Saving Lives Through Better Sepsis Care
Kaiser Santa Clara Medical Center

Presented by
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Kaiser Permanente Northern California (KPNC) Sepsis Mortality Reduction Initiative

- **Background**
  - Began in 2008
  - KPNC provides care to 3.3 million members
  - 21 hospitals in Northern California Region

- **Program Goals**
  - Improve identification of sepsis patients
  - Appropriately stratify risk
  - Reliably provide treatment
  - Focus on spread and sustainability across all medical centers

Kaiser Santa Clara Medical Center

- Kaiser Santa Clara Medical Center provides care for over 289,000 members. 2013 Leapfrog Top Hospital.
- 327 licensed beds
- The Joint Commission's Gold Seal of approval and American Heart Association distinction as Gold+ and Target Stroke.
- Superior ratings for Surgical Care Measures (SCIP and NSQIP), Overall Patient Experience, Heart Attack Care, and Pneumonia Care through the Joint Commission's Quality Check program.
“The key to reducing sepsis mortality is to find sepsis and find it early.”

— Alan Whippy, MD, Medical Director of Quality and Safety, The Permanente Medical Group
Origins of Sepsis

- the Greek word sepsis means “putrefaction” originally “decomposition of animal or vegetable organic matter.”
- one of the first medical descriptions 5th and 4th centuries BCE in works attributed to the ancient Greek physician Hippocrates
- cited Homer’s poems, where Sepsis is a derivative of the verb form sepo which means “I rot”

Hippocrates, the father of medicine.

Johan Sebastián Hernández Botero and María Cristina Florián Pérez, “The History of Sepsis from Ancient Egypt to the XIX Century.” http://dx.doi.org/10.5772/51484
Why Sepsis?

• Sepsis is a potentially deadly infection that causes your immune system to attack your body rather than protect it. It’s a leading cause of death in U.S. hospitals, accounting for five times as many deaths as heart disease.¹

• Every year, 750,000 people develop sepsis, and nearly one in four dies.

• Kaiser Permanente developed an innovative program that led to increased rates of sepsis detection, reduced mortality rates, and reduced average length of stay for patients with sepsis.

• If the U.S. achieved Kaiser Permanente’s level of results around sepsis care, each year there would be 72,000 fewer deaths, 5 million fewer hospital days, and reductions in hospital costs of over $11 billion.
Why is treating Sepsis so hard?

Because patients often develop sepsis before they get to the hospital, diagnosis and treatment during the initial “golden hour” timeframe becomes critical. Yet most hospitals struggle with this. In fact, only half of patients with septic shock — the most severe form — get effective treatment within six hours of onset. Here’s why:

**Sepsis is unpredictable.** Sepsis occurs in all age ranges and can result from a variety of illnesses or injuries — even scraped knees.

**Symptoms are generic.** The first signs of sepsis — fever, high pulse or breathing rate, elevated white blood count, nausea, and vomiting — are also symptoms of many other illnesses.

**Treatment is complex.** Effective sepsis treatment requires swift collaboration among nurses, physicians, and specialists in different departments — and most hospitals aren’t structured to deliver this type of coordinated care.
Goals of KP Sepsis Program

1. Find and Name it
2. Stratify it
3. Treat it early
4. Prevent it

Save Lives

Early Detection

- Education: building awareness for signs and symptoms of sepsis
- Lactate Testing: accessibility
- Results: the first year KP NCAL experienced 102% increase in the rate of sepsis detection
Our Sepsis Journey...

In 2008, Kaiser Permanente developed a comprehensive approach to screen and provide effective treatments to hospital patients identified as at-risk for sepsis.
Putting in all together..

**Sepsis Resuscitation**

**The Golden Hours**

**EGDT Goals from Time Zero**
1. **Start Antibiotic in 1 hr**
2. **First CVP or ScvO2 within 2 hrs**
3. **CVP ≥ 8-12 within 6 hrs**
4. **MAP ≥ 65 within 6 hrs**
5. **ScvO2 ≥ 70 within 6 hrs**
6. **Repeat lactate is lower than initial lactate w/in 3-12 hrs**

**EARLY GOAL**

**DIRECTED THERAPY**

**CVP ≥ 8-12**
- ≤ 8
  - 500 – 1000 ml Fluid boluses q 30 min
- ≥ 8-12

**MAP ≥ 65?**
- < 65
  - Norepinephrine
- ≥ 65

**ScvO2 ≥ 70?**
- < 70
  - If Hct low, transfuse to 30
- ≥ 70

**Repeat lactate 3-12 hrs**
Keys to Success

<table>
<thead>
<tr>
<th>Activating Sepsis Alert</th>
<th>Antibiotics within 1 hr</th>
<th>Placing Central Line within 2 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>If patient meets criteria, activate to get additional resources ASAP</td>
<td>Ordering and administering ABX quickly</td>
<td>Line insertion is critical to hemodynamic monitoring</td>
</tr>
</tbody>
</table>
Spreading the word…

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Start Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepsis Alert</td>
<td>March 2009</td>
</tr>
<tr>
<td>EGDT Clock</td>
<td>May 2010</td>
</tr>
<tr>
<td>iSTAT lactates</td>
<td>Dec 2010</td>
</tr>
<tr>
<td>“Cheat Sheets” on WOWs and MD Dictation Rooms</td>
<td>Aug 2010</td>
</tr>
<tr>
<td>ED Nursing Skills Day Station</td>
<td>Dec 2009</td>
</tr>
<tr>
<td>Auto-calculating electronic hand off form</td>
<td>Oct 2011</td>
</tr>
</tbody>
</table>
Sepsis Alert

The “Sepsis Alert” Team
- Rapid Response Team RN
- Respiratory Care Practitioner
- Inpatient Pharmacist
- House Supervisor
- ICU Resident on-call
- Additional team members to be called as needed include, but are not limited to:
  - Infectious Disease MD
  - CVICU MD
  - Anesthesiology

Activating a Sepsis Alert

- Lactate and BUN combination resulting in **Highest Risk** and **Very High Risk** -or- Persistent SBP < 90 for 1 hr, despite fluid bolus (20-40ml/kg w/in 1hr) **AND** patient and family agreeable to ICU CARE

**Stratifying Intermediate Lactates**

<table>
<thead>
<tr>
<th>Sepsis Mortality Risk*</th>
<th>Lactate 2-2.99</th>
<th>Lactate 3-3.99</th>
<th>Lactate ≥ 4.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUN &lt; 20</td>
<td>5.2%</td>
<td>7.1%</td>
<td>14.7%</td>
</tr>
<tr>
<td>BUN 20-45</td>
<td>10.6%</td>
<td>19.5%</td>
<td>31.1%</td>
</tr>
<tr>
<td>BUN ≥ 45</td>
<td>21.9%</td>
<td>39.2%</td>
<td>40.3%</td>
</tr>
</tbody>
</table>

- **Highest Risk**: EDGT Recommended
- **Very High Risk**: Consider EGDT
- **High Risk**: Close monitoring, give ABX, fluid resuscitation, Re-check lactate, reassess and escalate if needed
EGDT Clock

- Helps to communicate time targets
- Low Tech
- Holds lots of helpful hints

Implemented May 2010
iSTAT Lactates

- Two or three drops of blood
- Results in minutes
- Accelerates clinical decision making time
- Reduces hand-off of specimen

Implemented Dec 2010
What Time Is It? It’s EGDT Time!
Screen for Sepsis:
2 SIRS and suspected/known infection
Temp: <96.8(36.0) or >100.4(38) RR>20
WBC >12K or <4K or 10% band
Give aggressive fluids: 2 L in 1hr
Enter Weight in kg here

Choose one of these 3 items.

- Lactate ≥4: iStat DRAW time +1 hr or RESULT time of regular lab draw
- SBP < 90 for more than 1 hour: 1st episode of hypotension +1 hr
- Lactate/BUN Mortality Risk >15%: 1st CVP/ScvO2 documented in HC

Time Zero (TZ) is: __________

All other time targets will be calculated for you!
Then print form, check items completed, send w/patient

Initial 6hr Bundle Elements

<table>
<thead>
<tr>
<th>ABX due by:</th>
<th>Central Line placed by:</th>
<th>Huddle with MD at:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Document on MAR!</td>
</tr>
<tr>
<td></td>
<td>Document CVP and/or ScvO2/VBG</td>
<td></td>
</tr>
</tbody>
</table>

Update MD re: CURRENT hemodynamic readings compared to listed targets

Reminder About Hemodynamic Targets and EGDT Protocol

MAP should be: ≥65
CVP should be: ≥8

Document CVP Q 30 mins until CVP ≥ 8, then Q1 hr
If CVP not at target, start boluses per protocol

Document CVP readings at these times

ScvO2 should be: ≥70%

Document ScvO2 Q 30 mins until ScvO2 ≥ 70, then Q1 hr
If ScvO2 not at target, start Dobutamine

Document ScvO2 readings at these times

End of 6hrs of EGDT is at: ______
Handoff Tool

Address the issues documentation

- Allows the entire team to ‘see’ where we are in EGDT
- Provides documentation reminders
- Holds lots of helpful hints: tips on documentation, protocol, targets
- Ensures safe hand-off and follow through for EGDT goals
Continuous feedback and learning

The Feedback Letter:
Sent to all MDs and RNs involved in the Sepsis Alert and EGDT care of each identified sepsis patient

### Review of Sepsis Management

**Patient MRN: XXXXXX  Admit Date: XX/XX/XX**

#### What is Being Tracked

<table>
<thead>
<tr>
<th>Component</th>
<th>Met</th>
<th>Not Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABX within 1 hrs of Time Zero (TZ)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lactate Clearance for EGDT Cases</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CVP or ScvO2 documented within 2 hrs of TZ</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>CVP &gt; 8 met. within 6hrs of TZ</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>MAP &gt; 65 met and maintained within 6hrs of TZ</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>ScvO2 &gt; 70% met and maintained within 6hrs of TZ</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>No Pneumothorax after CL placed</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Use of CL Navigator (for Santa Clara only)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Activating Sepsis Alert (for Santa Clara only)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Adequate fluid resuscitation of 30-40ml/kg per 30mins (for Santa Clara only)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Documenting Time Zero by ED Nurse (for Santa Clara only)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Documenting Fluids on Intake and Output Flowsheet (for Santa Clara only)</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

#### Patient Information & Background

51 yo female presented to ED with FEVER and had 3SIRS criteria with PNA infection. She met Time Zero (TZ) for Early Goal Directed Therapy (EGDT) based on persistent hypotension (TZ was at 2111). A sepsis alert was activated. Fluid resuscitation started at 2028. Total volume ordered by MD in ED was 3 liters. Total volume documented by ED nurse was ZERO. Pressors were started at 2123. The pt received unknown ml/kg during the first hour of fluid resuscitation. Antibiotics were on board by 2031. Central line placed by ED without complications. Hemodynamics were met and maintained within 6 hrs of Time Zero.

#### For Better Outcomes (For This Case)

*Use EGDT Time Zero Row to document Time Zero and how patient met criteria for EGDT.
*Please remember that adequate fluid resuscitation for severe sepsis/septic shock is 30-40ml/kg (within 60 minutes) and bolus orders should reflect this.

### Current and Target Performance

<table>
<thead>
<tr>
<th>Components</th>
<th>09/13</th>
<th>YTD</th>
<th>2013 Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lactates drawn within 12 hrs of BC</td>
<td>92%</td>
<td>92%</td>
<td>90%</td>
</tr>
<tr>
<td>ABX within 1 hr of TZ</td>
<td>100%</td>
<td>96%</td>
<td>90%</td>
</tr>
<tr>
<td>CL documentation within 2 hrs of TZ</td>
<td>100%</td>
<td>83%</td>
<td>70%</td>
</tr>
<tr>
<td>Lactate Clearance for Intermediate LA</td>
<td>90%</td>
<td>85%</td>
<td>85%</td>
</tr>
<tr>
<td>Compliance with 6 hr Bundle Element</td>
<td>55%</td>
<td>60%</td>
<td>50%</td>
</tr>
</tbody>
</table>
Outcomes

Since implementing its sepsis program, Kaiser Permanente has achieved:
• a threefold increase in the rate of sepsis detection
• a 60 percent reduction in mortality for patients with sepsis
• a 25 percent drop in the risk-adjusted average length of stay for patients with sepsis.
Source: Quality Operations Support, The Permanente Medical Group

* Data for Northern California hospitals.

** Data for 2006 and 2007 represent the organization’s baseline before the sepsis program was implemented in 2008.
Keys to Success

- An integrated approach to performance improvement
- Mentors and improvement advisors within each medical center to support cross-functional teams
- Fully engaged, committed leadership at all levels
- Timely, actionable data
What is next for improved sepsis outcomes???

- Intermediate Lactate Management
- Surgical Sepsis
- Identification and Treatment of sepsis in a nursing unit
Intermediate Lactate

"intermediate" lactate= lactate 2 mmol/L or greater and less than 4 mmol/L

Mortality and Intermediate Lactate Clearance
(Q2'12, 1495 Admissions)

9% Overall Mortality

15% Mortality Without Lactate Clearance

8% Mortality With Lactate Clearance

"Sepsis at the Hospital System Level One Sepsis Journey"
Alan Whippy, MD Oct 2012
Surgical Sepsis

2005-2007 National Surgical Quality Improvement Program

363,897 general-surgery pts
- Sepsis 2.3% (8350)
- Septic Shock 1.6% (5977)

30 day mortality for these patients
- Sepsis 5.4%
- Septic Shock 33.7%

definition of surgical sepsis
- SIRS plus an infection requiring surgical intervention for source control or SIRS plus an infection within 14 days of a major surgical procedure

Surgical Sepsis

- Among surgical patients, sepsis is a leading cause of morbidity and mortality (Angus et al., 2001).

- Surgical patients account for nearly one-third of sepsis cases in the United States (Moore et al., 2010).

- Sepsis and septic shock are 10 times more common than perioperative myocardial infarction and pulmonary embolism (Moore et al., 2010).


Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, and AHRQ Quality Indicators, version 3.1.
KP Surgical Sepsis

- Meets 2 SIRS criteria, possible source of infection
- Sepsis Alert called
- Surgical case identified
- Surgery Consult
- EGDT as directed by ED/ICU team ongoing
- Surgical source control as indicated (within 6hrs of TZ)
Identifying Sepsis in medical, surgical and telemetry units

- 24% of patients who develop severe sepsis or septic shock will do so on a medical-surgical unit (Sebat et al., 2005).
- Kaiser Santa Clara is joining with Surviving Sepsis Campaign (SSC) Collaborative
- The aim of the new initiative is to study, test and disseminate tools related to the early identification and treatment of sepsis on hospital floors
- Sepsis screening every patient, every shift

For more information about the collaborative: http://www.survivingsepsis.org/About-SSC/Collaborative

“The names of the patients whose lives we save can never be known. Our contribution will be what did not happen to them. And, though they are unknown, we will know that mothers and fathers are at graduations and weddings they would have missed, and that grandchildren will know grandparents they might never have known, and holidays will be taken, and work completed, and books read, and symphonies heard, and gardens tended that, without our work, would never have been.”

Donald M. Berwick, MD, MPP  
Former President and CEO  
Institute for Healthcare Improvement

photo from http://www.earlyexperiences.org/grandparent_info.html
Any questions? Concerns? Comments?

For more information, please contact:
Kaiser Permanente Institute for Health Policy at
http://www.kp.org/ihp
References


3 Kaiser Permanente Northern California Quality Data Consulting Team.

4 National Institute of General Medical Sciences, Sepsis Fact Sheet, November 2012.


8 www.healthcare.gov/compare/partnership-for-patients/


10 Johan Sebastián Hernández Botero and María Cristina Florián Pérez, “The History of Sepsis from Ancient Egypt to the XIX Century.” http://dx.doi.org/10.5772/51484