



**NORTHWEST
COMMUNITY
EMERGENCY
MEDICAL
SERVICES
SYSTEM**

August 2018

Continuing Education



Questions and comments are welcome and should be directed to
Connie Mattera, MS, RN, EMT-P, EMS Administrative Director



First, a message from our
Medical Director

https://www.youtube.com/watch?v=Bfv_9aJmChg&t=9s



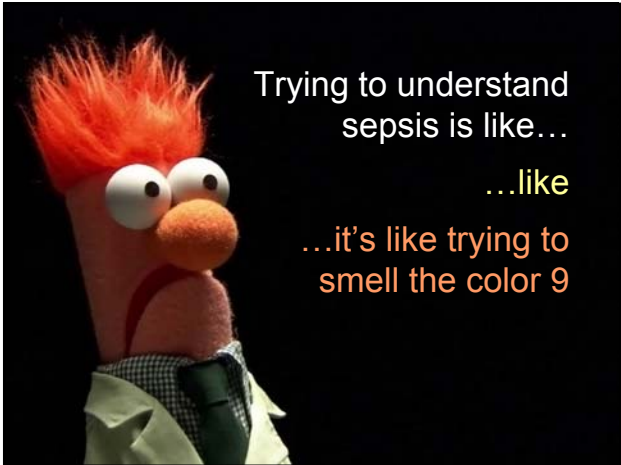
12 minutes

Take home points
Once arrest started, continue with that monitor UNLESS an older unit without software capabilities.
Zoll puck/pads remain in use during ENTIRE arrest regardless of CPR method
Physio feedback puck to be used throughout arrest – ONLY exception is to DC puck once back plate of CPR device is placed.
Need to determine acquisition of Physio puck data
When Physio puck is DC'd and manual CPR is still being performed, the monitor metronome must be activated.
No pause in compressions >10 sec; prefer < 5 sec.
Do not use CPR device on small pts that would need padding to make it fit; mark chest with Sharpie to assess for migration of device
ETCO ₂ reading within 90 sec of monitor application and first breath (consider exception when using apneic oxygenation)
Find pulse while compressions in place prior to rhythm check. When CPR paused, should know in 3 sec if present or absent. No pulse, resume CPR.

2nd video – Getting pts into a device in < 10 sec

https://drive.google.com/file/d/1vx7x06Svmp41CcJDl0RuZi5_E1Hw2sIW/view

Yes	No	QI Elements
		ETCO ₂ < 90 sec from monitor turned on and/or first ventilation
		Average compression rate 100-110
		Any CPR pause >10 sec? How many?
		Average depth of compressions



Enduring understanding

Expert EMS knowledge and skill are required to rapidly identify a person at risk for sepsis or septic shock and to provide immediate evidence-based assessment, care, and effective communication so hospitals are alerted to the impending arrival of these critical patients for multidisciplinary integration, care coordination, and optimal outcomes.

Essential question

Does the implementation of a peer-reviewed and validated EMS assessment and management strategy for sepsis patients along with the use of SBAR sepsis alerts increase the effectiveness of EMS care and facilitate a seamless handover and timely treatment in the EDs with better patient outcomes?

Upon completion, the participant will

- explain high performance cardiac arrest management.
- differentiate infection, sepsis and septic shock based on Hx & PE.
- sequence EMS care priorities for sepsis and septic shock.

MANY OF THESE DEATHS ARE PREVENTABLE

SEPSIS INTRODUCTION - FACTS ABOUT SEPSIS

258,000 Americans die from Sepsis each year

5+ million children worldwide die from Sepsis each year

1.6 million cases of Sepsis in the U.S. every year

55% of Americans have ever heard of the word "SEPSIS"

Sepsis is the third leading cause of death in the U.S. after heart disease and cancer

Sepsis the Equal Opportunity Killer

Impact: US prevalence: ~300 cases/100,000 people \$20 billion+/yr or 5.2% of US health costs on sepsis

Why the increase?

Drug resistant bacteria

Aging population

Medical advances: more surgeries, medical devices, and invasive Rx

Weakened immune systems

Every 2.3 minutes, sepsis kills a patient in the U.S.*

Sepsis Readmission Rates

Sepsis is the No. 1 killer of hospital patients. It is a condition that arises when the body's response to an infection injures its own tissues and organs. Nationally, hospital readmissions* of patients who suffered sepsis far outpace the four medical conditions that the federal government tracks to gauge hospital performance.

Percentage of hospital readmissions

Sepsis	12.2%
Heart Failure	6.7%
Pneumonia	5.0%
COPD	4.6%
Heart attack	1.3%

Estimated average cost per readmission

Sepsis	\$10,070
Pneumonia	\$9,533
Heart attack	\$9,424
Heart Failure	\$9,051
COPD	\$8,417

*30-day readmission, 2015 Nationwide Readmissions Database
Source: Mayr, et al., JAMA, 2017

UPMC
LIFE CHANGING MEDICINE

What do our numbers look like?
Data report run weekly

qSOFA patients with Suspected Infection - Hospital Transport			
Incident Date	Agency Name	Incident Number	Patient Age In Years
Destination Hospital: Advocate Condell Medical Center			
12/18/2017	Livestrong/Riverside FPD	17-00046171	63
12/24/2017	Buffalo Grove Fire	17-4640-28	54
12/25/2017	Livestrong/Riverside FPD	17-00046522	71
12/29/2017	Livestrong/Riverside FPD	17-00046781	87
01/05/2018	Rock/Rescue Eight - NMC	NMRP118-000058	84
01/10/2018	Advantage Ambulance	8833	87
01/19/2018	Livestrong/Riverside FPD	18-00002811	80
01/23/2018	Livestrong/Riverside FPD	18-00001331	89
02/04/2018	Livestrong/Riverside FPD	18-00001628	52
02/21/2018	Livestrong/Riverside FPD	18-00002829	85
03/02/2018	Livestrong/Riverside FPD	18-00004238	84
04/05/2018	Livestrong/Riverside FPD	18-00004834	90
04/09/2018	Advantage Ambulance	8785	62
04/29/2018	Advantage Ambulance	82475	62
05/05/2018	Livestrong/Riverside FPD	18-00002427	73
05/08/2018	Advantage Ambulance	89148	89
05/12/2018	Livestrong/Riverside FPD	18-00002876	89
05/15/2018	Livestrong/Riverside FPD	18-00003882	79
07/19/2018	Advantage Ambulance	131885	68
Count:			19
Destination Hospital: Advocate Good Shepherd Hospital			
12/18/2017	Barrington Fire Department	F17-41834	97
12/24/2017	Barrington Countywide FPD	F17-61427	83
12/27/2017	Long Grove Fire	17-18124-48	89
12/28/2017	Lake Zurich Fire / Rescue	17-03831	17
12/29/2017	Lake Zurich Fire / Rescue	17-03843	84
12/30/2017	Lake Zurich Fire / Rescue	17-03846	89
01/01/2018	Lake Zurich Fire / Rescue	18-000113	82

Per destination hospital 12/17 - 7/18
Suspected infection + qSOFA ≥2

Advocate Condell	19
Advocate GSH	64
Advocate LGH	71
Amita Alexian Brothers	116
Amita Glen Oaks	50
Amita St. Alexius	57
Glenbrook	19
Northwest Community	215
Total	609
Infants to 100	

NEW SUPPLEMENTAL SEPSIS/INFECTION QUESTION

- A New Supplemental Question was previously added to the Template.
- Within the "Supplemental Questions" tab.
- On Monday, December 18th, new validity rules will be implemented.
- The box will turn red and require an answer.

Supplemental Questions

When your qSOFA score is 2 or greater

Sepsis / Septic shock
Patient Blood Count

• GCS < 15
• RR ≥ 22
• SBP ≤ 100

Full Template View

Full Template View

Supplemental Questions

When your qSOFA score is 2 or greater

Sepsis / Septic shock
Patient Blood Count

• GCS < 15
• RR ≥ 22
• SBP ≤ 100



Northwest Community EMS System
Provider Based Performance Improvement
2018

Aspect of Care: Sepsis Recognition

Purpose: To review incidents that may or may not involve a septic patient. To determine if system parameters are properly recognizing that patients that meet qSOFA (Quick Sequential Organ Failure Assessment) criteria are septic and calling Sepsis Alerts. To determine if septic shock patients are receiving the appropriate interventions when required per SOP.

Population: All Patient Care Reports with a patient over the age of 18 having a qSOFA score of 2 or 3 (RR≥22, SBP≤100, GCS≤15) and a Suspected Infection. Any incident with a patient disposition of "Arrest/TOR" or "DOA/DNR" will be excluded.

Date range: December 18, 2017 – May 31, 2018

Measurements to be Reported: Average Patient's Age – average age of the each patient included in the query.

Patient Age Counts – number of patients within the query for the following age groups: 18 to <30, 30 to <40, 40 to <50, 50 to <60, 60 to <70, 70 to <80, 80 to <90, 90 to <100, 100 to <110, 110 to <120, 120 to <130, 130 to <140, 140 to <150, 150 to <160, 160 to <170, 170 to <180, 180 to <190, 190 to <200, 200 to <210, 210 to <220, 220 to <230, 230 to <240, 240 to <250, 250 to <260, 260 to <270, 270 to <280, 280 to <290, 290 to <300, 300 to <310, 310 to <320, 320 to <330, 330 to <340, 340 to <350, 350 to <360, 360 to <370, 370 to <380, 380 to <390, 390 to <400, 400 to <410, 410 to <420, 420 to <430, 430 to <440, 440 to <450, 450 to <460, 460 to <470, 470 to <480, 480 to <490, 490 to <500, 500 to <510, 510 to <520, 520 to <530, 530 to <540, 540 to <550, 550 to <560, 560 to <570, 570 to <580, 580 to <590, 590 to <600, 600 to <610, 610 to <620, 620 to <630, 630 to <640, 640 to <650, 650 to <660, 660 to <670, 670 to <680, 680 to <690, 690 to <700, 700 to <710, 710 to <720, 720 to <730, 730 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THE RORY STAUNTON FOUNDATION

FOR SEPSIS PREVENTION



Our Sepsis Stories

We hear from many families from around the country whose loved ones or who themselves have been affected by sepsis. We offer an opportunity for people to advocate and tell their stories and then we most importantly compile these special stories from around the country. We thank all the family members who have shared their stories with us, and who have allowed us to share them with you too. These stories illustrate all too clearly that sepsis does not discriminate – regardless of age, gender, health or location, you can be effected by sepsis – and these stories make us more determine than ever to achieve our 2020 Vision: to have Rory's Regulations enacted across all 50 States by 2020.

SEPSIS FACT SHEET

A POTENTIALLY DEADLY OUTCOME FROM AN INFECTION

What is sepsis?
Sepsis is the body's overreacting and life threatening response to an infection which can lead to tissue damage, organ failure, and death.


What can you get sepsis?
Sepsis can occur to anyone, at any time, from any type of infection, and can affect any part of the body. It can occur even after a minor infection.

What causes sepsis?
Any type of infection that is anywhere in your body can cause sepsis, including infections of the skin, lungs such as pneumonia, urinary tract, abdomen (such as appendicitis), or other part of the body. It is also more common when germs enter a person's body and multiply, causing illness and organ and tissue damage.

Who gets sepsis?
Anyone can get sepsis as a bad outcome from an infection, but the risk is higher to:
• people with weakened immune systems
• babies and very young children
• elderly people
• people with chronic diseases, such as diabetes, AIDS, cancer, and kidney or liver disease
• people suffering from a severe burn or wound

Ask your doctor about your risk for getting sepsis.

What are the symptoms of sepsis?
There is no single sign or symptom of sepsis. It is, rather, a combination of symptoms. Since sepsis is the result of an infection, symptoms can include infection signs, allergies, vomiting, sore throat, etc., as well as most of the symptoms below.



Sepsis and Children

77% of parents know the word sepsis.
Only 28% can identify the common signs.

Sepsis kills more children than childhood cancers every day in the U.S.

41% of parents think children can only get sepsis if they are already in the hospital.

The reality is as many as 92% of sepsis cases originate in the community from everyday occurrences like a scrape on the playground that becomes infected or the flu.

Largest Killer of Children Around the Globe
More than 3 million children around the world die from sepsis every year.

WHAT IS SEPSIS?

258,000 8,000,000
DEATHS WORLDWIDE ANNUALLY
1 in 3 AMERICANS WILL BE AFFECTED BY SEPSIS AT SOME POINT IN THEIR LIVES

SEPSIS SYMPTOMS
S: SHIVERING, FEVER, OR CHILLS
E: OTHER TWO OR MORE OF THESE
P: FAST HEART RATE
S: FAST BREATHING OR RAPID BREATHING
S: PAIN OR SWELLING

NUMBER ONE
THE LEADING CAUSE OF DEATH IN HOSPITALS
THE LEADING CAUSE OF HOSPITAL READMISSIONS
THE SINGLE BIGGEST COST TO HOSPITALS OVER BILLION DOLLARS

IDENTIFY COMMON SYMPTOMS
AVERAGE CITY OF AMERICANS CAN EXPECT ONE PERSON TO GET SEPSIS EVERY YEAR
-1% CAN SURVIVE THE FIRST HOUR

CONTAGIOUS?
39% OF AMERICANS INCORRECTLY BELIEVE SEPSIS IS CONTAGIOUS

THERE IS NO SIMPLE TEST OR CURE FOR SEPSIS
SEPSIS CAN BE PREVENTED BY PREVENTING INFECTIONS AND CAN BE TREATED SUCCESSFULLY IN MOST CASES WITH EARLY RECOGNITION AND TREATMENT

SOUND THE ALARM
IF YOU SUSPECT YOUR OR A LOVED ONE MAY HAVE SEPSIS, GET MEDICAL ATTENTION IMMEDIATELY OR CALL 911 AND SAY "I AM CONCERNED ABOUT SEPSIS."

YOU CAN HELP SAVE LIVES FROM SEPSIS. GET INVOLVED AT SEPSIS.ORG

SEPSIS ALLIANCE
Support Sepsis. Save Lives.

SEPSIS

IS A RARE BUT SERIOUS COMPLICATION OF AN INFECTION

If your child has any of these symptoms you should take immediate action:

- Looks mottled, bluish or pale
- Is breathing very fast
- Is very lethargic or difficult to wake
- Has a rash that does not fade when you press it
- Feels abnormally cold to touch
- Has a fit or convulsion

Acting quickly could save your child's life. If your child has any of these symptoms, don't be afraid to go to A&E immediately or call 999.

For more information visit nhs.uk/sepsis or sepsistrust.org

THE UK SEPSIS TRUST

GET AHEAD OF SEPSIS

KNOW THE RISKS. SPOT THE SIGNS. ACT FAST.



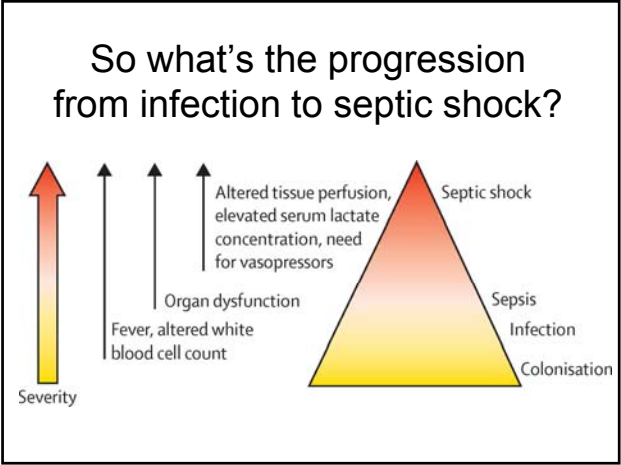
Goals of EMS Sepsis Management

Early identification of **high risk** patients

Spot the signs:
Early recognition of acidosis & organ dysfunction

Act fast:
Early OLMC to expedite preparation for patient

Restore BP; normalize perfusion, preserve organ function



Causes of infection

Whatever organism has invaded the body

Ex: bacteria, virus, fungi, protozoa, parasites, and prions

Leading causes of sepsis: UTI, pneumonia, GI, wounds

Post-op

Who is at risk?

Very young or old

Chronic illnesses: DM, cirrhosis, autoimmune, renal

Immunocompromised: post-transplant, HIV/AIDS, splenectomy, sickle cell disease

Immunosuppressive therapy: chemo, steroids

Bedridden or immobile

Addictive habits (drugs, alcohol); malnourished, debilitated

Who else is at risk?

Recent trauma or surgery

Breached skin integrity (wounds, burns)

Recent dental work

Indwelling devices/ catheters

Females - recent birth, miscarriage, abortion

From local Infection to bacteremia, general inflammation, and sepsis

Local infection overcomes body's local defense mechanisms

Pathogens and toxins they produce leave site of origin and enter circulatory system

Leads to general inflammatory response

Can quickly spiral out of control → tissue damage, organ failure and death

Sepsis starts with onset of at least one organ dysfunction



'SEPSIS 3'

The Third International Consensus Definitions for Sepsis and Septic Shock

SCCM, ESICM taskforce

JAMA. 2016;315(8):801-810

Clinical Review & Education

Special Communication 1 CARES FOR THE CRITICALLY ILL PATIENT

The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

Horng J, et al. JAMA. 2016;315(8):801-810.

Research

Original Investigation 1 CARES FOR THE CRITICALLY ILL PATIENT

Assessment of Clinical Criteria for Sepsis For the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

Christie M, et al. JAMA. 2016;315(8):801-810.

Research

Original Investigation 1 CARES FOR THE CR

Developing a New Definition and Assessing New Clinical Criteria for Septic Shock For the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)

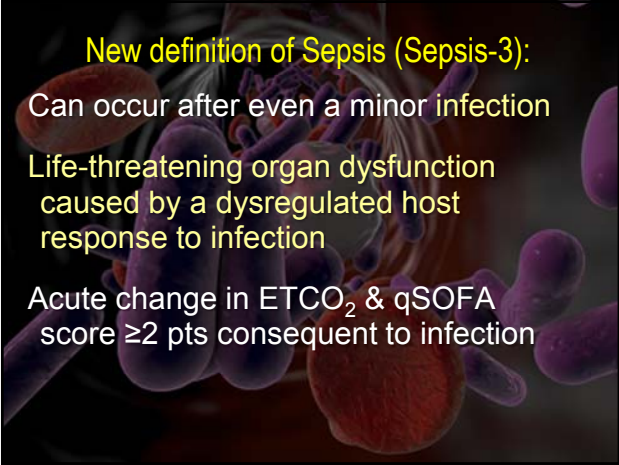
Christie M, et al. JAMA. 2016;315(8):801-810.

New definition of Sepsis (Sepsis-3):

Can occur after even a minor infection

Life-threatening organ dysfunction caused by a dysregulated host response to infection

Acute change in ETCO₂ & qSOFA score ≥2 pts consequent to infection

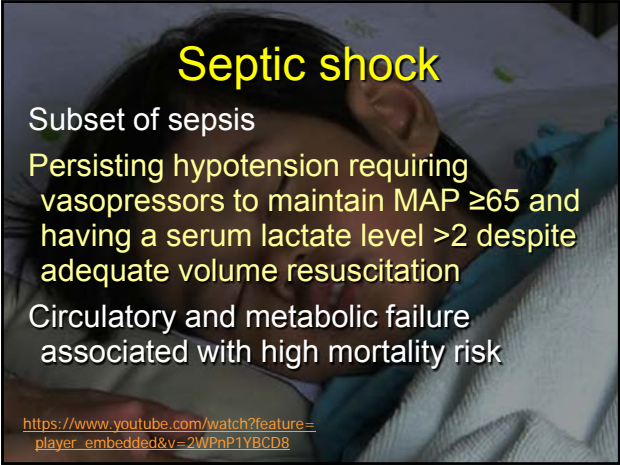


Septic shock

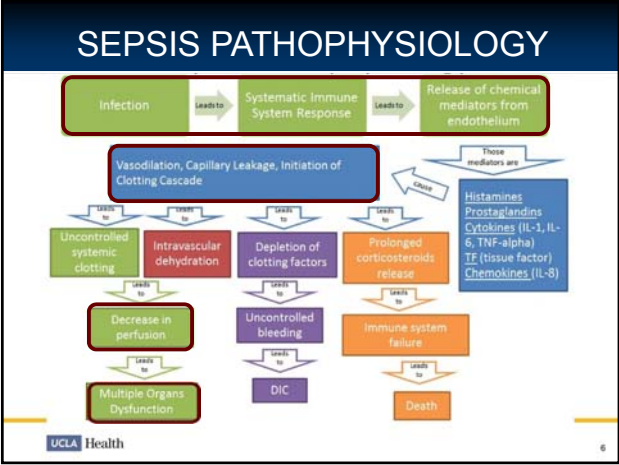
Subset of sepsis

Persisting hypotension requiring vasopressors to maintain MAP ≥65 and having a serum lactate level >2 despite adequate volume resuscitation

Circulatory and metabolic failure associated with high mortality risk



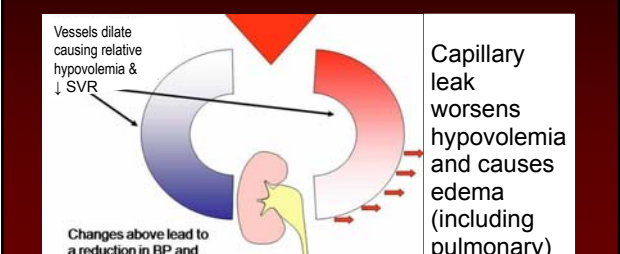
https://www.youtube.com/watch?feature=player_embedded&v=2WpNp1YBCD8



Arterial and venous dilatation

Vascular smooth muscle fails to constrict

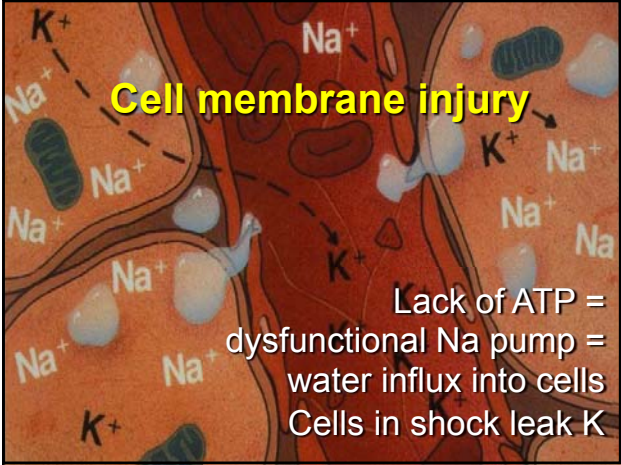
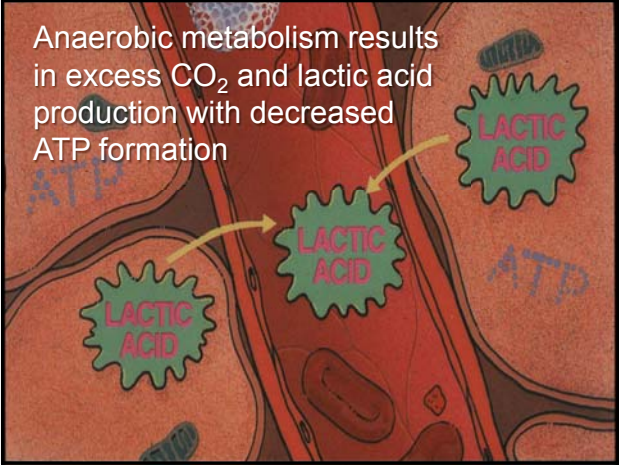
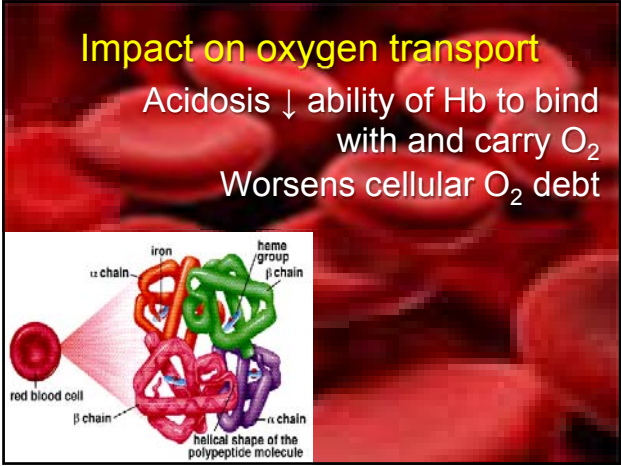
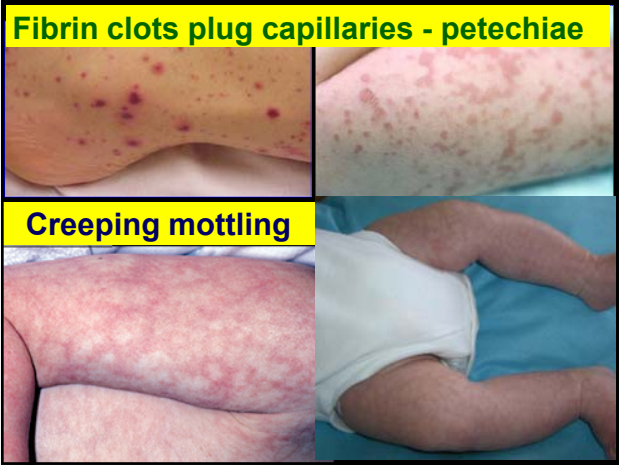
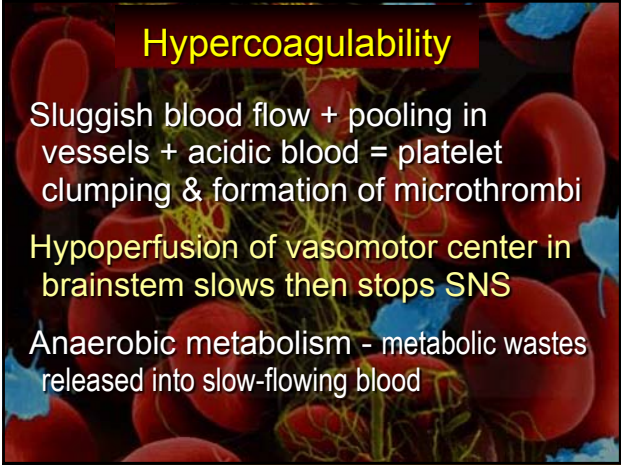
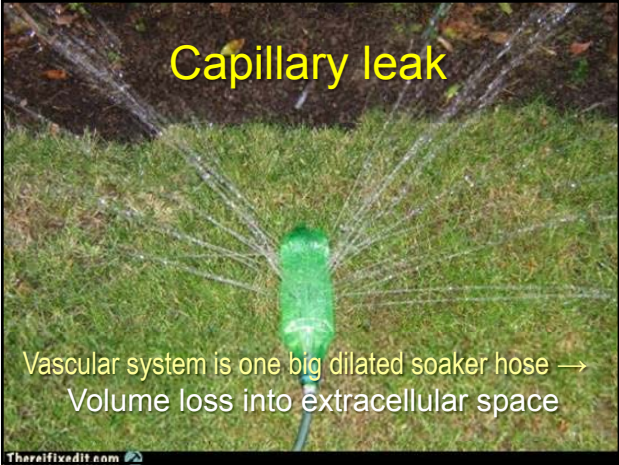
Profound venodilation in splanchnic and cutaneous beds = ↓ venous return and CO



Vessels dilate causing relative hypovolemia & ↓ SVR

Capillary leak worsens hypovolemia and causes edema (including pulmonary)

Changes above lead to a reduction in BP and organ perfusion



Sepsis: Significance for EMS

Up to 80% of sepsis deaths could be prevented with rapid diagnosis and treatment!

Illness progression – can happen FAST!

Infection	Sepsis	Septic shock	Death
Acquired	Acidosis + Blood vessel problems	Circulatory collapse	

Photo courtesy Rommie Duckworth

KNOW YOUR SEPSIS SIX

1. Assess for infection
2. Assess ETCO₂
3. Assess qSOFA
4. Give oxygen
5. Fluid challenges
6. Norepinephrine for persistent ↓ BP

Infection

Acidotic

- Suspected: (Fever, UTI, URI)
- Known: Taking antibiotics, visible

- ETCO₂ <31
- Lactate level >2 mmol/L

Assess qSOFA

SBP ≤100 GCS < 15 RR ≥22

Above + qSOFA ≥2 = **SEPSIS ALERT**

Infection?

Meds: antibiotic, antifungal?

- Fever
- Chest: Cough, sputum, pain, dyspnea
- Abdomen: Pain, distension, diarrhea
- Urine: (Foley?); Frequency/dysuria, odor, cloudy
- Neuro: AMS, headache, neck stiffness
- Skin: Warm/hot (cold); local redness, warmth, swelling, wounds
- Bone/joint – pain, swelling
- New onset fatigue, weakness; sore throat/ earache
- Central line?

Use the *right tools the right way!*

If low, validate on another site - use a central sensor

ETCO₂ in Sepsis

Metabolic acidosis triggers ↑ RR to “blow off” escalating body CO₂

Same time: hypoperfusion ↓ blood return to lungs/alveoli

Minimal CO₂ exhaled - ETCO₂ LOW

Evidence Supports Using End-Tidal Carbon Dioxide to Detect Prehospital Sepsis

Wed, Aug 10, 2016

By David Amayo, MBS, BA, EMT-B

Photo courtesy: Ronnie Duckworth

The term “sepsis” was originally used over 2,700 years ago in the poems of Homer and in the writings of Hippocrates to describe the processes of “rotting” or “decaying.”^{1,2} Sepsis is a major cause of emergency department (ED) visits and results in significant morbidity and mortality.³

With over a million Americans suffering from sepsis per year, the annual total treatment costs exceed \$20 billion,^{4,5} making septicemia the most expensive inpatient condition to treat in the United States.⁶

A prehospital screening tool utilizing end-tidal carbon dioxide predicts sepsis and severe sepsis

Christopher L. Haste, MD, PhD; Correspondence: Salwa Shihimi, MD, George Rali, MD, Amanda Stoss, MD, Aranya Walker, MD, Linda Papa, MD, MSc

Annals of Emergency Medicine May 2015; Volume 34, Issue 5, Pages 813-819

[http://www.annemergmed.com/article/S0736-5951\(15\)00027-9#](http://www.annemergmed.com/article/S0736-5951(15)00027-9#)

Abstract

Objective

To determine the utility of a prehospital sepsis screening protocol utilizing systemic inflammatory response syndrome (SIRS) criteria and end-tidal carbon dioxide (ETCO₂).

Methods

We conducted a prospective cohort study among sepsis alerts activated by emergency medical services during a 12-month period after the initiation of a new sepsis screening protocol utilizing ≥2 SIRS criteria and ETCO₂ levels of ≥25 mmHg in patients with suspected infection. The outcomes of those that met all criteria of the protocol were compared to those that did not. The main outcome was the diagnosis of sepsis and severe sepsis. Secondary outcomes included mortality and in-hospital lactate levels.

Lactate Pro Meter

Lactate (Lactic acid)

- Level – venous: 0.5 - 2.2 mmol/L
- An increased lactate level is an indirect measure of tissue hypoxia and a approximation of the magnitude, duration and potential severity of shock.
- Trending of lactate levels
 - Can describe the natural history of sepsis
 - Guide therapy
 - Predict outcome
- Lactate Metabolism ->
- Removal
 - 60% Liver
 - 30% Kidneys
 - 10% Heart/Muscle

ETCO₂ & lactate levels

ETCO₂ INVERSELY related to lactate

Lactate ≥ 2 (ETCO₂ 31) - sepsis

Lactate ≥ 4 (ETCO₂ 25) – likely septic shock & assoc. w/ high mortality

ETCO ₂ / Lactate Correlation	
31	↔ 2
25	↔ ≥4

SEPSIS CLINICAL CRITERIA

INFECTION

ETCO₂ < 31

CHANGE IN: SEPSIS-RELATED ORGAN FAILURE ASSESSMENT ≥ 2

SBP ≤ 100

GCS < 15 or 1 pt < their normal

RR ≥ 22

Manual or machine? What are the standards?

</

Causes of hypotension

vasodilatory
sepsis
anaphylaxis
neurogenic

obstructive
tension pneumothorax
cardiac tamponade
pulmonary embolism

cardiogenic
arrhythmia
ischemia
valvulopathy
myopathy

toxicologic
calcium channel blocker
beta blocker
clonidine
digoxin
opioids
sedatives
valproic acid
TCA
phenothiazine
CO, CN⁻

hypovolemic
hemorrhage
chest
abdomen
retroperitoneum
GI tract
high street

metabolic
vomiting, diarrhea
inadequate fluid intake
diuresis, hyperglycemia
diaphoresis, hyperthermia
cirrhosis, pancreatitis, burn

hypoadrenalism
hypo/hyperthyroidism

spurious
equipment or technique failure

Other SEPSIS Signs and Symptoms

S	E	P	S	I	S
SHIVERING, FEVER, OR VERY COLD	EXTREME PAIN OR DISCOMFORT	PALE OR DISCOLORED SKIN	SLEEPY, DIFFICULT TO ROUSE, CONFUSED	"I FEEL LIKE I MIGHT DIE"	SHORT OF BREATH

Don't forget the Peds triangle

Appearance
Tone
Interactiveness
Gaze
Cry
Consolability

Work of Breathing
Breath sounds
Positioning
Retractions
Nasal flaring

Circulation
Pallor
Mottling
Cyanosis

Data says...

For each hour that passes after onset of hypotension, survival drops 7.6%

Prehospital IVF assoc. w/ ↓ odds of death

Pts are 3X more likely to survive to hospital discharge when **EMS** reports **sepsis alert**

Pts receive IVF, vasopressors, & antibiotics much sooner if they arrive by EMS, esp if **sepsis alert** is reported by **EMS**!

EMS Sepsis Management

1. IMC special considerations:

- Rapidly assess patient for risk factors, S&S suggesting **INFECTION*** and infectious source - IF YES
- Assess oxygenation: Use central sensor for SpO₂ if pt has poor peripheral perfusion (cold hands)
- Assess ETCO₂ readings, **low levels (<31)** suggest hyperventilation, poor perfusion to lungs, and/or metabolic acidosis. Good correlation between ETCO₂ and venous lactate levels. If ETCO₂ <31:
- Assess **qSOFA** (Quick Sequential [Sepsis-related] Organ Failure Assessment) **criteria**
 - AMS (GCS <15), **assess for disorientation/agitation and/or GCS 1 or more points below patient's baseline**
 - RR ≥22
 - SBP ≤100 (note if 22 criteria are present)
- Trend pulse pressures (normal 30-50) and mean arterial pressure (MAP = DBP + 1/3 PP) (normal 70-110) q 5 minutes. **These pts can crash rapidly.**
- Elderly & those with pre-existing HTN, cannot tolerate hypotension for even a short time.
- Assess S&S of **fluid depletion**: orthostatic VS changes if not hypotensive; poor skin turgor, dry mucosae
- Vascular access & IVF- See below
- Assess blood glucose; anticipate hyperglycemia and electrolyte abnormalities

Warm Stage (6-24 hrs) Tachypnea, Hyperdynamic phase with high cardiac output, SBP 25% < normal, fever, vasodilation, skin hot, dry, flushed

Cold Stage (ominous/late) AMS, T< 96.8 F, skin cold, mottling, HR increases, hypotension profound, RR increased

Septic shock Biphasic presentation

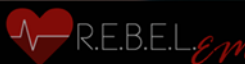
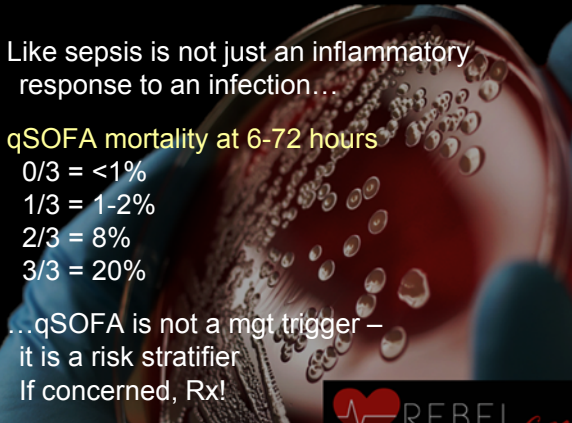
Early: Warm Stage	Late: Cold Stage
Hyperdynamic response	Ominous/decompensation
6-24 hrs	AMS
Tachypnea	Temp < 96.8 F
High cardiac output	Skin cold
SBP 25% < normal	Mottling
Fever	HR increases
Vasodilation	Hypotension profound
Skin: hot, dry, flushed	RR increased

Like sepsis is not just an inflammatory response to an infection...

qSOFA mortality at 6-72 hours

- 0/3 = <1%
- 1/3 = 1-2%
- 2/3 = 8%
- 3/3 = 20%

...qSOFA is not a mgt trigger – it is a risk stratifier
If concerned, Rx!



If patient comatose or an aspiration risk - consider need for advanced airway; support ventilations/oxygenation



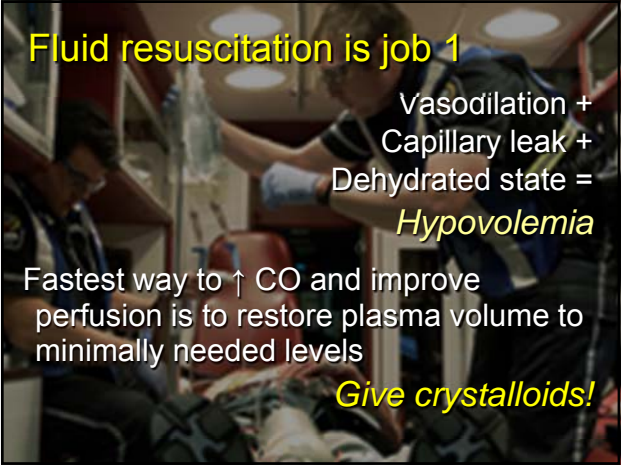
Photo courtesy Rommie Duckworth

Fluid resuscitation is job 1

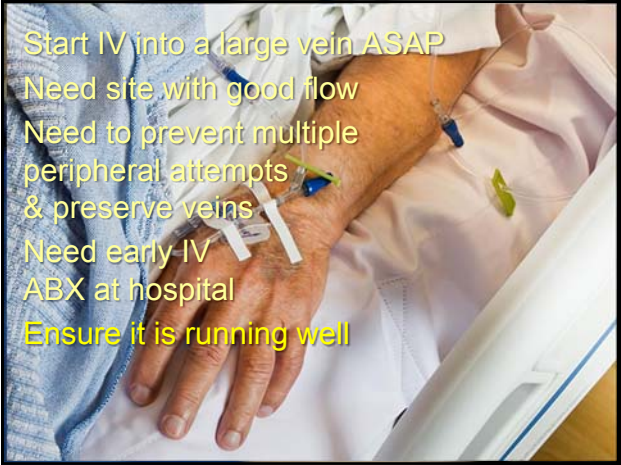
Vasodilation +
Capillary leak +
Dehydrated state =
Hypovolemia

Fastest way to ↑ CO and improve perfusion is to restore plasma volume to minimally needed levels

Give crystalloids!



Start IV into a large vein ASAP
Need site with good flow
Need to prevent multiple peripheral attempts & preserve veins
Need early IV
ABX at hospital
Ensure it is running well



No IV sites?

If responsive, remember lidocaine!



Brush up on peds insertions and securing the needle!



Photo courtesy Rommie Duckworth

EMNote.org

Surviving Sepsis Guidelines 2017

Definition	<ul style="list-style-type: none">• Sepsis: Life-threatening organ dysfunction caused by a dysregulated host response to infection• Septic shock: Subset of sepsis with circulatory and cellular/metabolic dysfunction associated with a higher risk of mortality• Deemphasize "severe sepsis" and "sepsis criteria"
Fluids	<ul style="list-style-type: none">• At least 30 cc/kg in first 3 h, even in patients with ESRD and CHF• Use crystalloids, consider albumin, avoid starch solutions
Vasopressors	<ul style="list-style-type: none">• Use norepinephrine (NE), avoid dopamine• Add epinephrine if NE inadequate, add vasopressin to taper NE
Steroid	<ul style="list-style-type: none">• No steroid, unless shock refractory to adequate fluids and vasopressors
Antibiotics	<ul style="list-style-type: none">• Broad-spectrum (e.g. Vancomycin+Tapimycin), avoid double coverage
PRBC	<ul style="list-style-type: none">• Only if Hb < 7.0 g/dL in the absence acute bleeding, myocardial ischemia, etc
Source control	<ul style="list-style-type: none">• As soon as feasible (old guideline: within 12 h)
Ventilator	<ul style="list-style-type: none">• TV 6 cc/kg, plateau pressure ≤30 cmH₂O, BIPAP role unknown
Goal therapy	<ul style="list-style-type: none">• Target at MAP 65 mmHg, normalize lactate,• Prefer dynamic variables to assess fluid responsiveness• Deemphasize protocolized care, CVP and ScvO₂

@ jackcfchong

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 ≥4 mmol/L

TO BE COMPLETED WITHIN 6 HOURS:

5) Apply **vasopressors** (for hypotension that does not respond to initial fluid resuscitation) to maintain a MAP ≥65 mmHg

6) In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate ≥4 mmol/L :

- Measure **CVP**
- Measure **ScvO₂**

7) **Remeasure lactate** if initial lactate was elevated

Surviving Sepsis Campaign

A Rational Approach to Fluid Therapy in Sepsis

P. Mark: R. Bellomo

Br J Anaesth. 2016;116(3):339-349.

Abstract and Introduction

Abstract

Aggressive fluid resuscitation to achieve a central venous pressure (CVP) greater than 8 mm Hg has been promoted as the standard of care, in the management of patients with severe sepsis and septic shock. However recent clinical trials have demonstrated that this approach does not improve the outcome of patients with severe sepsis and septic shock. Pathophysiologically, sepsis is characterized by vasoplegia with loss of arterial tone, venodilation with sequestration of blood in the unstressed blood compartment and changes in ventricular function with reduced compliance and reduced preload responsiveness. These data suggest that sepsis is primarily not a volume-depleted state and recent evidence demonstrates that most septic patients are poorly responsive to fluids. Furthermore, almost all of the administered fluid is sequestered in the tissues, resulting in severe edema in vital organs and, thereby, increasing the risk of organ dysfunction. These data suggest that a physiologic, hemodynamically guided conservative approach to fluid therapy in patients with sepsis would be prudent and would likely reduce the morbidity and improve the outcome of this disease.

loss. Sepsis is characterized by arterio- and venodilation together with microcirculatory and myocardial dysfunction, with septic patients being poorly responsive to fluid administration. Nevertheless, aggressive fluid resuscitation to achieve a central venous pressure (CVP) greater than 8 mm Hg (Early Goal Directed Therapy - EGDT), has been considered the standard of care in the management of patients with severe sepsis and septic shock.¹⁸⁻²¹ However, recent multicenter clinical trials (ProCESS, ARISE and PROMISE) and a meta-analysis of EGDT have demonstrated that **this approach does not improve the outcome of patients with severe sepsis and septic shock.¹⁸⁻²¹** This article reviews the hemodynamic changes associated with sepsis and provides a rational approach to fluid management in this complex disorder.

So here's what we've done with the guidelines & literature

If infection, no sepsis: Cardio-respiratory support pm and treat specific conditions per appropriate SOP or OLMC.

SEPSIS: Suspect infection + ETCO₂ <31 + ≥2 qSOFA criteria: (SBP 90-100)

2. Call OLMC with a **Sepsis alert** per local policy/procedure.

3. Vascular access important – **IVF**: to achieve SBP ≥100 mmHg

SEPTIC SHOCK: Above PLUS: SBP <90 (MAP <65) or hypotensive for pt (40 mmHg < baseline); ETCO₂ < 25 (lactate level ≥ 4 mmol/L) suggests poor outcome

2. Call OLMC with a **Sepsis alert** per local policy/procedure.

3. Improve perfusion: **IVIO NS 200 mL boluses** in rapid succession (max 30 mL/kg) to SBP ≥90 (MAP ≥65); Reassess VS/Skin signs ETCO₂ after each bolus, may not respond to fluids.

4. If hypotension persists after 500 mL IVF: (2nd IV time while IVF continues in 1st)
Adult: NOREPINEPHRINE 8 mcg/min (2 mL/min IVPB): Target SBP ≥ 90 (MAP ≥ 65). Retake BP q 2 min until desired BP reached, then every 5 min. Do not overshoot BP to high levels. Titrate drip at target BP (2 to 4 mcg/min (0.5 mL to 1 mL/min) OR (PUSH BOLUS Dose: 0.03 mg IVF one time with caution and OLMC order)
Peds: NOREPINEPHRINE 1 mcg/kg/min IVPB; increase in increments of 0.5 mcg/kg/min to a max dose of 2 mcg/kg/min titrated to SBP > 70 + (2X Age). Retake BP q 2 min until desired BP reached, then every 5 min.

5. Keep fingers on pulse & watch SpO₂; pleth on monitor for 5 min to detect PEA.

Call SEPSIS ALERT to OLMC

SEPSIS: Suspect infection + ETCO₂ < 31+ ≥2 qSOFA criteria SBP 90-100

SBAR is a technique designed to communicate critical information succinctly and briefly.

Situation

What's going on with the patient right now? (Identify yourself, identify the patient. State the problem concisely.)

Background

What's the background on this patient? How did we get to this point? (Review the chart. Anticipate questions. State the relevant medical issues.)

Assessment

What do I think the issue is? Why am I concerned? (Provide your observations and evaluations of the patient's current state.)

Recommendation

What should we do to respond to the situation? (Suggest what should be done to meet the patient's immediate needs.)

Response

Collaboration resulting in a plan of action. (Listen. Follow feedback to ensure responder understands the issue.)

maxiSHARE

Septic SHOCK

Sepsis S&S PLUS:

SBP <90 (MAP <65) or hypotensive for pt (40 mmHg < baseline)

ETCO₂ < 25 (lactate level ≥ 4 mmol/L) suggests poor outcome

160

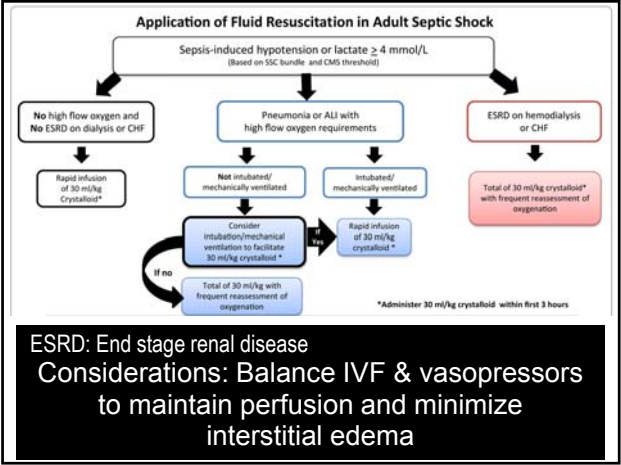
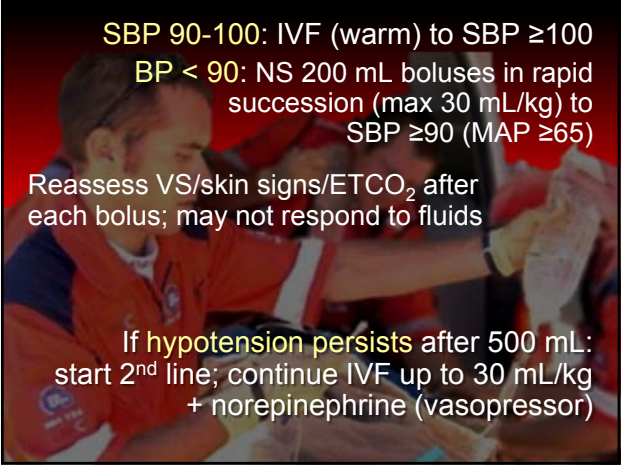
46

51/33 (38)

SBP 90-100: IVF (warm) to SBP ≥ 100
BP < 90: NS 200 mL boluses in rapid succession (max 30 mL/kg) to SBP ≥ 90 (MAP ≥ 65)

Reassess VS/skin signs/ETCO₂ after each bolus; may not respond to fluids

If hypotension persists after 500 mL: start 2nd line; continue IVF up to 30 mL/kg + norepinephrine (vasopressor)



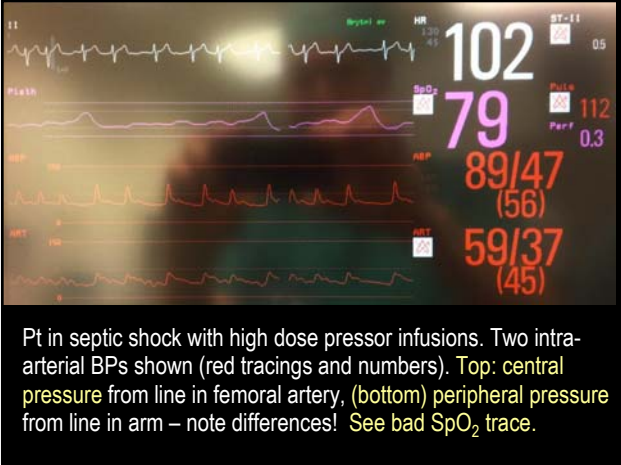
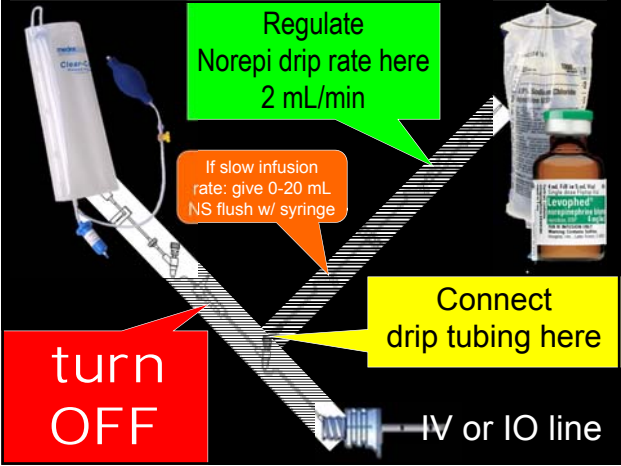

Mix drip: 4 mg (4 mL) in 1000 mL NS or D5W
Concentration: 4 mcg/mL
Place label on bag!

Initial dose: 8 mcg/min (2 mL/min)
Titrate based on tubing calibration

- ✓ BP q 2 min: Achieve SBP 90 (MAP ≥ 65) – do not overshoot

Once at SBP 90-100
Titrate to maintain BP target

- ✓ BP q 5min



2016 Surviving Sepsis Campaign Guidelines

Important ED Medication Recommendations

Antimicrobials

- Give ASAP, ≤ 1 hr after recognition of sepsis/septic shock [strong R, moderate Q]
- Consider initial doses at high end of dosing range
- Consider double coverage in septic shock (not routinely for bacteremia or sepsis [weak R, low Q] or neutropenic sepsis [strong R, moderate Q])

Vasoactives

- Norepinephrine 1st line [strong R, moderate Q]
- Add vasopressin [weak R, moderate Q] or epinephrine [weak R, low Q]
- No low-dose dopamine for renal protection [strong R, high Q]
- Dobutamine for persistent hypoperfusion despite fluids & vasopressors [weak R, low Q]

Corticosteroids

- IV hydrocortisone (200 mg/day) only if hemodynamic stability not achieved with fluids & vasopressors [weak R, low Q]

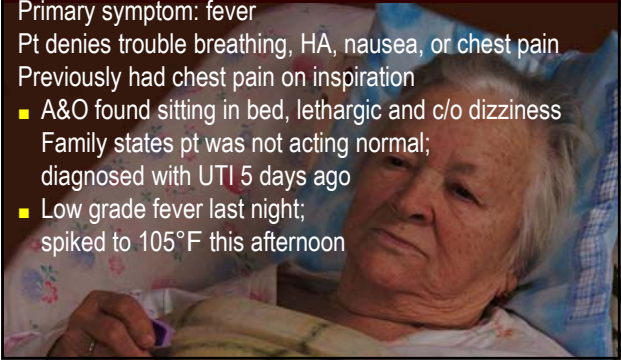
R = Recommendation
Q = Quality of evidence

Rhodes A, et al. Crit Care Med. 2017 Jan 17. Epub ahead of print. @PharmERToxGuy

Case 1

75 y/o F 90.7 kg D/P for Breathing problem
Primary symptom: fever
Pt denies trouble breathing, HA, nausea, or chest pain
Previously had chest pain on inspiration

- A&O found sitting in bed, lethargic and c/o dizziness
Family states pt was not acting normal; diagnosed with UTI 5 days ago
- Low grade fever last night; spiked to 105°F this afternoon



Case 1 cont.

PMH: HTN, Dt2
Meds: Tamsulosin, nitrofurantoin, metformin, lisinopril, Januvia
Chest: Productive cough with unspecified sputum color; basilar crackles in LLL
Skin: Hot to touch, moist
Generalized weakness

What are critical pieces of information that should alert you to the potential for sepsis in this patient?




Case 1

Time	BP	Pulse	RR	SpO2	GCS	ETCO2	Temp
1909	170/60 (97)	140	40		15	32	40.6
1916	166/60 (95)	138	44	88	15	32	40.6
1924	156/68 (97)	138	36	94	15	32	

ETCO₂ square waveform
ECG: ST
Glucose 173
O2 given; IV 18 g L-AC 50 mL infused
Diagnosis? Infection – Sepsis – Septic shock
How'd they do?

Case #2

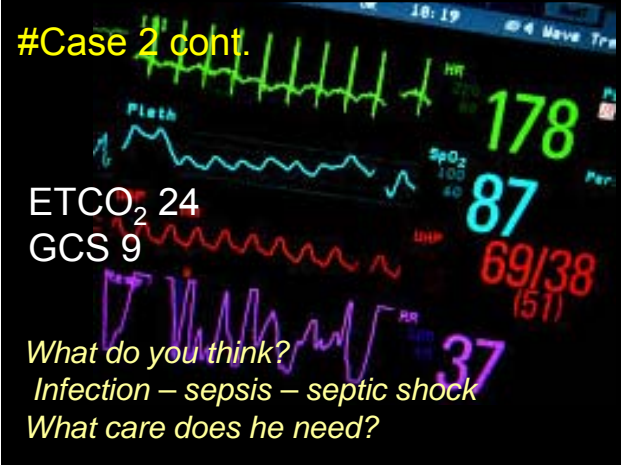
86 (m)
Hx Dt2; prostate cancer
Fever 103° F
Foley; UTI
On antibiotics X 24 h
Lungs clear
Mottled
Cold legs

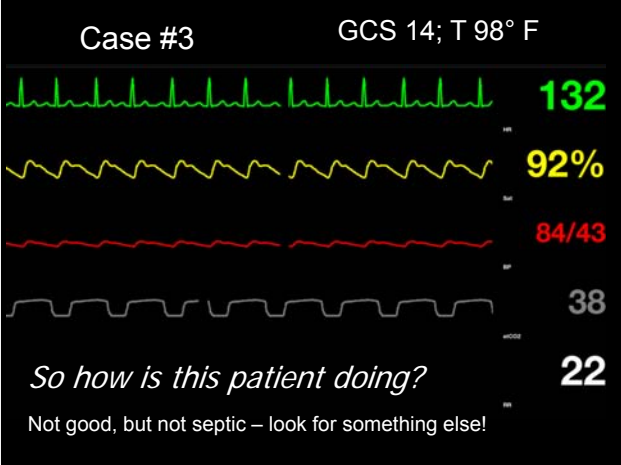


#Case 2 cont.

ETCO₂ 24
GCS 9

What do you think?
Infection – sepsis – septic shock
What care does he need?





Surviving sepsis

Lingering, sometimes severe, S&S

- Amputations d/t tissue death caused by ↓ blood flow to limbs
- Muscle weakness
- Breathing difficulties d/t lung damage
- Kidney damage requiring dialysis
- Chronic fatigue and ↓ physical resilience
- Cognitive changes and memory loss
- Panic attacks and depression

Surviving sepsis: Elderly

60% of elderly hospitalized for sepsis had ↓ cognitive and physical functioning: inability to walk, do ADLs + memory loss

Odds of moderate-severe cognitive impairment 3.3 X higher than those of same age with alternate diagnoses

Prevention of infection

- Decrease risk with good hand hygiene
- Clean/disinfect vehicles & equipment
- Clean/disinfect all wounds; cover
- Stay current on vaccinations
- Only take antibiotics when prescribed, complete recommended course even if symptoms improve

How can we improve?

- ↑ Recognition and diagnosis: ETCO₂, qSOFA
- Improve response to SEPSIS ALERTS
- ↑ Vascular access success rates
- Infuse appropriate IVF
- ↑ Appropriate use of norepinephrine
- Improve documentation and reporting

Public Health Emergency

Any good news?

FOR IMMEDIATE RELEASE
June 5, 2018

Los Angeles company selected to accelerate innovation for U.S. health security, daily medical care

MedTech Innovator of Los Angeles has been selected as one of eight accelerators in the nation by the U.S. Department of Health and Human Services (HHS) to drive innovation in life-saving medical technologies that solve challenging problems spanning modern health security threats and daily medical care.

"Accelerators are part of a new business-friendly approach," said Deputy Secretary for Health and Human Services Eric Hargan. "This approach will help startups and other businesses shape the next generation of life-saving technology and transform health security. That innovation is crucial to protecting Americans and saving lives."

One of the first challenging problems is the need for earlier detection of infection, creating technology that can alert people when they have been infected with a bacteria or virus even before they begin to feel sick. The second is the urgent need to solve sepsis, the body's life-threatening response to infection or traumatic injury. Sepsis is a top cause of hospitalization in America, leads to 250,000 deaths annually and costs approximately \$24 billion a year to treat. The number of sepsis cases could skyrocket after a bioterrorism attack or pandemic.



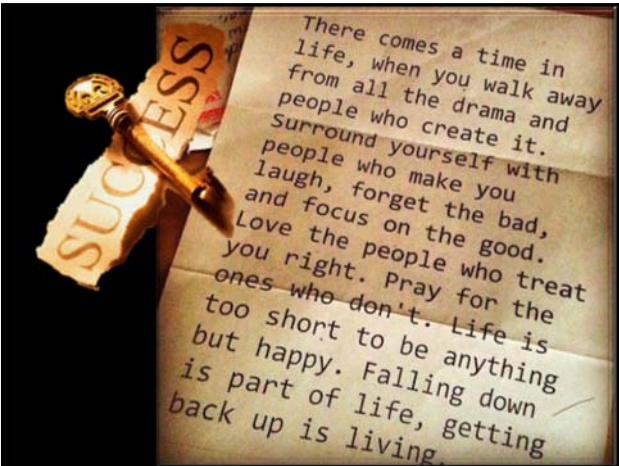
Marik Cocktail:

Vitamin C 1.5g IV q6h
Hydrocortisone 50 mg IV q6h
Thiamine 200mg IV q12h

Infused, not stirred.



Dr. Marik feels very strongly that it's worked in his patients, and he's changed his practice because of his own experience," says Jonathan Sevransky, MD, a critical care doctor at Emory University in Atlanta who is leading one of the studies. "If you think something works, it makes sense for a doctor to try something and to change their own practice. But if you want to change other people's practices, the way to do that is to do a randomized, controlled trial -- and ideally, you'd have more than one randomized,





The ball is in your court

SEPSIS and SEPTIC SHOCK

Time
sensitive pt

1. IMC special considerations:

- Rapidly assess patient for risk factors; S&S suggesting **INFECTION*** and infectious source - IF YES
- Assess oxygenation: Use central sensor for SpO₂ if pt has poor peripheral perfusion (cold hands)
- Assess **ETCO₂** readings; **low levels (<31)** suggest hyperventilation; poor perfusion to lungs; and/or metabolic acidosis. Good correlation between ETCO₂ and venous lactate levels. If ETCO₂ <31:
- Assess **qSOFA** (Quick Sequential [Sepsis-related] Organ Failure Assessment) **criteria**:
 - AMS (**GCS <15**); assess for disorientation/agitation and/or GCS 1 or more points below patient's baseline
 - **RR ≥22** **SBP ≤100** (note if ≥2 criteria are present)
- **Trend pulse pressures** (normal 30-50) and **mean arterial pressure** (MAP = DBP + 1/3 PP) (normal 70-110) q. 5 minutes. **These pts can crash rapidly.**
Elderly & those with pre-existing HTN, cannot tolerate hypotension for even a short time.
- **Assess S&S of fluid depletion:** orthostatic VS changes if not hypotensive; poor skin turgor, dry mucosa
- **Vascular access & IVF- See below**
- **Assess blood glucose;** anticipate hyperglycemia and electrolyte abnormalities

Warm Stage (6-24 hrs): Tachypnea; Hyperdynamic phase with high cardiac output; SBP 25% < normal; fever, vasodilation, skin: hot, dry, flushed

Cold Stage (ominous/late): AMS; T < 96.8 F; skin cold; mottling; HR increases; hypotension profound; RR increased

*Indicators suggesting infection:

Fever; warm skin	New onset fatigue, AMS, HA/neck stiffness	Cough, sputum, dyspnea	Sore throat, ear ache
Diarrhea	Dysuria, foul smelling/cloudy urine	Local redness, warmth, swelling, unhealed wounds etc.	

If infection, no sepsis: Cardio-respiratory support prn and treat specific conditions per appropriate SOP or OLMC.

SEPSIS: Suspect infection + ETCO₂ < 31 + ≥2 qSOFA criteria:

(SBP 90-100)

2. Call OLMC with a **Sepsis alert** per local policy/procedure.
3. Vascular access important – **IVF:** to achieve SBP ≥100 mmHg

SEPTIC SHOCK: Above PLUS: **SBP <90 (MAP <65)** or hypotensive for pt (40 mmHg < baseline); **ETCO₂ < 25** (lactate level ≥ 4 mmol/L) suggests poor outcome

2. Call OLMC with a **Sepsis alert** per local policy/procedure.
3. Improve perfusion: IV/IO **NS 200 mL boluses** in rapid succession (max 30 mL/kg) to SBP ≥90 (MAP ≥65); Reassess VS/skin signs/ETCO₂ after each bolus; may not respond to fluids.
4. **If hypotension persists after 500 mL IVF:** (2nd IV line while IVF continues in 1st)
Adult: NOREPINEPHRINE 8 mcg/min (2 mL/min IVPB): Target SBP ≥ 90 (MAP ≥ 65). Retake BP q. 2 min until desired BP reached, then every 5 min. Do not overshoot BP to high levels. Titrate drip at target BP (2 to 4 mcg/min (0.5 mL to 1 mL/min) OR (PUSH BOLUS Dose: 0.03 mg IVP one time with caution and OLMC order)
Peds: NOREPINEPHRINE 1 mcg/kg/min IVPB; increase in increments of 0.5 mcg/kg/min to a max dose of 2 mcg/kg/min titrated to SBP > 70 + (2X Age). Retake BP q. 2 min until desired BP reached, then every 5 min.
5. Keep fingers on pulse & watch SpO₂ pleth on monitor for 5 min to detect PEA.

Sepsis : Life-threatening organ dysfunction caused by a dysregulated host response to infection

Septic shock: Subset of sepsis with circulatory and cellular/metabolic failure associated with high mortality

At risk populations: ≥65 or < 1 yr, or weakened immune systems (cancer, indwelling devices; chronic steroid use; sickle cell disease, splenectomy; bedridden or immobile); recent trauma or surgery; breached skin integrity (wounds, burns); IV drug use; females - recent birth, miscarriage, abortion; post-organ transplant; chronic disease: DM, cirrhosis, HIV/AIDS, autoimmune, renal disease

Results in a systemic cascade of immune/**inflammatory responses** that cause hypoperfusion. Other concerns:

Hypercoagulability (petechiae); mottling, ↑ vascular permeability (**capillary leak**), **volume loss**; **vasodilation.**

May be sicker than they look – tissue hypoxia and acidosis begins BEFORE ↓ BP