Sepsis – What I’ve learned in the past 10 years

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Sepsis Warrior
History

• Rivers article 2001
• County wide effort
• Started ~ 2005
• Sepsis waiver (Godsend) 2010
What went wrong?

Trained nurses, not physicians
• Nurses got a powerful curriculum with didactics, skills stations, and post test
• Physicians had a 1 hour lecture on cytokines
• We welcomed input
• Data was administrative, not case by case
• Corrective action was local
Education Vs. Training

Education

Training
Education Vs. Training

Education

How to Clean Poop

Training
What went wrong...cont.

• A million little things...
  • Abnormal vitals were dutifully taken and documented on a napkin.
  • Where were the antibiotics?
  • How do you decide how much fluid is enough?
• It’s not my turn to draw the blood
• Oh well, we missed it
Summary Slide

• We were allowed to fail
What went right?

• Waiver arrived
• Waiver was simple
• Like it or not, it was a leadership priority
  #cmswaiver
• We dug into every nook and cranny and fixed all that was broken
• We were not allowed to fail
• Leadership required ongoing data and updates
CMS Waiver

• Delivery System Reform Incentive Waiver (DSRIP)
• 21 Public health care systems in California
• Section 1115 Waiver
• Tied to 3 billion dollars
• LA County the largest system included in the waiver
• We were going to have to do it right, in order to get paid
• Mortality reported, but process measures count
Leaders
Leadership not impressed with our performance...
INLP and the Waiver

• Got it right
• Nurse driven protocol to screen and get treatment started
• Boiled down a protocol to 4 simple steps
  • 2 blood draws
  • 2 infusions
The Sepsis Bundle

• 2 Draws
  • Lactate
  • Blood Cultures

• 2 Infusions
  • 20 cc/kg fluid (or equivalent, over 6 hours)
  • Antibiotics (3 hrs for ED, 1 hr for inpt) (T zero issues)
Adult Sepsis Mortality Index
Using ICD 9 codes
(administrative data- 995.91, 995.92, 785.52)
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All Cause Adult Mortality

OVMC %Mortality

Q4 05  Q1 06  Q2 06  Q3 06  Q4 06  Q1 07  Q2 07  Q3 07  Q4 07  Q1 08  Q2 08  Q3 08  Q4 08  Q1 09  Q2 09  Q3 09  Q4 09  Q1 10  Q2 10  Q3 10  Q4 10  Q1 11  Q2 11  Q3 11  Q4 11  Q1 12  Q2 12  Q3 12  Q4 12  Q1 13  Q2 13
All Cause Adult Mortality Index
Observed/Expected (lower is better)

Mortality Index OVMC

Q4 05  Q1 06  Q2 06  Q3 06  Q4 06  Q1 07  Q2 07  Q3 07  Q4 07  Q1 08  Q2 08  Q3 08  Q4 08  Q1 09  Q2 09  Q3 09  Q4 09  Q1 10  Q2 10  Q3 10  Q4 10  Q1 11  Q2 11  Q3 11  Q4 11  Q1 12  Q2 12  Q3 12  Q4 12  Q1 13  Q2 13
Sepsis ED Dashboards DY8-DY9

OV-UCLA ED Bundle Compliance DY8

- Q3 2012 (N=68): 81% ED Compliant, 19% ED Not Compliant
- Q4 2012 (N=67): 93% ED Compliant, 7% ED Not Compliant
- Q1 2013 (N=90): 81% ED Compliant, 19% ED Not Compliant
- Q2 2013 (N=64): 83% ED Compliant, 17% ED Not Compliant
- DY8 (N=289): 84% ED Compliant, 16% ED Not Compliant

OV-UCLA ED Bundle Compliance DY9

- Q3 2013 (N=67): 87% ED Compliant, 13% ED Not Compliant
- Q4 2013 (N=90): 90% ED Compliant, 10% ED Not Compliant
- Q1 2014 (N=157): 89% ED Compliant, 11% ED Not Compliant
- Q2 2014 (N=157): 89% ED Compliant, 11% ED Not Compliant
- ED DY9 (N=157): 89% ED Compliant, 11% ED Not Compliant
Sepsis Inpatient Dashboards DY8-DY9

OV-UCLA Inpatient Bundle Compliance DY8

OV-UCLA Inpatient Bundle Compliance DY9
Absolute Mortality Difference for Patients Meeting Waiver

- OVMC: -16%
- Hosp A: -14%
- Hosp B: -17%
- Hosp C: -19%
- Aggregate: -19%

Bar chart shows the mortality difference for patients meeting the waiver, with Hosp A having the highest difference at -14% and OVMC having the lowest at -16%.
Bundle Compliance and Mortality

Sepsis Bundle Compliance and Sepsis Mortality Rates

- Bundle Compliance (%)
- Sepsis Mortality Rates

Graph showing trends from Jan-11 to Oct-13.
The Problem with Data

• Everyone wants to see it
• No one wants to collect it
• If it’s not good, no one believes it
• If it’s good, no one is motivated by it
The Multiple Little Fixes

• Multidisciplinary group
• Nurse educators (closest to line staff)
• Pharmacy-had keys to the Pyxis
• Lab Director- gave phlebotomy their assignments
• Physicians
• Administrators
• IT
Identification of Sepsis Patients

- Vitals taken by NA
- Copied on to a napkin
- Lack of recognition for an abnormal
- Eventually placed in computer
- RN not immediately aware
Correction

• NA checks vitals against parameters
• Abnormals immediately reported
• RN runs “SUPO” screen for 2 abnormals
• Standardized Procedure
• RN orders the blood culture and lactate (does not need an order)
• Phlebotomist comes immediately for SUPO
• Triggers call to MD (RN expected to ignore any previous “notify MD” order) (can call more, not less)
PDSA

• Needed a work around to bundle blood cult with lactate
• Pre-checked box, computer fix
• Prioritizing phlebotomy work
• Canceling SUPO, repeat SUPO, SUPO-ing CHF w/afib
ED Issues

• Who “comes back” first? A 30 yo with cp or a 70 yo with fever?
• Do we need blood cultures every time we give IV antibx?
• What can we do before the patient is brought back?
• Using EHR to identify patients
Riddle: What does...

• A physician always do?
• A nurse sometimes do?
• A computer never do?

• Explain away abnormal parameters.
Screening- SUPO*

**ED**
- Vitals at triage
- Computer or manual screen
- SIRS, tachycardia and fever, hx of fever or chills, hx of cancer
- Allow triage RN to draw lactate

**Inpatient**
- Routine vitals
- Issues with Nursing Attendant VS
- Early warning systems
- Allow RN to draw lactate and blood cultures
- Script language for MD notification “Doctor your patient is SUPO, we need orders for fluids and antibiotics”

*Sepsis Until Proven Otherwise*
Physician “Buy-in”

• “what if the patient has CHF or renal failure”
• “we are wasting money on blood cultures”
• “we ran out of blood culture bottles”
• “I don’t agree with ___”
Identified the Concept of the “Anchor Antibiotic”

• The anchor antibx is the one doing the lion’s share of the work
• The anchor antibx has gram negative and pneumococcal coverage, the organisms likely to result in rapid demise if not covered
• Anchor ideally has a long half-life
• Identify your anchor antibiotics and ensure immediate availability
Anchor Antibiotic

• Infuse first, ideally capable of rapid infusion
• Stock in ED and local pyxis
• Ideally low incidence of allergies
• Examples of anchors: ceftiaxone, pip/tazo, cefepime, quinolones
• Broaden coverage after anchor infused
Our Rules for Antibx in ED

• All antibiotics ordered in the ED must be hung in the ED
• All antibx ordered in the ED must be in the Pyxis
  • Pre-mixed
  • Easy mix
  • Not weight based (e.g. gent)
• Vancomycin is not infused first
• No renal dosing in ED
Rules for Anchor on Ward

• Stocked in Pyxis
• Good broad coverage
• Infused first
• MD pushed to order a known anchor (get fancy later)
• Shared vision of the concept
Pre-choose Antibiotics

• Team to steward antibiotic choices
• Empiric antibiotic menu
  • ID physicians, ED physicians, pharmacist
• Choose based on suspected site of infection
• When in doubt, get an anchor on board, then fine-tune the ideal antibiotics (generic vs. designer)
Getting the Fluids In

• Made IO lines widely available

• Created fluid exemptions, but truth is, most patients can tolerate 20cc/kg

• Encouraged MD’s to fluid overload
WARNING:

ALL ROADS LEAD TO DIALYSIS

Too Much Fluid

Too Little Fluid
IVC Assessment
Physicians using more US
Non-Invasive Stroke Volume

- **Key Hemodynamic Parameters:**
  - Stroke Volume (SV)
  - Cardiac Output (CO)
  - Heart Rate (HR)
  - Stroke Volume Variation (SVV)
  - Noninvasive Blood Pressure (NIBP)
  - Total Peripheral Resistance (TPR)
  - O₂ Saturation (SPO₂)
  - Oxygen Delivery Index (DO₂I)
  - Stroke Volume Index (SVI)
  - Cardiac Index (CI)
  - Total Peripheral Resistance Index (TPRI)
  - Thoracic Fluid Content trend (dTFC)

- **Continuous Non-Invasive Hemodynamic Insight**

- **Tailored Fluid management to Optimize Resuscitation**

- **Validated Accuracy**

- **Predicated Against Swan-Ganz**
Build in Accountability

• Review deaths
  • Keep it simple
  • Look at time to antibiotics and 1st 6 hr fluid resus
  • Call clinicians- ask what happened
  • Find out why early antibiotics can’t be easy
  • Involve pharmacy, nursing, MD’s
  • Mini M&M your sepsis mortalities

• Keep the ED in the loop for outcomes
  • Most ED’s never realized how many patients went upstairs and died!
  • Out of sight out of mind
Data: Keeping it Simple

- Review all Sepsis charts
- Door to antibiotic time
  - 1st time stamp to antbx hanging
  - Build on door to balloon success
- Fluids in 1st 6 hours
- Total ED fluid
- Survived/Expired
More Lessons Learned

• Got to get ‘em early
  • Antibiotics and fluids key
• Train Physicians, not just nurses
• Simple is better (order sets)
• Controversial stuff can be a fill in the blank
• Hold all accountable
  • Generate a report card
  • Create a Chain of Accountability
Chain of accountability
The Sepsis Worksheets Arrive
Waiver RN reviews Fallouts with Waiver MD
Waiver MD reviews Fallout with Patient’s Attending
Ward Attending Reviews Fallout with Ward Intern
Ward Intern Reviews Fallout With Bedside RN
RRT Nurse Educator Reviews Fallout With RRT RN
Waiver Physician Presents Data to Leadership
There is more than enough data out there that we all need to be working on sepsis
• Make a (short) bundle and collect data
• Make every step of patient care easy
• Feedback and report data
• Make a “chain of accountability” and use all the links