Gases
    - Point of care
- Hemodynamic Assessment
  - Stroke Volume

Blood Pressure and Blood Flow

Do they equal each other?



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What Type of Hemodynamic Monitoring?

- CVP and PAOP should never be used in isolation
  - Inconsistent in revealing information about volume and flow
  - *Marik et al. Based on the results of our systematic review, we believe that CVP should no longer be routinely measured in the ICU, operating room, or emergency department.*

Marik P, Baram M, Vahid B. Does central venous pressure predict fluid responsiveness? A Systematic Review ofthe Literature and the Tale of Seven Mares. Chest 2008;134:172-178

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Temporal order of events

(each event can take minutes to hours)

1. Stroke volume falls
   - Heart rate compensates to keep cardiac output normal
     - Many reasons for heart rate to increase
2. Cardiac output falls
   - Heart rate compensation fails
   - Vasoconstriction (increase in SVR), BP remains unchanged
3. Increased oxygen extraction of hemoglobin
   - Peripheral initially (StO_2)
   - Central later ($ScvO_2$)
4. Blood pressure, urine output change

Evidence (8 RCTs) of Using SV as Endpoint

- Chytra I, Pradl R, Bosman R, Pelnar P, Kasal, Zidkova A. Esophageal Doppler-guided fluid management decreases blood lactate levels in multiple-trauma patients: a randomized controlled trial. Critical Care 2007 Feb 22;11(1):1-9.
- Conway DH, Mayall R, Abdul-Latif MS, Gilligan S, Tackaberry C. Randomized controlled trial investigating the influence of intravenous fluid titration using esophageal Doppler monitoring during bowel surgery. Anesthesia 2002 Sept;57(9):845-849.
- Gan TJ, Soppitt A, Maroof M, El-Moalem H, Robertson K, Moretti E, Dwane P, Glass PS. Goal-directed intra-operative fluid administration reduces length of hospital stay after major surgery. Anesthesiology 2002;97:820-826.
- Mark JB, Steinbrook RA, Gugino LD, et al. Continuous noninvasive monitoring of cardiac output with esophageal Doppler during cardiac surgery. Anesth Anlg 1986;61:1013-1020. (NON RCT)
- McKendry M, McGloin H, Saberi D, Caudwell L, Brady AR, Singer M. Randomized controlled trial assessing the impact of a nurse delivered, flow monitored protocol for optimization of circulatory status after cardiac surgery. BMJ 2004;329(7460):258 (31 July), doi:10.1136/bmj.38156.767118.7C.
- Mythen MG, Webb AR. Peri-operative plasma volume expansion reduces the incidence of gut mucosal hypoperfusion during cardiac surgery. Archives of Surgery 1995;130:423-429.

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Methods of Measuring SV

	Uses	Ease of use	Accuracy	Reimbursed
Doppler – USCOM	Anywhere	Good	Good	–
Doppler (EDM)	OR, ICU	Excellent	Excellent	$$$
ECON	OR, ICU	Good	Fair	–
Bioimpedance	Anywhere	Good	Fair	$
Pulse contour (FloTrac, LiddCo, PICCO)	OR, ICU	Difficult	Fair	–
NICO	OR, ICU	Difficult	Fair	–
PAC	OR, ICU	Difficult	Good	$$
Bioreactance	OR, ICU	Good	Good	–

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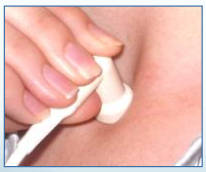
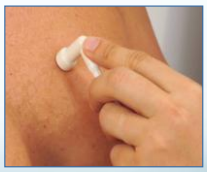
Non Invasive Doppler Measurement of Blood Flow

Allows Both Left & Right Heart Measurement



AORTIC ACCESS



PULMONARY ACCESS

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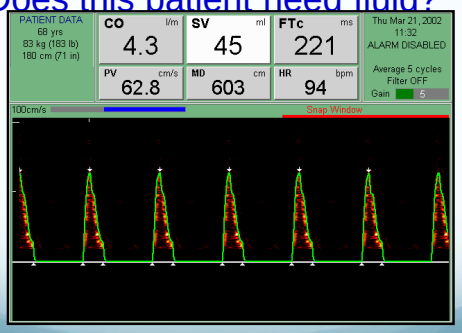
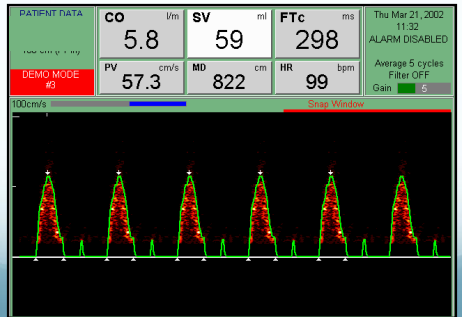
Does this patient need fluid?



Response to fluid bolus – need more fluid or stop?



Any Change in Blood Flow (CO) Should be Compared against an Oxygenation End Point

ScvO2 or StO2

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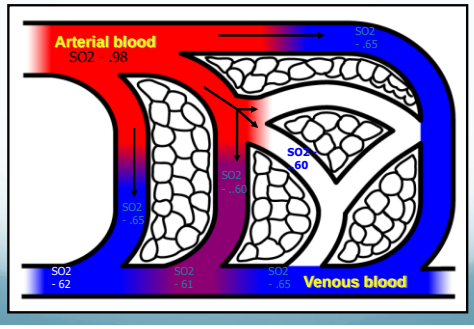
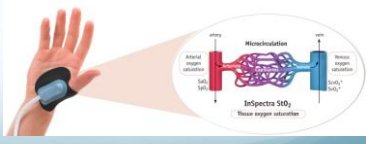
Macrocirculation vs Regional Blood Flow

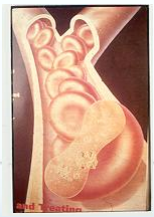


Tissue Oxygenation End Points

- ScvO2 – > 70%
- StO2 – > 75%
- Titration of drugs can occur against these values



Lactate as a easy, early marker for hypoxia



Needs to be repeated to evaluate condition or treatment

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Don't take Vital Signs – Take a Lactate

Lactate Levels and Systolic Blood Pressure (SBP)

Lactate (N=530)	<2 (N=219)	2-4 (N=177)	>4 (N=104)
SBP >90	158/219 (72%)	116/177 (65%)	64/104 (62%)
SBP <90	61/219 (28%)	61/177 (34%)	40/104 (38%)

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Sepsis: 1991 ACCP / SCCM Definitions (no change in 2015)

- Infection
  - Inflammatory response to microorganisms, or
  - Invasion of normally sterile tissues
- Systemic Inflammatory Response Syndrome (SIRS)
  - **Two or more of the following**:
    - Core temperature >38°C or <36°C (>100.4°F or <96.8°F)
    - Elevated heart rate (>90 beats/min)
    - Respiratory rate >20 breaths/min or $PaCO_2$ <32 mm Hg or mechanical ventilation for acute respiratory process
    - WBC count >12,000/mm^3 or <4,000/mm^3 or >10% immature neutrophils

Bone RC, et al. *Chest* 1992;101:1644-55.

Sepsis: 1991 ACCP / SCCM Definitions (cont)

Infection/ Trauma	SIRS	Sepsis	**Severe Sepsis**

- Sepsis
  - Known or suspected infection, plus
  - ≥2 SIRS criteria
- Severe Sepsis
  - **Sepsis plus**
  - **≥1 organ dysfunction**
- Septic Shock
  - Sepsis with
  - Hypotension despite fluid resuscitation, and
  - Perfusion abnormalities

Bone RC, et al. *Chest* 1992;101:1644-55.

New Definitions

New Sepsis Definition qSOFA

- An alteration in mental status (not the GCS)
- A decrease in SBP of less than 100 mm Hg
- A respiratory rate > 22 bpm

Key Differences in New Definition

- Sepsis as infection and 2 or more SIRS is now just an infection
- Severe sepsis is now sepsis
- Septic shock is
  - Blood lactate > 2 mmol/L despite volume resuscitation
  - Hypotension that persists after fluid resuscitation and requires vasopressors
- Sepsis definition now will carry a higher risk of death and increased ICU LOS

Rationale for New Definition

- Based on review of 2 million patients in sepsis studies
- SIRS based on expert opinion
- SIRS should still be used when evaluating sepsis

Campaign Bundles – April 2015

TO BE COMPLETED WITHIN 3 HOURS OF TIME OF PRESENTATION*:

1. Measure lactate level
2. Obtain blood cultures prior to administration of antibiotics
3. Administer broad spectrum antibiotics
4. Administer 30ml/kg crystalloid for hypotension or lactate ≥4mmol/L

   * *"Time of presentation" is defined as the time of triage in the emergency department or, if presenting from another care venue, from the earliest chart annotation consistent with all elements of severe sepsis or septic shock ascertained through chart review.*

Remains the Same

TO BE COMPLETED WITHIN 6 HOURS OF TIME OF PRESENTATION:

5. Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥65mmHg
6. In the event of persistent hypotension after initial fluid administration (MAP < 65 mm Hg) or if initial lactate was ≥4 mmol/L, re-assess volume status and tissue perfusion and document findings according to Table 1.
7. Re-measure lactate if initial lactate elevated.

New Volume and Tissue Perfusion Elements

TABLE 1

DOCUMENT REASSESSMENT OF VOLUME STATUS AND TISSUE PERFUSION WITH:

EITHER

- Repeat focused exam (after initial fluid resuscitation) by licensed independent practitioner including vital signs, cardiopulmonary, capillary refill, pulse, and skin findings.

OR TWO OF THE FOLLOWING:

- Measure CVP
- Measure $ScvO_2$
- Bedside cardiovascular ultrasound
- Dynamic assessment of fluid responsiveness with passive leg raise or fluid challenge

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The resuscitation challenge

The Sepsis Trilogy

ProCESS

Protocolized Care for Early Septic Shock (ProCESS) – 31 ED's in US

ARISE

Australasian Resuscitation in Sepsis Evaluation (ARISE) – 51 ED's in Australia, New Zealand, Finland, Hong Kong, Ireland

ProMISe

The Protocolised Management in Sepsis (ProMISe) Trial – 56 ED's in the UK

Dr Salim Rezaie Clinical Assistant Professor of EM and IM at UTHSCSA

ProMise, ProCess and ARISE Trials

- Key points
  - Fluid administration similar in both control and experimental groups
  - Vasopressor use similar in both groups
  - Antibiotics administered similarly in both groups
  - Lactates obtained in both groups
  - Mortality rates (<20%) is not as common outside centers with well designed sepsis recognition/management programs
- Problems– Antibiotics and fluids given in both control and experimental groups within 3 hours.
  - Hawthorne Effect Likely
    - Contamination of practice

Take away Points

- If Patients are
  - identified early,
  - Receive antibiotics EARLY
  - receive IVF EARLY
- Then ScvO2 and CVP monitoring does not seem to add a benefit
- BUT EGDT with ScvO2 not really tested since resuscitation had already occurred

Types of Fluids

- Is normal saline normal?
- Lactated Ringers vs normal saline – are they comparable?

Setting Goals

- Discuss goals of care and prognosis with patients and families (grade 1B).
  - Sepsis has a high mortality rate. Families should understand and recognize that determining what the patient's wishes are may help dictate the aggressiveness of therapy
- Incorporate goals of care into treatment and end-of-life care planning, utilizing palliative care principles where appropriate (grade 1B).
- Address goals of care as early as feasible, but no later than within 72 hours of ICU admission (grade 2C)

Implementing Sepsis Protocols

Benefits and Barriers

- Improved
  - Patient identification
    - Coding and reimbursement
    - SOI/ROM
  - Reduced mortality
  - Improved compliance with bundles
- Barriers
  - Multidisciplinary cooperation
  - Funding
  - Education

Where are we at from a National Public Health standpoint

- NYS: Rory's Regulation, you can look up the data dictionary to see what is being collected
- NQF: CMS – Public reporting, some time in 2016
- CDC – sepsis page: url: http://www.cdc.gov/sepsis/
- Staunton Foundation: url: http://rorystaunton.com/

JC Sepsis Designated Centers (late 2014)

Orange Park Medical Center	Orange Park	FL
Memorial Healthcare	Jacksonville	FL
Specialty Hospital Jacksonville	Jacksonville	FL
Grand Strand Medical Center	Myrtle Beach	SC
Colleton Medical Center	Walterboro	SC
Trident Medical Center	Charleston	SC
Mercy Health Youngstown	Youngstown	OH

Four process or outcome measures to monitor on an ongoing basis

Select from the universe of measures;
or – Create your own measures

Two of the measures must be clinical

Other two measures can be clinical, administrative, utilization, or satisfaction

Examples

Repeat lactate within 6 hours if initial lactate > 2.0

Order lactates with every blood culture order

Blood cultures drawn prior to antibiotic Administration

Fluids given within 3 hours of time zero

SBAR on Sepsis Regulation

Situation

The third edition of "Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock: 2012?" appeared in the February 2013 issues of Critical Care Medicine and Intensive Care Medicine. Furthermore, the New York State Department of Health has required hospitals to have standardized care protocols and reporting requirements established by December 2013. NYCRR Parts 405.2 and 405.4 requires hospital protocols for severe sepsis and septic shock for adults and for children.

Background

The incidence and impact of severe sepsis is generally underappreciated; it is the 10th leading cause of death in the United States, with an estimated 750,000 hospitalizations each year, a mortality rate of 30%–50%, and costs the health care system an estimated $17 billion.

With the incidence of severe sepsis increasing, largely owing to an aging population, there is an undeniable need for a targeted focus on early recognition and consistent, standardized treatment that is shown to improve outcomes in patients with severe sepsis and septic shock.

Assessment

Consistent with the regulation, all hospitals will be required to implement such protocols on or before December 31, 2013. Protocols shall apply to all patients in the hospital except those specifically excluded, and include use of explicit algorithms and/or alert systems to assist in the early identification of patients with severe sepsis and septic shock including an approach to stratifying patients into sepsis, severe sepsis, and septic shock based on a constellation of appropriate clinical and laboratory findings. Protocols directed at treatment should address both ER and inpatient presentations of severe sepsis and septic shock for adults and for children. The Kaleida Health protocols were reviewed and accepted by the NYSDOH and IPRO.

Recommendation/Requirement

Medical staff is mandated by the DOH to receive Sepsis education. Per the regulation: The NYS mandate requires that all Medical Staff providers, residents, nursing staff, pharmacy staff, and labratorians complete our hospital-based education program.

CMS Core Measure

- **Measure Description:** This measure will focus on patients aged 18 years and older who present with symptoms of severe sepsis or septic shock. These patients will be eligible for the 3 hour (severe sepsis) and/or 6 hour (septic shock) early management bundle.
- **Numerator Statement:** If:

  measure lactate level

  obtain blood cultures prior to antibiotics

  administer broad spectrum antibiotics

  administer 30 ml/kg crystalloid for hypotension or lactate >=4 mmol/L

Sepsis Funding by the NIH

	New Cases	Deaths	NIH $ (million) (yr)
Breast Ca	232620 (2010)	39,520 (2010)	$712 (2011)
Colorectal Ca	141210 (2010)	49,380 (2010)	$313 (2011)
Lung Ca	221130 (2010)	156,940 (2010)	$221 (2011)
Pancreatic Ca	44030 (2010)	37,600 (2010)	$113 (2011)
HIV/AIDS	~50000 (2011)	7,638 (2011)	$3,059 (2011)
CAD		374,601 (2011)	$437 (2011)

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Pancreatic Ca	44030 (2010)	37,600 (2010)	$113 (2011)
HIV/AIDS	~50000 (2011)	7,638 (2011)	$3,059 (2011)
Anthrax	0	0	$87 (2011)
Sepsis (Iwashyna, 2008)	1,000,000 (2008)	348,000 (2008)	$43 (2008)

Summary

- Recognize Sepsis Early
- Treatments quickly
  - Lactate
  - Cultures or remove source of infection
  - Antibiotics
  - Fluids
    - Pressors
    - Steroids
  - EOL discussion

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