

2018 HIMSS Davies Case Study

Identification of Sepsis:
*The effect of an automated
screening tool*

MEMORIAL
HERMANN

Memorial Hermann Health System



Woodlands



Sugar Land



TMC



Katy



Memorial City



Southeast



Southwest

- Total hospitals: 14 (11 acute, 2 rehab, 1 orthopedic)
- Inpatient admissions: 158,241
- Annual emergency visits: 595,611
- Annual deliveries: 25,146

- Employees: 25,040
- Beds (acute licensed): 4,016
- Medical staff members: 5,708
- Fellowship programs: 48



Greater Heights



Northeast



Cypress



Pearland



MHOSH

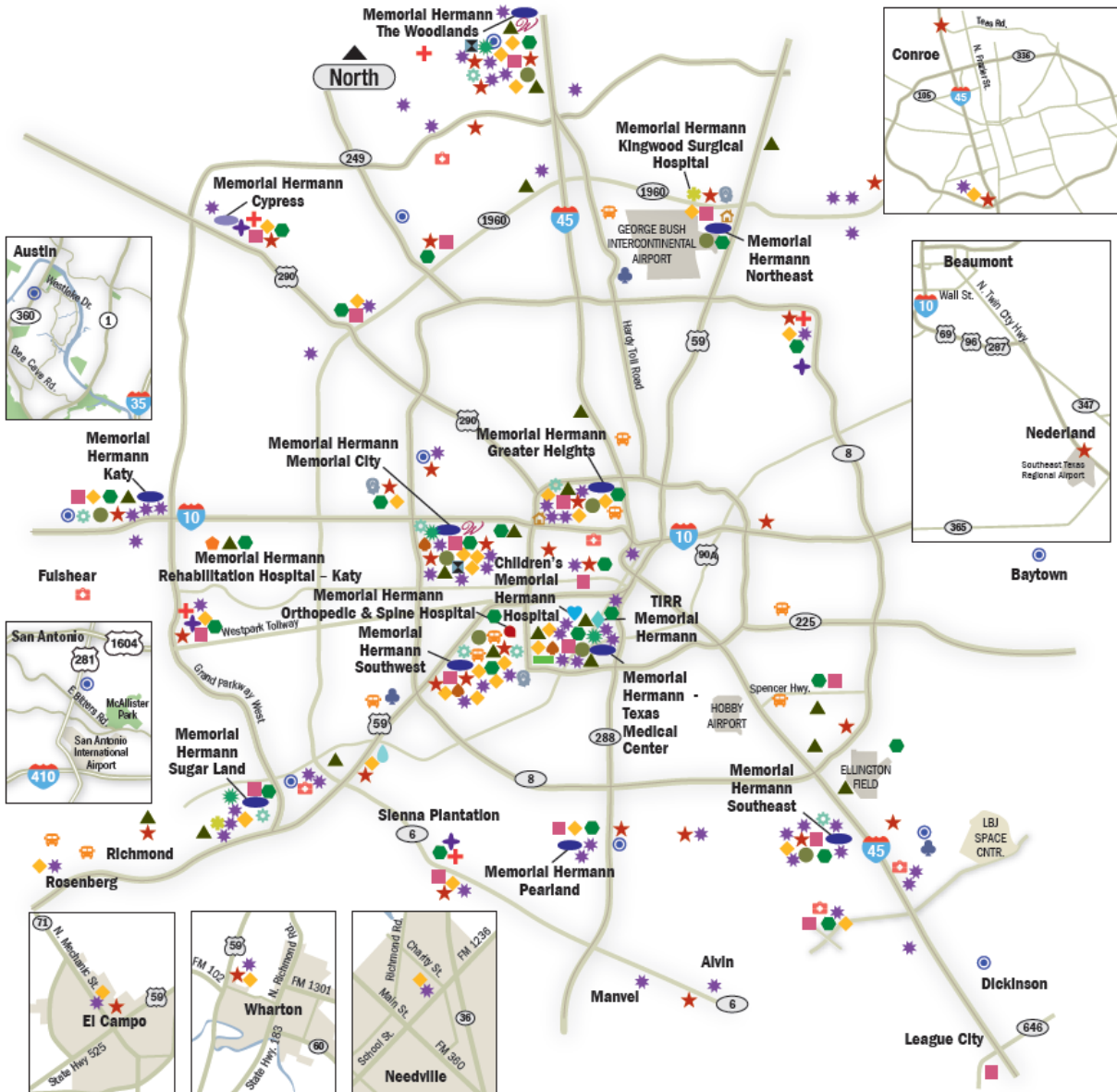


Katy Rehab



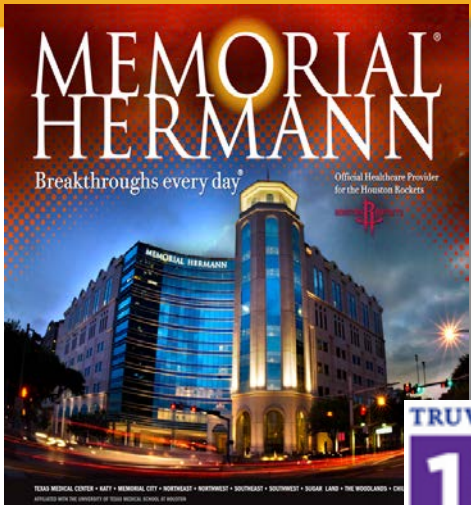
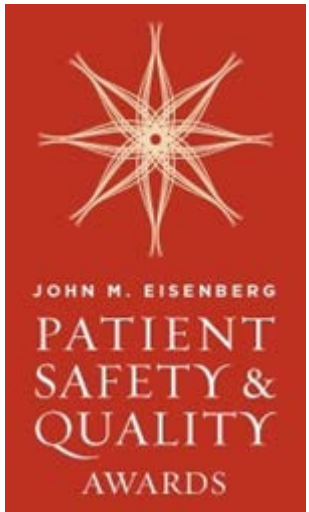
TIRR

Our Network of Care



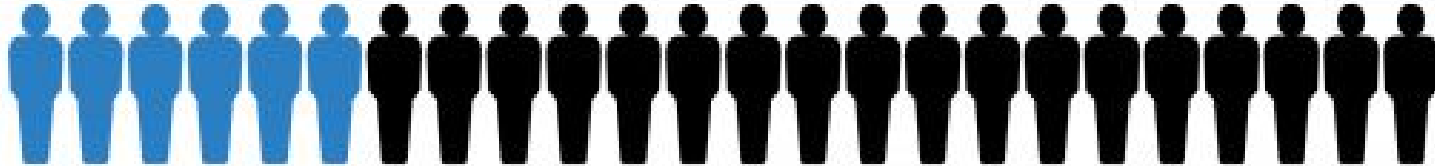
- 25 Imaging Centers
- 19 Breast Care Locations
- 36 Sports Medicine & Rehabilitation
- 34 Diagnostic Laboratories
- 20 Surgery Centers
- 5 Freestanding Emergency Centers
- 3 Home Care
- 8 Cancer Centers
- 3 Heart & Vascular Institutes
- 1 Physicians at Sugar Creek
- 10 School-Based Health Centers
- 2 Neighborhood Health Centers
- 4 Convent Care Centers
- 8 Joint Centers
- 3 Mental Health Crisis Clinics
- 6 Urgent Care Centers
- 4 IRONMAN Sports Medicine Institutes
- 2 Women's Memorial Hermann Hospitals
- 1 Mischer Neuroscience Institute
- 11 Prevention & Recovery Centers (PaRC)
- 68 Memorial Hermann Medical Group
- 2 Executive Health Centers
- 10 Acute-Care Hospitals
- 1 Children's Memorial Hermann Hospital
- 1 TIRR Memorial Hermann
- 1 Memorial Hermann Rehabilitation Hospital - Katy
- 1 Memorial Hermann Orthopedic & Spine Hospital
- 2 Surgical Hospitals

Awards & Recognition



Sepsis Screening

Background



More than 1.5 million people get sepsis each year in the U.S.

About 250,000 Americans die from sepsis each year.

1 in **3**

One in three patients who die in a hospital have sepsis.

In 2013: \$24,000,000,000 spent on treating Sepsis in the U.S*

Sources:

Centers for Disease Control and prevention

<https://www.cdc.gov/sepsis/datareports/index.html>

* Sepsis Alliance

No one is immune.....

MEMORIAL
HERMANN

'Superman' star Christopher Reeve dead at 52

Paralyzed actor was advocate for spinal cord research

Monday, October 11, 2004 Posted: 9:18 AM EDT (1318 GMT)

CNN.com



MOUNT KISCO, New York (AP) -- Actor Reeve went into cardiac arrest Saturday while at his home in Pound Ridge, New York, then fell into a coma and died Sunday at a hospital surrounded by his family.
In the last week, Reeve had developed a **serious systemic infection from a pressure wound**, a common complication for people living with paralysis. He was hospitalized Saturday.



GSA
GLOBAL SEPSIS ALLIANCE

Background



What Can We Do?

- Step 1:
 - Identify
 - Signs and Symptoms
 - Systemic Inflammatory Response Syndrome (SIRS)
 - Severe Sepsis
- Step 2:
 - Evaluate and Treat
 - Diagnostics
 - Fluids
 - Antibiotics

Evolution



**Phase 3:
Advanced
Clinical Decision
Support Tools**

**Phase 2:
Electronic
Forms**

**Phase 1:
Paper-Based
Forms**

Governance Model

Evolving Everyday.....

- CDS Oversight Committee
- Sepsis Steering Committee
- Sepsis Joint Operating Council
- Critical Care Clinical Practice Subcommittee

Key Decisions

- Screening Tool
- Screening Criteria
- SIRS vs. Sepsis
- Notification
- Treatment/ Monitoring
- Measuring Processes
- Measuring Outcomes

Screening Powerform

Sepsis Screening Tool - RXLRKPK, BXEQKL

*Performed on: 08/07/2012 0801

Sepsis Screening Tool

Complete the first three required Fields, then follow the Blue Text below to Determine if Patient Screened Positive for Severe Sepsis

SIRS (System Inflammation Response Syndrome) (Field 1)

- No clinical symptoms of SIRS
- Hyperthermia (Temp) >= 101 F (38.3 C)
- Hypothermia (Temp) <= 96.8 F (36C)
- Tachycardia (Heart Rate) >= 90 bpm
- Tachypnea (Respiratory Rate) >= 20 bpm
- PCO2 < 32
- WBC >= 12000/mm3
- WBC <= 4000/mm3
- WBC > 0.5 K/ μ bands
- ANC (Absolute Neutrophil Count) < 1000
- Mental status acutely altered
- Hyperglycemia (glucose) > 120 mg/dL
- Other

Last Charted value/result for 24 hours VS, Labs & Mental Status

Tahoma 9

08/06/2012 11:40	Temperature	(no data)	
08/06/2012 11:40	Heart rate	(no data)	
08/06/2012 11:40	Respiratory rate	(no data)	
08/06/2012 11:40	WBC	8.2	C K/DMM
08/06/2012 11:40	Glucose Lvl	400	mg/dL
08/06/2012 11:40	Lactic Acid	(no data)	
08/06/2012 11:40	SPO2	(no data)	
08/06/2012 11:40	Blood pressure	(no data)	
08/06/2012 11:40	Creatinine	10.0	H mg/dL
08/06/2012 11:40	Consciousness	(no data)	
08/06/2012 11:40	Orientation	(no data)	
08/06/2012 11:40	Platelet count	150	K/DMM
08/06/2012 11:40	INR	(no data)	
08/06/2012 11:40	Total Bilirubin	(no data)	

Suspected Source of New Infection (Field 2)

- No SUSPECTED SOURCE OF NEW INFECTION
- Pneumonia
- Urinary tract infection
- Abdominal Infection (acute)
- Meningitis
- Skin/soft tissue infection
- Bone/joint infection
- Wound infection
- Bloodstream catheter infection
- Endocarditis
- Implantable device infection
- Suspected or documented infection
- Antibiotic Therapy (not prophylaxis)
- Other

Organ Dysfunction (Field 3)

- No clinical symptoms of ORGAN DYSFUNCTION
- Agitation
- SaO2 < 92%
- SPO2 < 90%
- MAP < 65 mmHg
- SBP < 100 mmHg
- SBP decrease > 40 mmHg from baseline
- PaO2/FiO2 ratio < 300
- Urine output < 0.5 ml/kg/hr after fluid resuscitation
- Creatinine > 2.0 mg/dl (176.8 mmol/L)
- Bilirubin > 2 m/dl (34.2 mmol/L)
- Platelet count < 100,000
- Coagulopathy (INR > 1.5 or aPTT > 60secs)
- Lactate > 2 mmol/L (18.0 mg/dl)
- GCS <= 12
- CNS: altered consciousness (unrelated to primary neuro pathology)

If 2 or more boxes in Field 1 are checked **AND** If 1 or more boxes in Field 2 are checked **AND** If 1 or more boxes in Field 3 are checked = **POSITIVE for Severe Sepsis**

Screening Powerform

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Last Charted value/result for 24 hours VS, Labs & Mental Status

Tahoma 9

	Temperature	(no data)		
	Heart rate	(no data)		
	Respiratory rate	(no data)		
08/06/2012 11:40	WBC	8.2		K/CMM
08/06/2012 11:40	Glucose Lvl	400	C	mg/dL
	Lactic Acid	(no data)		
	SPO2	(no data)		
	Blood pressure	(no data)		
08/06/2012 11:40	Creatinine	10.0	H	mg/dL
	Consciousness	(no data)		
	Orientation	(no data)		
08/06/2012 11:40	Platelet count	150		K/CMM
	INR	(no data)		
	Total Bilirubin	(no data)		

Screening Powerform

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- GCS ≤ 12
- CNS: altered consciousness (unrelated to primary neuro pathology)

If 2 or more boxes in Field 1 are checked

AND

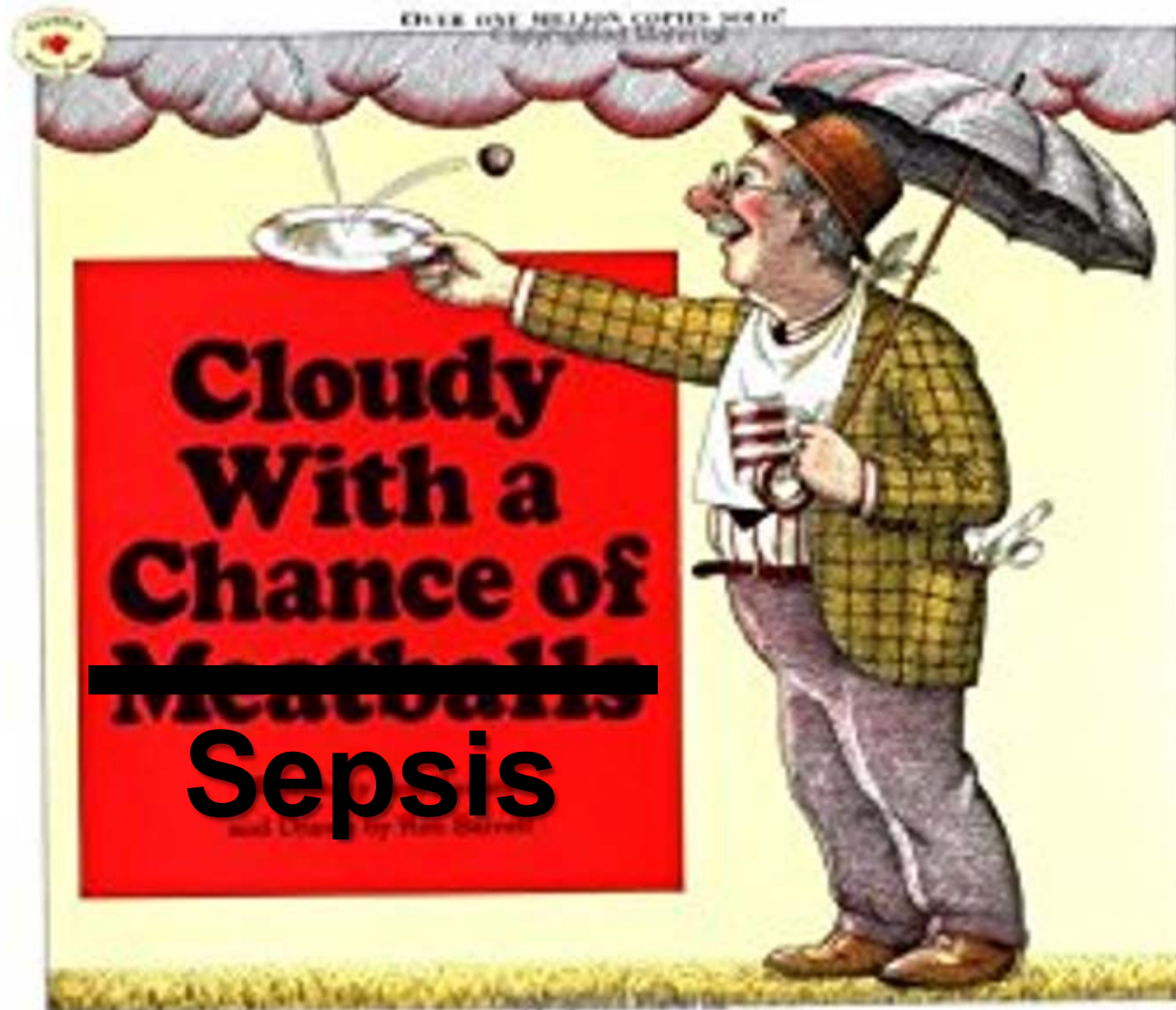
If 1 or more boxes in Field 2 are checked

AND

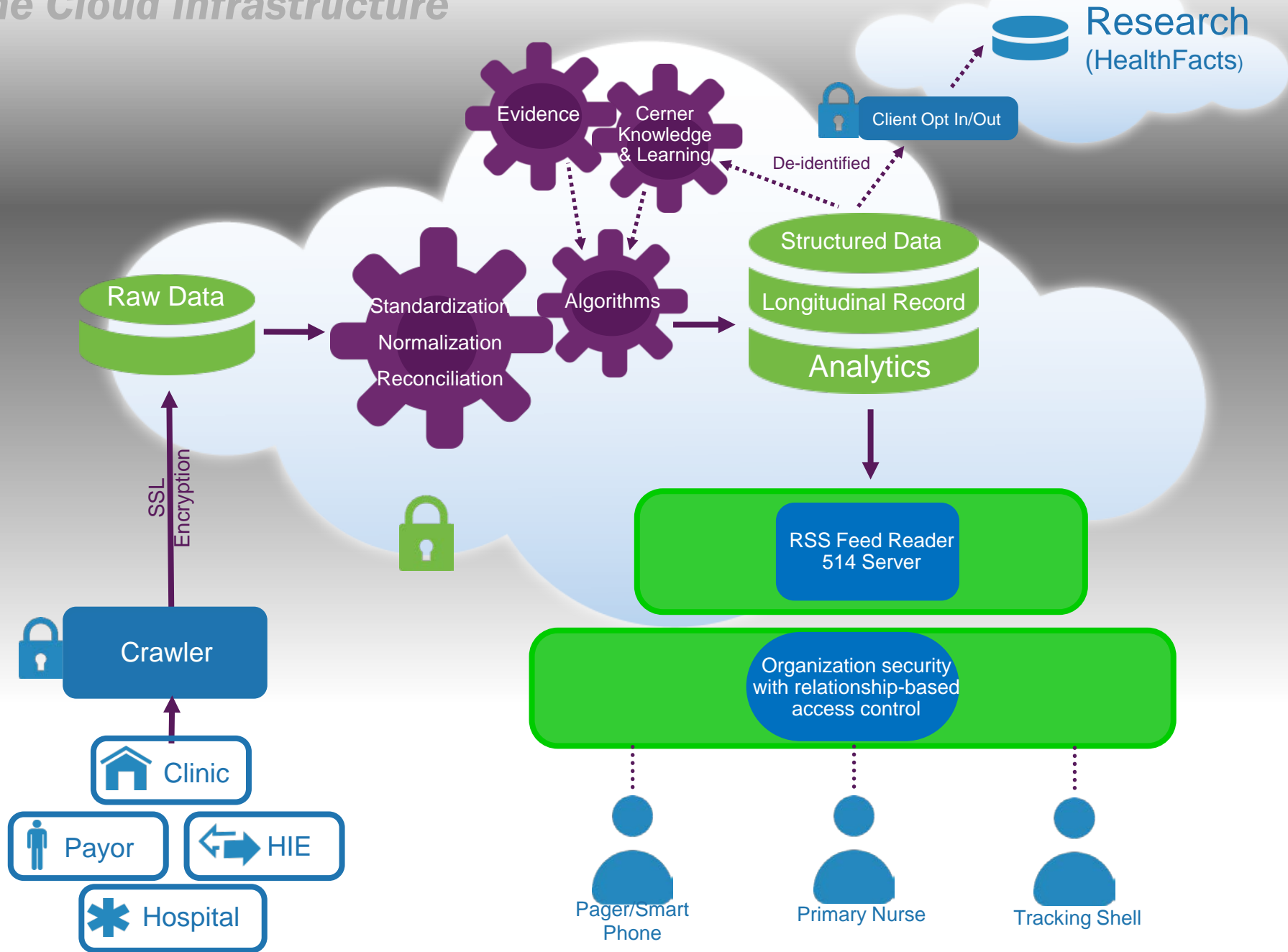
If 1 or more boxes in Field 3 are checked

Sepsis Screening In 2013

MEMORIAL
HERMANN



The Cloud Infrastructure



Patient Audit:

1 Week, 28 Patients (2/13/13 – 2/20/13)

Current State: Sepsis Screening Tool

- Showed **2** Positive Screenings for Severe Sepsis
- Resulted in **1** Patient Moved to Higher Level of Care

St. John Sepsis Agent

- Resulted in **11** Alerts for Sepsis
- Resulted in **5** Patients Moved to Higher Levels of Care

Same group of patients used for each tool

Comparison: One Calendar Day



Facility	Current Sepsis Screening Tool PowerForm		St. John Sepsis Alerts (Background mode for all except HH Cullen)	Patients "Missed" by Screening tool
	Number of Screenings	Positive Sepsis Result		
Facility 1	687	6	49	43
Facility 2	145	0	8	8
Facility 3	399	3	23	20
Facility 4	243	2	10	8
Facility 5	227	0	13	13
Facility 6	379	2	11	9
Facility 7	75	0	2	2
Facility 8	422	11	19	8
Facility 9	212	0	9	9
Grand Total	2814	24	189	165

SIRS vs. Severe Sepsis

Adjustable Trigger Ranges

SIRS ALERT - The patient must meet at least 3 SIRS criteria below:

- Temp (<36°C or >38.3°C)
- HR (>95 bpm)
- RR (>22 b/min)
- Glucose Level (<50 mg/dL or >180 mg/dL)
- WBC (<4 or >12 K/CMM)
- Bands (>10%)

SEVERE SEPSIS ALERT - The patient must meet at least 2 SIRS criteria and 1 Organ Dysfunction criteria below:

- Lactic Acid level (>2.0)
- SBP (<90mmHg)
- MAP (<65mmHg)
- Creatinine Level (0.5 mg/dL increase)
- Total Bilirubin (<10 mg/dL or >2 mg/dL)

These ranges can be refined to adjust the sensitivity.

St. John Sepsis Agent

Workflow Considerations



St. John Sepsis Agent Workflow Considerations

Display: All Orders (All Statuses)

Ordering Physician	Order Name
Laboratory	
Patel, Bela	Bilirubin Total (Bili Total)
Patel, Bela	Complete Blood Count w/ Diff and Platelet (CBC w/ Diff and PL
Patel, Bela	Differential (Auto Diff)
Patel, Bela	Glucose Level (Glu)
Patient Care (MD to Nurse)	
SYSTEM	SIRS Alert
Nursing Interventions	
SYSTEM	Admission History Completion-Adult
SYSTEM	Basic Information-Adult
SYSTEM	DVT/PE Prophylaxis Physician Notification
SYSTEM	Initiate Assessment Adult
SYSTEM	Initiate Interdisciplinary Plan of Care
SYSTEM	Order Entry Details

ED17,A	
ED18,A	
ED19,A	
ED20,A	
ED21,A	
ED22,A	
ED23,A	

SIRS alert –Yellow
 Severe Sepsis Alert – Red
 MD has been notified---Green

Meds	New	Lab	Rad	SIRS/Sepsis

Discern Notification (RHCRUZ)

Task Edit View Help

Subject	Event Date/Time
SEPSIS	1/22/2018 14:11:00

DISCERN ALERT - SEPSIS

Patient Name: FWTKK, ZBTMN OTKD
 FIN: 123584589

Ready | TEST | RHCRUZ | RHCRUZ | Monday, Jan

St. John Sepsis Agent Workflow Considerations

Physician Notification for SIRS

SIRS Result Information

St. John SIRS Alert Criteria

01/23/2018 11:02 SIRS

SIRS Criteria:
 01/22/2018 05:23 Neutrophils, bands manual blood (10.4 %)
 01/23/2018 10:00 Heart Rate (114 bpm)
 01/23/2018 10:00 RR (25 br/min)

SIRS Alert: This patient has met at least 3 SIRS criteria. Please contact the physician and consider ordering/reviewing the following to evaluate for organ dysfunction:

Lactic Acid
 Creatinine
 Total Bilirubin
 Platelet Count
 PTT
 Blood Culture
 UA with Culture

Last Charted Relevant Lab Results

Lab Results	
Lactic Acid Lvl:	(no data)
Creatinine Level:	(no data)
Bilirubin Total:	(no data)
WBC:	(no data)
Platelet:	(no data)
PTT:	(no data)
Culture: Blood	NEG

Read Back & Outcome

Outcome

Orders received
 No new orders received
 Escalation (chain of command)
 Physician not notified

Physician Not Notified Reason

Primary physician notified by ED
 SIRS alert within 24 hours post-op
 Subsequent alert, clinical improvement
 Vital sign(s) in error (typo, wrong pt)

Escalation Reason

Vital Signs In Error Reason

Time Alert Reported to Physician/Provider

Read-back time
Names of provider and nurse performing read-back

Physician/Practitioner Informed of Alert

Alert Documented

SIRS alert documented

Alert Reported by (Clinician/Nurse)

Clinical Improvements

WBC improving Creatinine Improving
 Lactic acid improving Bands Improving
 Bilirubin improving

1

2

Outcome of read-back

Read-back time
Names of provider and nurse performing read-back

Order Set

- Used existing Order Set Editorial Board
- Appointed subject matter experts
- Consensus on main content
- System-wide roll out
- Review periodically/ Update Content

Order Set

Screenshot

-ED Sepsis MPP (Initiated Pending)

▶ Vital Signs/I&Os/Weight


▶ Laboratory

▶ Radiology



▶ Diagnostic Tests


▶ Continuous Infusions

▾ Medications



 Vasoactive Medications Adult MPP

Antimicrobials

  Pneumonia Infection Antibiotic MPP

  Intra-Abdominal Infection Antibiotic MPP

  Skin and Soft Tissue Infection Antibiotic MPP








  Unknown Source or Suspected Line Infection Antibioti...

  Urinary Tract Infection Antibiotic MPP

Order Set

Screenshot

-ED Sepsis MPP (Initiated Pending)

- ▶ Sepsis MPP (Initiated Pending)
 - ▶ ADT/Condition
 - ▶ Laboratory
 - ▶ Radiology
 - ▶ Diagnostic Tests
 - ▶  Continuous Infusions
- ▢ Medications
 - ▢  Vasoactive Medications Adult MPP
 - ▢  Septic Shock with Resuscitation Add On MPP EKM
 - Antimicrobials
 - ▢  Pneumonia Infection Antibiotic MPP
 - ▢  Intra-Abdominal Infection Antibiotic MPP
 - ▢  Skin and Soft Tissue Infection Antibiotic MPP
 - ▢  Unknown Source or Suspected Line Infection Antibioti...

Lactate Order

<input type="checkbox"/>		Lactic Acid Level (Lactic Acid)	Completed
<input type="checkbox"/>		Lactic Acid Level (Lactic Acid)	Completed
<input type="checkbox"/>		Manual Differential (Manual Diff)	Completed
<input checked="" type="checkbox"/>		Point of Care Blood Glucose AC4	Ordered
<input checked="" type="checkbox"/>		Point of Care Blood Glucose AC4	Ordered
<input checked="" type="checkbox"/>		Point of Care Blood Glucose AC4	Ordered

07/08/18 4:13:06 CDT, Timed Study, ONCE, 1, day

Automatically ordered by Discern Expert. 1 of 1 most recent Lactic Acid Lvl level result within th

Lactic Acid Level (Lactic Acid)

Details:

07/08/18 4:13:06 CDT, Timed Study, ONCE, 1, day

Order Comment:

Automatically ordered by Discern Expert. 1 of 1 most recent Lactic Acid Lvl level result within the last 12 hours on July 08, 2018 01:13:00 CDT result = 2.2. FIRST. DO NOT CANCEL because this patient may have severe sepsis.

- Is the sepsis screening cloud working?
 - Possibility of cloud going “down”
- Are our alerts/notifications working?
 - Do we understand how often they are firing?
 - Are we at risk of over alerting?

Downtime Identification

Sepsis Crawler

Sepsis Alerts Triggered - Triggered within last 30min

Apr 8 2014, 8:20 am - Apr 9 2014, 8:20 am



Alerts to OR Staff

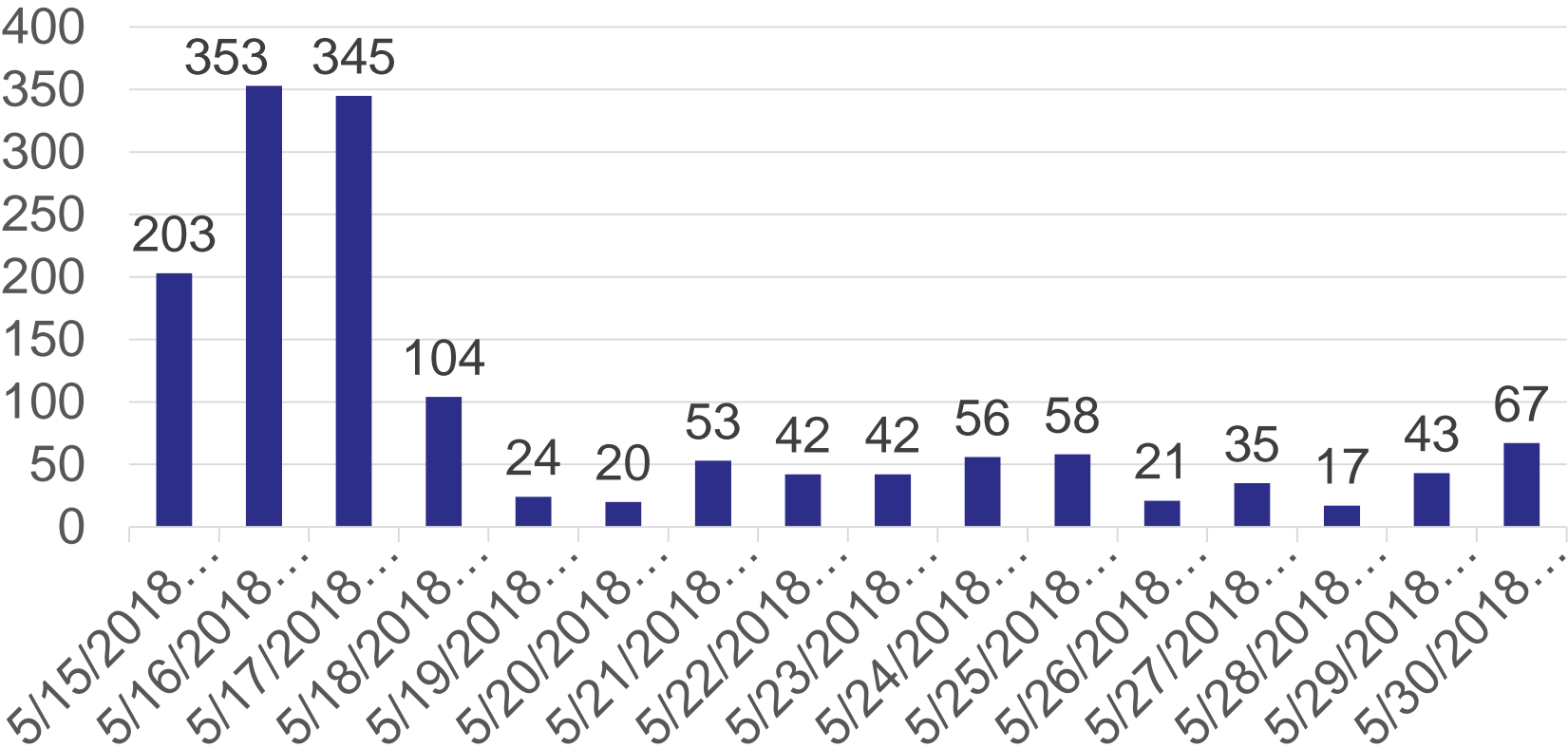
By Facility

May 15-May 30, 2018 (15 days)

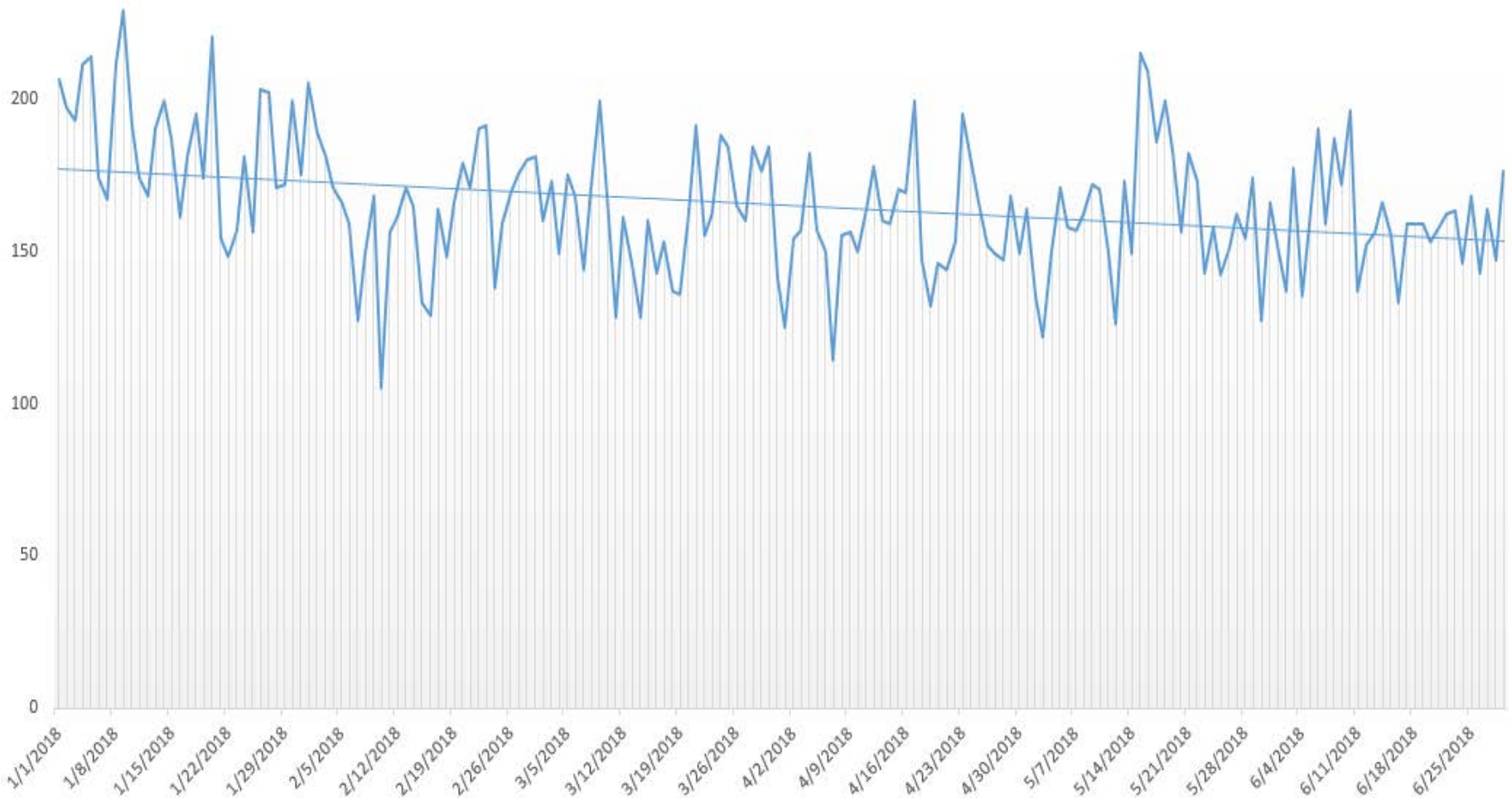
Facility	# of notifications
Facility 1	20
Facility 2	14
Facility 3	91
Facility 4	385
Facility 5	2
Facility 6	100
Facility 7	209
Facility 8	111
Facility 9	160
Facility 10	19
Facility 11	182
Facility 12	190
Grand Total	1483

OR/ PACU Notifications

↓ The relationship expirations turned on 5/17



Repeat Lactate Rule Firings



- How are our clinicians responding to our alerts/ notifications?
- How are our clinicians using the tools?
- Is care being provided to our patients in a timely manner?

Process Measures

St. John Sepsis Alert

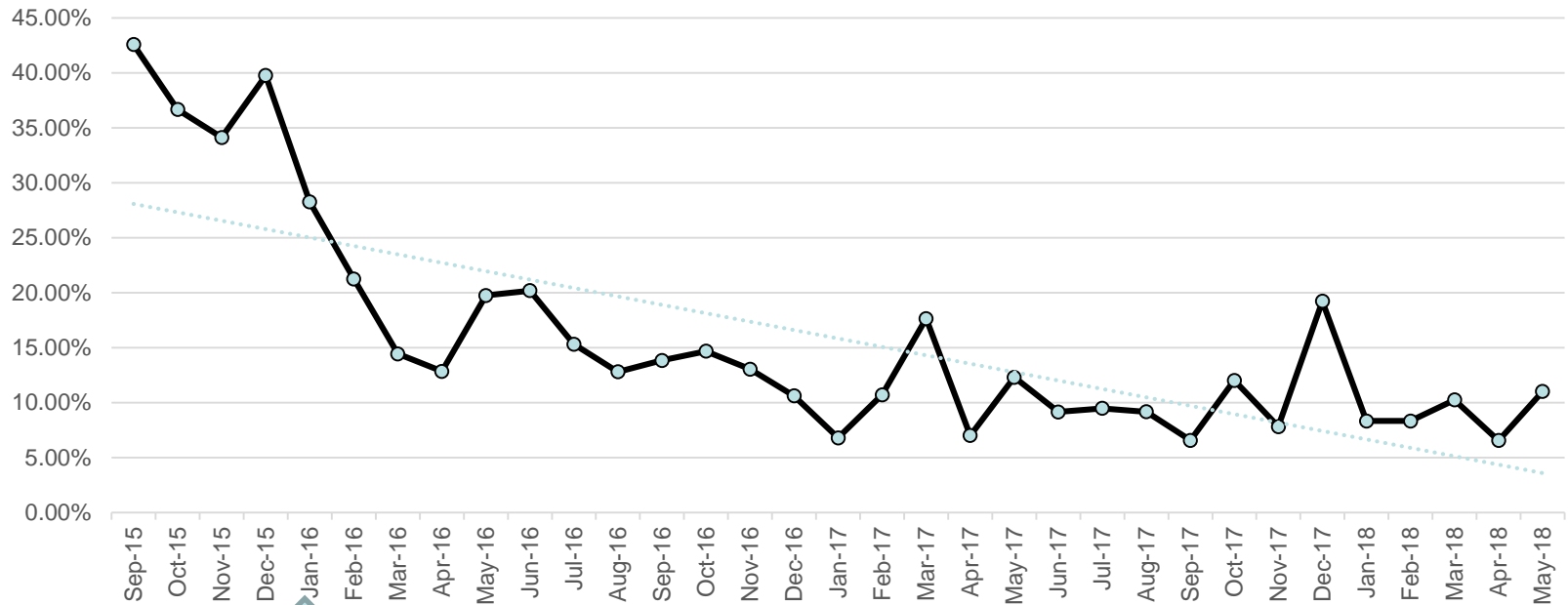


Alert Type	D/T of Alert	Time & Date MD Notified for SIRS (IP)	IP - MD Notified for SIRS	Time Between SIRS Alert and MD Notification (in minutes) (IP)	Time Between Alert and SIRS MD Notification (IP)	IP - SIRS Action Outcome
SIRS Alert	10/07/2015 12:41:58 PM	10/8/2015 1:44:56 AM		783	Greater Than 2 Hours	Physician not notified
SIRS Alert	10/07/2015 06:31:21 AM	10/7/2015 6:44:05 AM		13	1 Hour or Less	Physician not notified
SIRS Alert	10/07/2015 10:33:03 PM	10/8/2015 11:05:00 PM		1472	Greater Than 2 Hours	No new orders received
SIRS Alert	10/07/2015 08:42:50 PM	10/8/2015 4:12:21 AM		450	Greater Than 2 Hours	Physician not notified
SIRS Alert	10/07/2015 11:11:48 AM	10/7/2015 12:40:00 PM		89	1-2 Hours	No new orders received
SIRS Alert	10/07/2015 04:16:06 AM	10/7/2015 4:57:14 AM		41	1 Hour or Less	Physician not notified
SIRS Alert	10/07/2015 04:12:20 PM	10/7/2015 4:14:47 PM		2	1 Hour or Less	No new orders received
Alert Type	D/T of Alert	Time & Date MD Notified for Sepsis (IP)	IP - MD Notified for Sepsis	Time Between SEPSIS Alert and MD Notification (in minutes) (IP)	Time Between Alert and Sepsis MD Notification (IP)	IP - Sepsis Action Outcome
Severe Sepsis Alert	10/07/2015 05:27:28 PM	10/7/2015 5:27:00 PM		0	1 Hour or Less	Orders received
Severe Sepsis Alert	10/07/2015 09:01:36 AM	10/7/2015 11:33:20 AM		152	Greater Than 2 Hours	No new orders received
Severe Sepsis Alert	10/07/2015 07:41:29 AM	10/7/2015 7:57:57 AM		16	1 Hour or Less	No new orders received
Severe Sepsis Alert	10/07/2015 06:46:22 AM	10/7/2015 6:50:00 AM		4	1 Hour or Less	Orders received
Severe Sepsis Alert	10/07/2015 02:07:06 PM				Incomplete	
Severe Sepsis Alert	10/07/2015 08:22:47 PM	10/7/2015 8:49:48 PM		27	1 Hour or Less	Orders received
Severe Sepsis Alert	10/07/2015 10:06:43 AM	10/7/2015 11:58:54 AM		112	1-2 Hours	Physician not notified
Severe Sepsis Alert	10/07/2015 04:36:10 AM	10/7/2015 4:52:07 AM		16	1 Hour or Less	Physician not notified
Severe Sepsis Alert	10/07/2015 05:12:26 PM	10/7/2015 5:32:16 PM		20	1 Hour or Less	No new orders received

Process Measures

Repeat Lactate Compliance

No Repeat Lactate Level within 6 hrs when 1st >2.0



Repeat lactate rule turned on

Process Measures

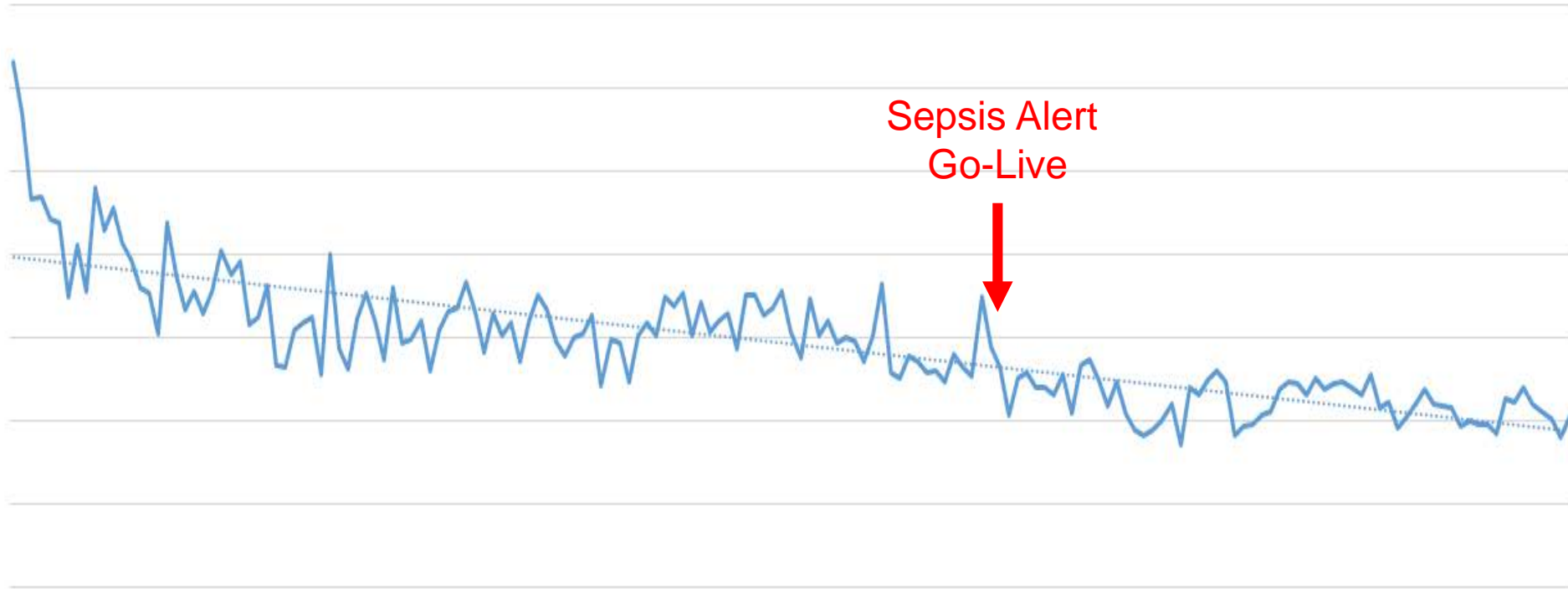
Sepsis Order Set Utilization

Home › MPP Utilization › MPP Population Group Dashboard › Summary Performance View

Population Groups	Plan Name	All Facilities	Facility 1	Facility 2	Facility 3	Facility 4
Sepsis	Sepsis ED	45.4%	50.0%	70.4%	46.7%	40.0%
	Sepsis IP	24.4%	25.0%	11.1%	18.7%	25.3%

Outcome Measures

Mortality Rate



Outcome Measures

ALOS



Outcome Measures:

As a result of improvement in mortality rate
and ALOS:

Lives Saved = 8,836

Days Saved = 327,346

THANK YOU!