

What Physicians Need in CDS

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Let me tell you a story.....

Advancing Clinical Decision Support
A Clinician's Perspective

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Sepsis Wolf

- 10th most common cause of death in US
- Leading cause of death in ICU
- 18 billion dollars/year
- Sepsis is the body's response to infection
 - Severe sepsis: multiple organ dysfunction
 - Septic shock: hypotension
 - Septicemia: bloodstream infection
- Estimated 800,000 cases of severe sepsis per year in the US
- Rate increasing by 1.5% per year – estimated additional 1 million cases by 2020
- Mortality 30-40%

The obedient child laid her down by the side
Of her Grandmother dear (as she thought);
But all at once, "Granny!" Red Riding Hood
cried,
"What very long arms you have got!"
He answered, "The better to hug you, my child,"
"But, Granny, what very large ears!"

"The better to hear you;" the voice was still
But the poor little girl had her fears. [mild,
"Grandmother, you seem to have very large
"The better to see you, I trow." [eyes!"
"What great teeth you have got!" and the
wicked Wolf cries,
"The better to eat you up now!"



Sepsis/Wolf Recognition

- What big eyes you have
- What big ears you have
- What sharp teeth you have
- What long nails you have
- WBC count
- Fever
- Tachycardia
- Respiratory rate elevation

Evaluation for Severe Sepsis Screening Tool

Instructions: Use this optional tool to screen patients for severe sepsis in the emergency department, on the wards, or in the ICU.

1. Is the patient's history suggestive of a new infection?

- | | | |
|---|---|---|
| ☐ Pneumonia, empyema | ☐ Bone/joint infection | ☐ Implantable device infection |
| ☐ Urinary tract infection | ☐ Wound infection | ☐ Other _____ |
| ☐ Acute abdominal infection | ☐ Bloodstream catheter infection | |
| ☐ Meningitis | ☐ Endocarditis | |
| ☐ Skin/soft tissue infection | | |

___ Yes ___ No

2. Are any two of following signs & symptoms of infection both present and new to the patient? Note: laboratory values may have been obtained for inpatients but may not be available for outpatients.

- | | | |
|--|--|---|
| ☐ Hyperthermia > 38.3 °C (101.0 °F) | ☐ Tachypnea > 20 bpm | ☐ Leukopenia (WBC count < 4000 μ L ⁻¹) |
| ☐ Hypothermia < 36 °C (96.8 °F) | ☐ Acutely altered mental status | ☐ Hyperglycemia (plasma glucose >120 mg/dL) in the absence of diabetes |
| ☐ Tachycardia > 90 bpm | ☐ Leukocytosis (WBC count >12,000 μ L ⁻¹) | |

___ Yes ___ No

If the answer is yes to both either question 1 and 2, *suspicion of infection* is present:

✓ Obtain: lactic acid, blood cultures, CBC with differential, basic chemistry labs, bilirubin.

Cloud Technology

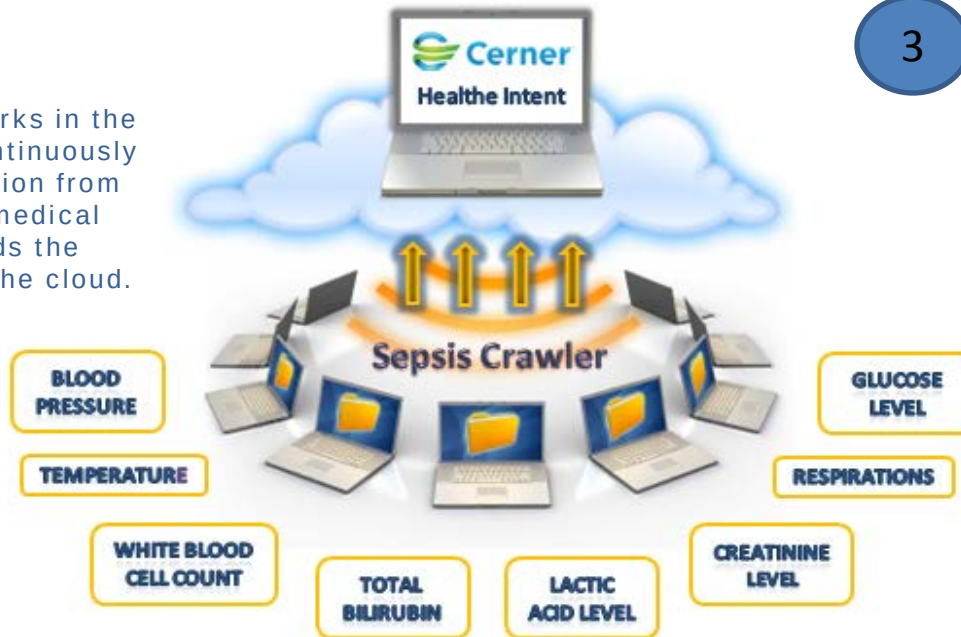
Sepsis Cloud

2

Data is extracted in "real-time" by the Sepsis Crawler. The Sepsis Agent then analyzes the data for potential triggers of Sepsis.

1

The crawler works in the background continuously pulling information from the electronic medical record and sends the information to the cloud.



3

When the Sepsis Agent finds a risk for Sepsis, communication alerts are sent to clinicians.



SIRS
ALERT

SEVERE SEPSIS
ALERT



Think of the crawler as a physician on constant rounds, continuously analyzing clinical parameters (The Cloud) and adding them up to determine if SIRS/Sepsis is possibly present (The Alerts).

You tell me a story.....



HR	•
NIBP	Y
A-Line	4
Manual Cuff	8
Diastolic Augmentation	•

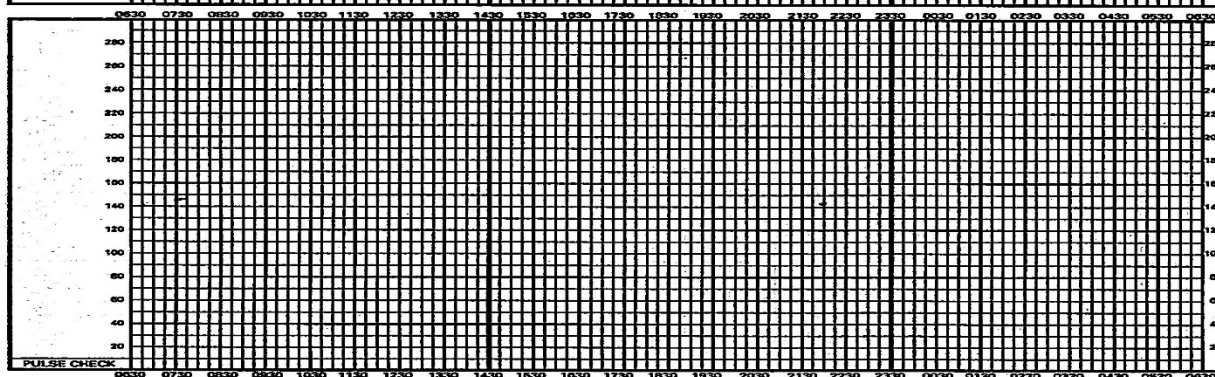
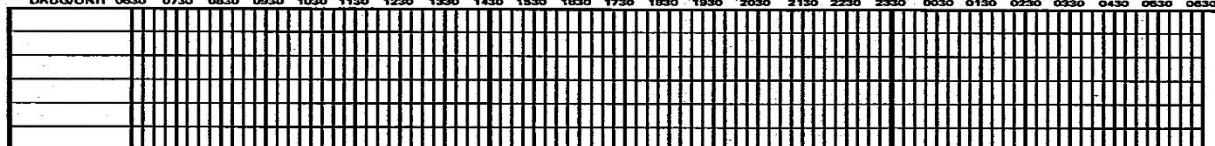
Oral	O
Tympanic	T
Axillary	A
Rectal	R
PA Catheter	C
Bladder	B

Weights:

Daily	_____
Yesterday	_____
Dry	_____
Admission	_____

	Predialysis	Postdialysis	BSA
Mean age	67.9 ± 8.0	67.9 ± 8.0	1.73 m ²
Female/male	10/10	10/10	
Dialysis vintage	1.9 ± 1.1	1.9 ± 1.1	years
Time from start of dialysis to study	1.9 ± 1.1	1.9 ± 1.1	months
Time from last hemodialysis session to study	1.9 ± 1.1	1.9 ± 1.1	hours
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	minutes
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	seconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	milliseconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	microseconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	nanoseconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	picoseconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	femtoseconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	attoseconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	zeptoseconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	yottoseconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	xenoseconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	neonseconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	nanoseconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	microseconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	milliseconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	seconds
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	minutes
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	hours
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	days
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	weeks
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	months
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	years
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	decades
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	centuries
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	millennia
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	eons
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	eternity
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	infinity
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	nothingness
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	void
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	emptiness
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	silence
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	darkness
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	light
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	heat
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	cold
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	warmth
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	coolness
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	humidity
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	dryness
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	wind
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	calm
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	storm
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	peace
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	war
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	love
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	hate
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	joy
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	sorrow
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	hope
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	despair
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	faith
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	doubt
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	belief
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	unbelief
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	trust
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	dis trust
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	confidence
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	lack of confidence
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	certainty
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	uncertainty
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	knowledge
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	ignorance
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	wisdom
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	foolishness
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	intelligence
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	stupidity
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	creativity
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	lack of creativity
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	imagination
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	reality
Time from last predialysis session to study	1.9 ± 1.1	1.9 ± 1.1	fantasy
Time from last predialysis			

DRUG/UNIT	0630	0730	0830	0930	1030	1130	1230	1330	1430	1530	1630	1730	1830	1930	2030	2130	2230	2330	0030	0130	0230	0330	0430	0530	0630
-----------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------



Date:	
TLCF	= Triple Lumen Proximal
TLCM	= Triple Lumen Medial
TLCD	= Triple Lumen Distal
PV	= Peripheral IV
DLP	= Double Lumen Proximal
DL	= Double Lumen Distal
SL	= Single Lumen
LTV	= Long Term Venous Access

PAPP = Pulmonary Artery Proximal
PAIP = Pulmonary Artery Infusion Port
PADP = Pulmonary Artery Distal
IP = Introducer Port

IJ = Internal Jugular
SC = Subclavian
FEM = Femoral

I - IMED
M - MINIMED
A - AUTOSYRINGE

DIET	TIME	% TAKEN

PREV 24° INTAKE

PREV 24° OUTPUT

PREV 24° NET

CUM BAL _____ from _____

XIII

DATE:

[illegible]

MEMORIAL
HERMANN

Critical Care Flowsheet



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MEMORIAL HERMAN

Critical Care Flowsheet



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- Infection
- SIRS**
- Renal System
- Respiratory System
- Central Nervous System
- Hepatic System
- Cardiovascular System

Heart Rate



109 bpm

Temperature



38.5 C

Respiratory Rate



20 bpm

Arterial PaCO2



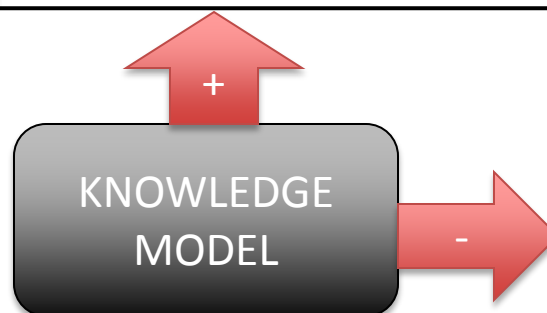
34 mmHg

WBC



22.9 K/uL

Jul 29 2017 Jul 29 2017 Jul 30 2017 Jul 30 2017 Jul 31 2017



SIRS

WBC

Infect

9.5

K/uL

Sho

2012-02-03 10:14:00 +0000

Orga

Respiratory Rate

0

BPM

2012-02-04 21:50:00 +0000

Heart Rate

35

BPM

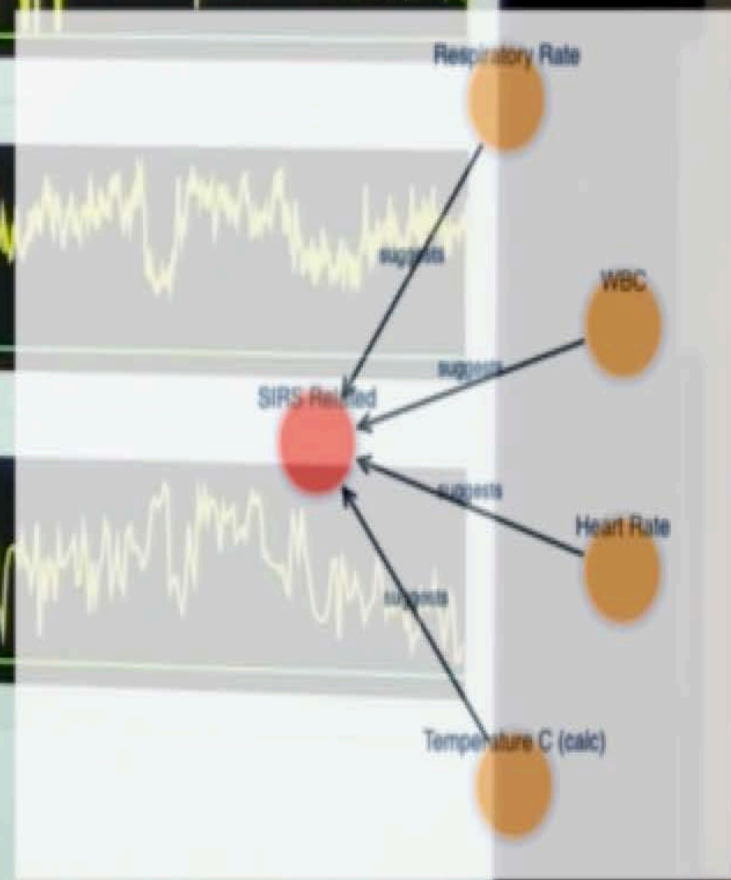
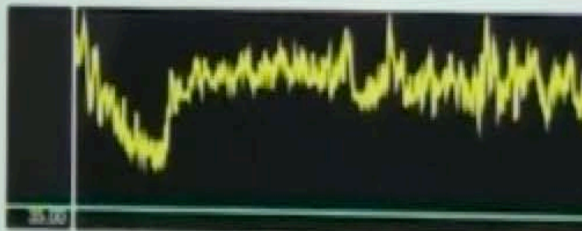
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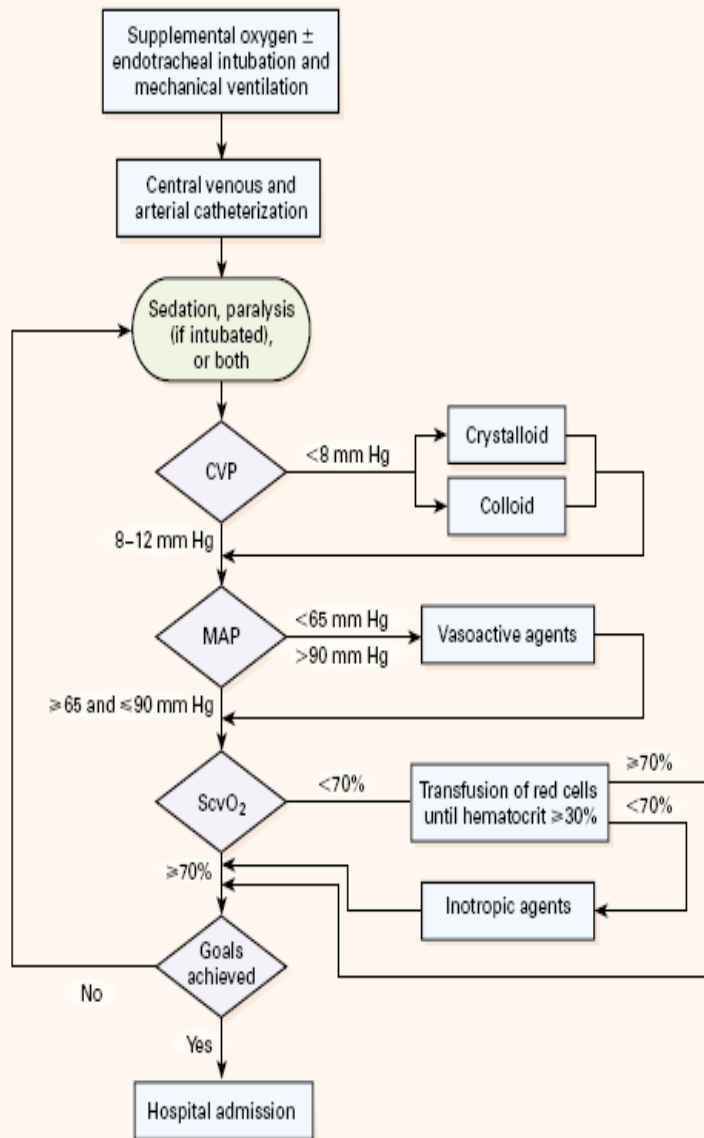
Temperature C (calc)

35.56

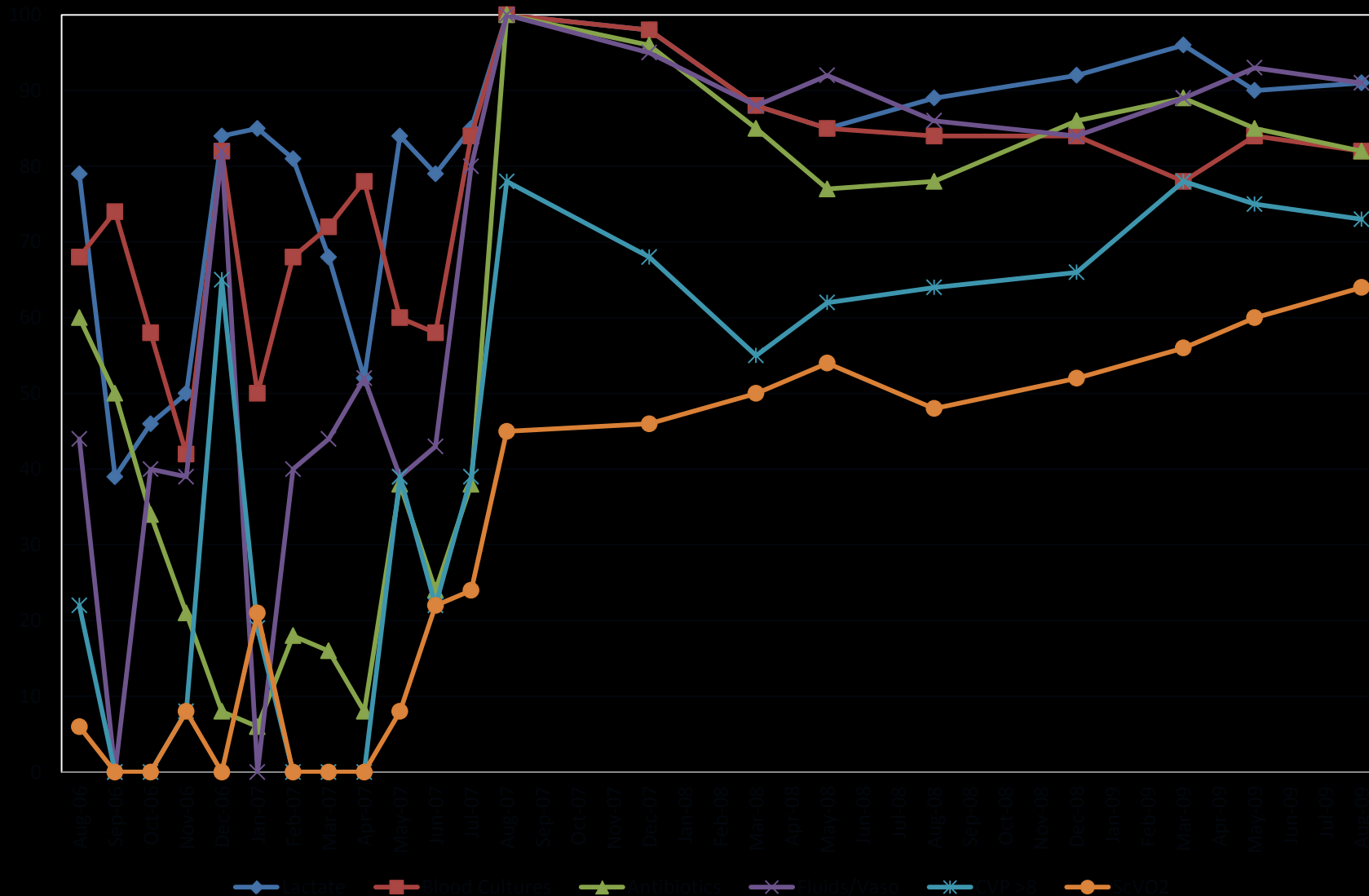
Deg. C

2012-02-03 22:00:00 +0000





Compliance with Bundle Elements





Command Central Clinical Decision Support

- Time to Detection
- Time to Initiation
 - Antibiotics
 - Fluids
 - Vasopressors
- Time to Organ Stabilization
 - Lactic Acid normalization
 - Urine output targets
 - Organ dysfunction resolution
- Time to de-escalation



Clinical Decision Support

Future State



- Preventions Systems
- Early Detection Systems
- Early Intervention Systems
- Organ response Systems
- De-escalation Systems

- Save Grandma

