January 27, 2012
ANA Quality Conference
Las Vegas, NV

From SIRS to Septic Shock: an Innovative Solution to Surviving Sepsis Utilizing a Nurse Practitioner-led Screen Team

Ariel Waters
MSN, RN, ACNP-BC

Charyl Bell-Gordon
MA, RN, CEN, FNP-C

Jennifer Steele
MSN, RN, ACNP-BC

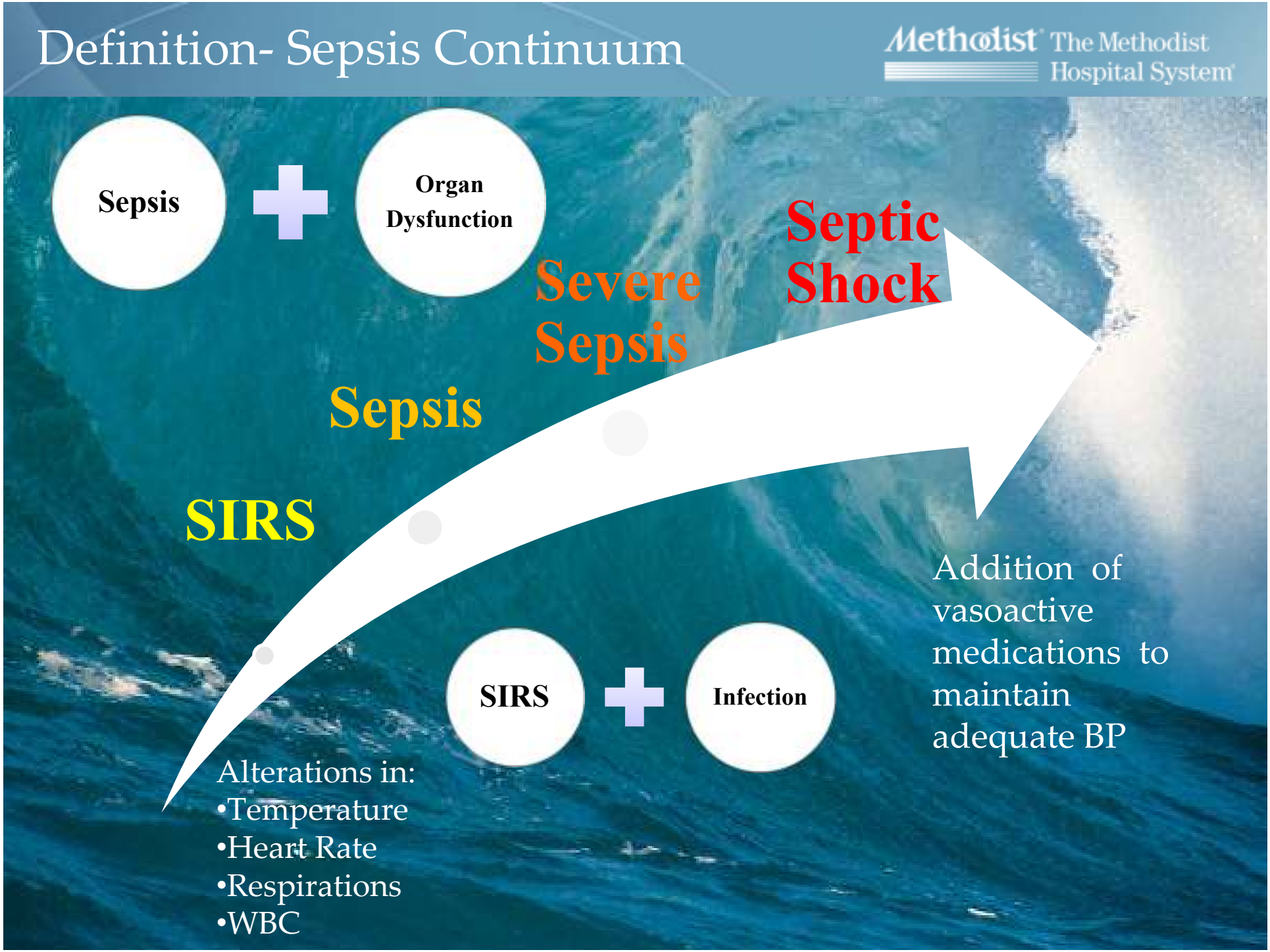
Methodist The Methodist Hospital System

Objectives

- Define sepsis and review the epidemiology and impact on healthcare systems
- Discuss evidence based guidelines of early sepsis management
- Describe The Methodist Hospital's innovative Nurse Practitioner-led approach to early identification and implementation of therapy to reduce sepsis-related mortality

Definition- Sepsis Continuum

Methodist The Methodist Hospital System



Why is Sepsis so Important?

Leading Causes of Death in 2007

1. Diseases of heart (heart disease)

More Americans die from severe sepsis than from breast cancer, lung cancer and stroke **combined.**

phrosis (kidney disease)

12. Chronic liver disease and cirrhosis
13. Essential hypertension and hypertensive renal disease (hypertension)
14. Parkinson's disease
15. Assault (homicide)

Xu JQ, Kochanek KD, Murphy SL, Tejada-Vera B. Deaths: Final data for 2007. National vital statistics reports; vol 58 no 19. Hyattsville, MD: National Center for Health Statistics. 2010. Available from: http://www.cdc.gov/nchs/data/nvsr/nvsr58/nvsr58_19.pdf.

Epidemiology and Impact

- Estimated for 2010 nearly 1,000,000 cases of sepsis
- Associated mortality rate of greater than 30%.
- Mortality from septic shock remains unchanged over the last several decades at > 50%

Angus, D.C., Linde-Zwirble, W.T., Lidicker, J., Clermont, G., Carcillo, J, & Pinsky, M.R. (2001). Epidemiology of severe sepsis in the United States: analysis of incidence, outcome, and associated costs of care. *Critical Care Medicine, 29* (7), 1303–1310.
Hall, M.J., Williams, S.N., DeFrances, C.J., & Golosinskiy, A. (2011). *Inpatient care for septicemia or sepsis: A challenge for patients and hospitals.* NCHS data brief, no 62. Hyattsville, MD:

Epidemiology and Impact

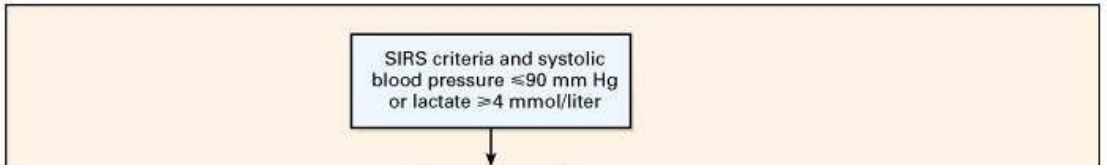
- Hospitalizations for sepsis more than doubled between 2000 and 2008
- Septic patients spent 75% more time in the hospital and were eight times as likely to die in the hospital as patients with other diagnoses
  - Similar for males and females
  - Increased with age
    - 65 and over (122.2 per 10,000)
    - Under age 65 (9.5 per 10,000)
  - In-hospital deaths 2008
    - 17% vs. 2%

- In 2008, sepsis-related treatments cost an estimated $14.6 billion

Hall, M.J., Williams, S.N., DeFrances, C.J., & Golosinskiy, A. (2011). *Inpatient care for septicemia or sepsis: A challenge for patients and hospitals.* NCHS data brief, no 62. Hyattsville, MD: National Center for Health Statistics. Retrieved from http://www.cdc.gov/nchs/data/databriefs/db62.htm

Evidence-Based Guidelines

- Rivers, et. al (2001) highlighted the importance of early



Background	Method	Results	Conclusion
Previous studies examined goal directed therapy in ICU patients with severe sepsis; however, no study has yet to examine efficacy of EGDT (maximizing cardiac preload, afterload, contractility for tissue oxygenation) prior to ICU admission	Patients admitted through ER with severe sepsis were randomly assigned EGDT vs. standard of care for the first six hours prior to ICU admission	Mortality 30.5% vs. 45.6% 34% reduction in-hospital mortality 21% reduction in mean length-of-stay Improved SCVO2, pH, lactate Significant decrease in APACHE 2 scores indicating less severe organ damage	Significant benefits in outcome can be achieved through early goal-directed therapy in patients with severe sepsis prior to ICU admission.

Rivers E, Nguyen B, Havstad S, et al. Early goal-directed therapy in the treatment of severe sepsis and septic shock. *N Engl J Med* 2001; 345(19):1368-77.

Evidence-Based Guidelines

Methodist The Methodist Hospital System

- The Surviving Sepsis Campaign, a world-wide effort led by international clinical experts, developed practical, evidence-based guidelines to increase awareness and improve outcomes related to sepsis.

Measure serum lactate

Obtain blood cultures (prior to antibiotic administration)

Administer broad-spectrum antibiotic (within three hours in ED, 1 hour non-ED admission)

Treat hypotension or elevated lactate >4 mmol/L with 20 ml/kg of crystalloid. If hypotension persists, may add vasopressors for a goal mean arterial pressure (MAP) > 65 mm Hg

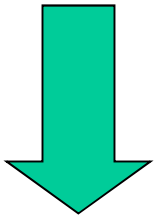
If persistent hypotension despite previous therapy (Septic shock) therapy includes goal central venous pressure (CVP) of > 8 mmHg and central venous oxygen saturation (ScvO2) > 70 % or mixed venous oxygen saturation (SvO2) > 65 %

6 Hour Bundle

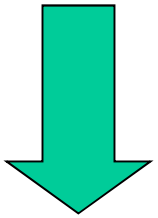
Dellinger RP, Levy MM, Carlet JM, et al. Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock. *Crit Care Med* 2008; [published correction appears in *Crit Care Med* 2008; 36:1394-1396] 36:296-327

Evidence-Based Guidelines

- Early Recognition



- Early Intervention



- Improved Survival!!!

Background

- In 2008, 50% of all patients who died at TMH had a diagnosis of sepsis coded in their medical record.

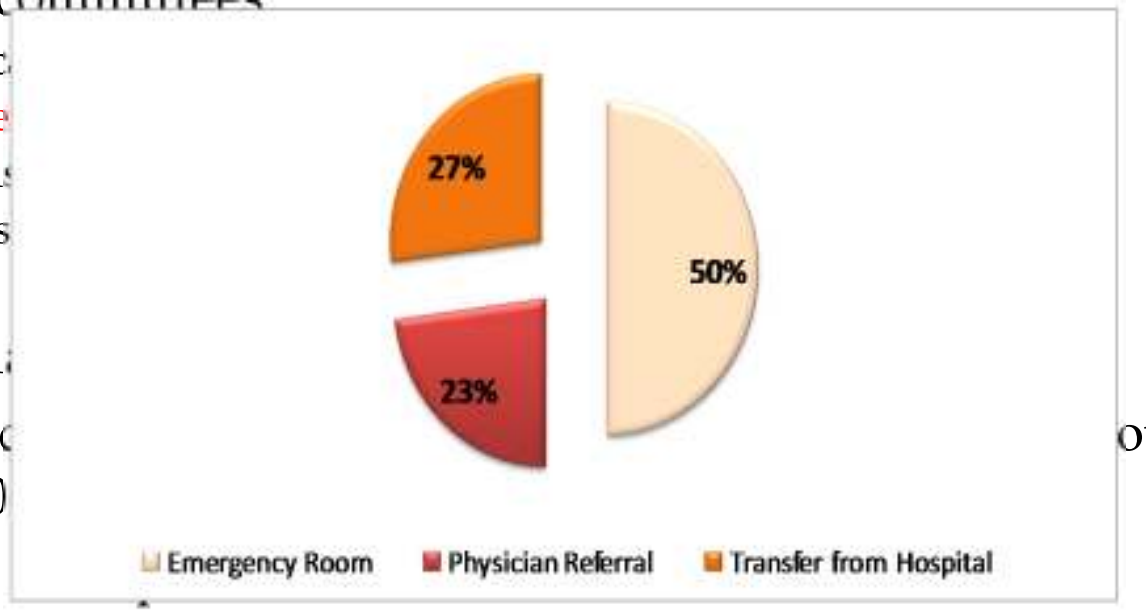
Houston We Have a Problem!

Development of Sepsis Screen Team

Methodist The Methodist Hospital System

Sepsis Care Management Performance Improvement

- **Interdisciplinary Team**
  - 4 Subcommittees:
    - Educ
    - Scree
    - Resu
    - Meas
  - Popul
    - All ough 6/20
  - Focus
    - Mortality cases with ANY diagnosis of septicemia, septic shock, SIRS-sepsis or SIRS-severe sepsis (ICD9s:038.0 - 038.9, 785.52, 995.91 or 995.92)



NP-led Screen Team is Born!

- Rollout recommendations-
  - Transfer patients
    - Acute Care Nurse Practitioner-led screen team
  - ER patients
    - Physicians and staff
  - In-patients
    - Pilot unit nurses (Dunn 8 E &W, Main 6)

Sepsis Screen Team

Methodist The Methodist Hospital System

The Journal of TRAUMA® Injury, Infection, and Critical Care

Validation of a Screening Tool for the Early Identification of Sepsis

Laura J. Moore, MD, Stephen L. Jones, MD, Laura A. Kreiner, MD, Bruce McKinley, PhD, Joseph F. Sucher, MD, S. Rob Todd, MD, Krista L. Turner, MD, Alicia Valdivia, RN, and Frederick A. Moore, MD

Sepsis prevalence: 12.2%
Sensitivity: 96.5%
Specificity: 96.7%
Positive predictive value: 80.2%
Negative predictive value: 99.5%

and decrease sepsis-related mortality by insuring early appropriate interventions.

Results: Over 5 months, 4,991 screens were completed on 920 patients. The prev-

J Trauma. 2009;66:1539–1547.

The Methodist Hospital Department of Surgery: Sepsis Screening Hub

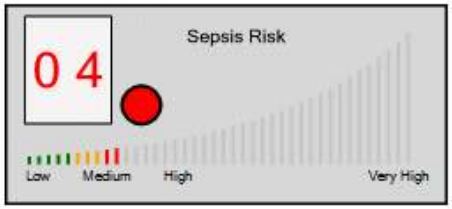
Mrs J

123456789
05/16/1933 78Yrs

SIRS Screening Tool
Female

The Methodist Hospital (TMC)
Visit Number: 0000

09/02/2011 14:29



Please Contact the back-up CERT Nurse Practitioner @ 713-768-0774 regarding this SIRS Screen and request a clinical assessment ASAP.

Date:	01/26/2011 17:20	01/26/2011 17:20	02/22/2011 10:36	03/10/2011 15:56	09/02/2011 14:29
Location:	Z-TRAINING	Z-TRAINING	Z-TRAINING	Z-TRAINING	Z-TRAINING
10+		●			
9	●				
8					
7					
6			●		
5					
4					■
3					
2				●	
1					
0					
SIRS:	3	3	3	2	3
Tmin/max:	96.4/103	96.4/103	101/102	94/98.6	100.4/101
HR:	120	150	120	99	111
RR:	36	36	26	20	24
WBC:	17.00	17.00	17.00	16.00	18.20
Mental:	▲	▲	▼	▲	▼
Eval:	none	none	none	none	none

Icon Key:
- ● = RN screen
- ■ = NP sepsis team screen

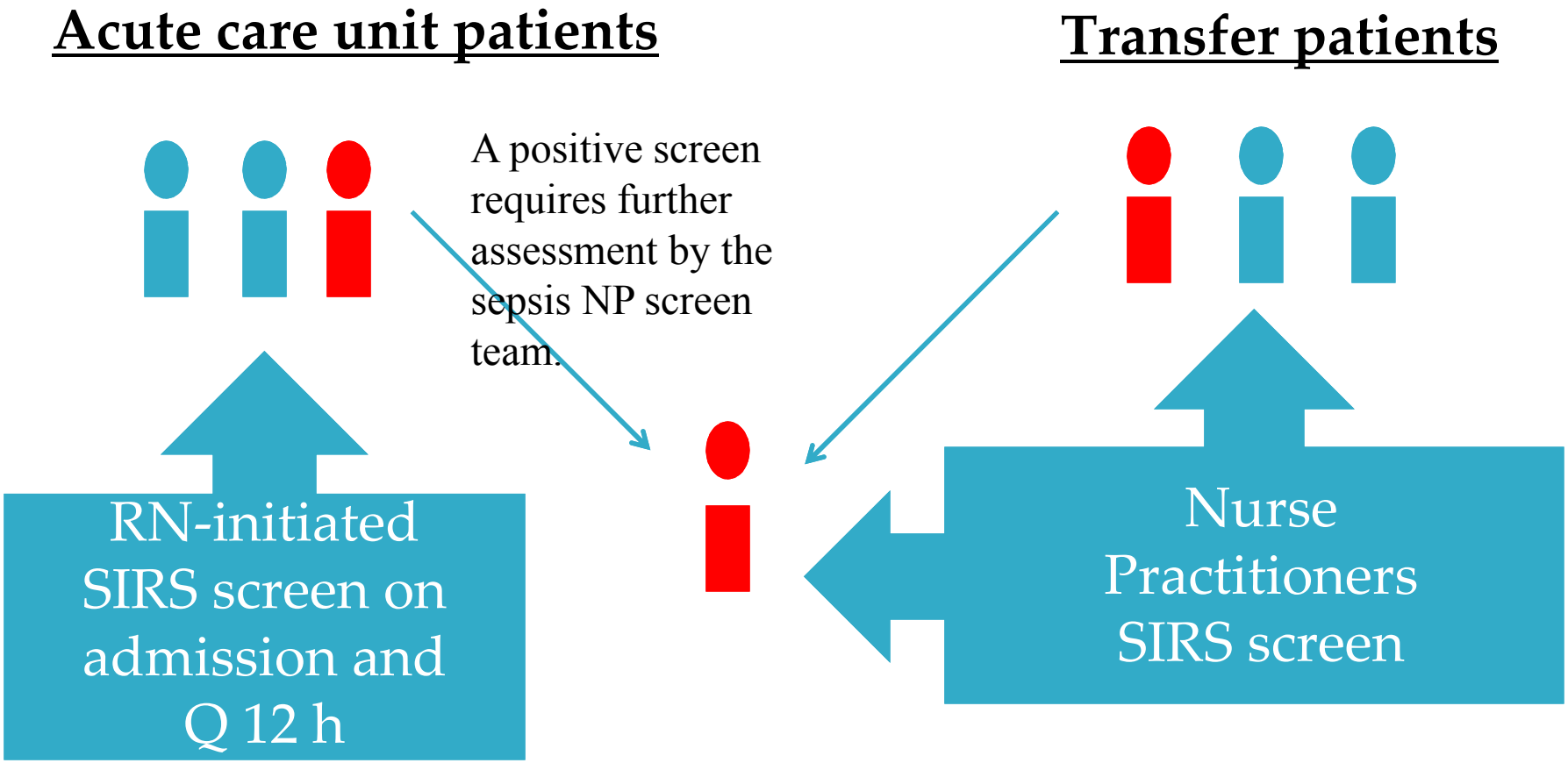
Clinical Vector Key:
- ▲▲ = marked improvement
- ▲ = moderate improvement
- ▲▼ = no change
- ▼ = moderate deterioration
- ▼▼ = marked deterioration

Sub-Score:						
(2)	Current Heart Rate:	111	-Select HR-	time:	14:27:33	
(0)	T max:	101	- °F -	time:	14:00	
	T min:	100.4	- °F -	time:		
(0)	Current Respiratory Rate:	24	-Select RR-	time:	14:27:33	
(1)	Latest WBC:	18.2		date-time:	08/10/2011	10:00

(0) **Cardiac Modifiers:** ☐ Beta Blockers ☐ Calcium Channel Blockers ☐ Pacemaker ☐ Other

(1) **Mental Status Deterioration:** ☑ Yes ☐ No ☐ Not Examined

Sepsis Screen Team Model



NP initiates evidence-based, early goal-directed therapy as recommended by the TMH-approved protocol when a potentially septic patient is identified

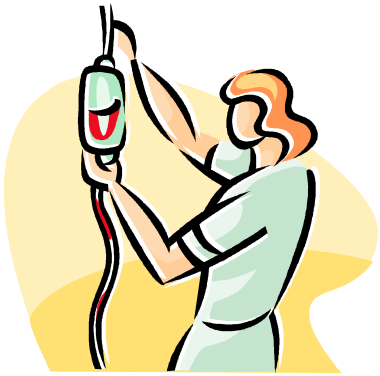
Early Goal-Directed Therapy

- Initial resuscitation (first six hours)
  - Identification of early pathogenesis
  - Initiation of evidence-based protocol with defined goals:
    - Optimizing hemodynamic status, tissue hypoxia, oxygen delivery and demand
    - The sepsis NP screen team goals are tailored to non-ICU patients:
      - HR less than 100
      - SBP greater than 90 or MAP greater than 65
      - Fever reduction
      - Improved mental status
      - Improved organ perfusion

Dellinger RP, Levy MM, Carlet JM, et al. Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock. *Crit Care Med* 2008; [published correction appears in *Crit Care Med* 2008; 36:1394-1396] 36:296-327.
Rivers E, Nguyen B, Havstad S, et al. Early goal-directed therapy in the treatment of severe sepsis and septic shock. *N Engl J Med* 2001; 345(19):1368-77.

Early Goal-Directed Therapy

- Diagnosis
  - Obtain indicated cultures (blood, urine, sputum, wound, etc.)
  - Radiological studies
- Antibiotic Therapy
  - Within one hour after cultures drawn
  - Broad spectrum tailored according culture and susceptibility
- Fluid Therapy
  - Aggressive fluid administration
    - Blood products if hemoglobin less than seven
  - Monitor for hemodynamic improvement to avoid volume excess

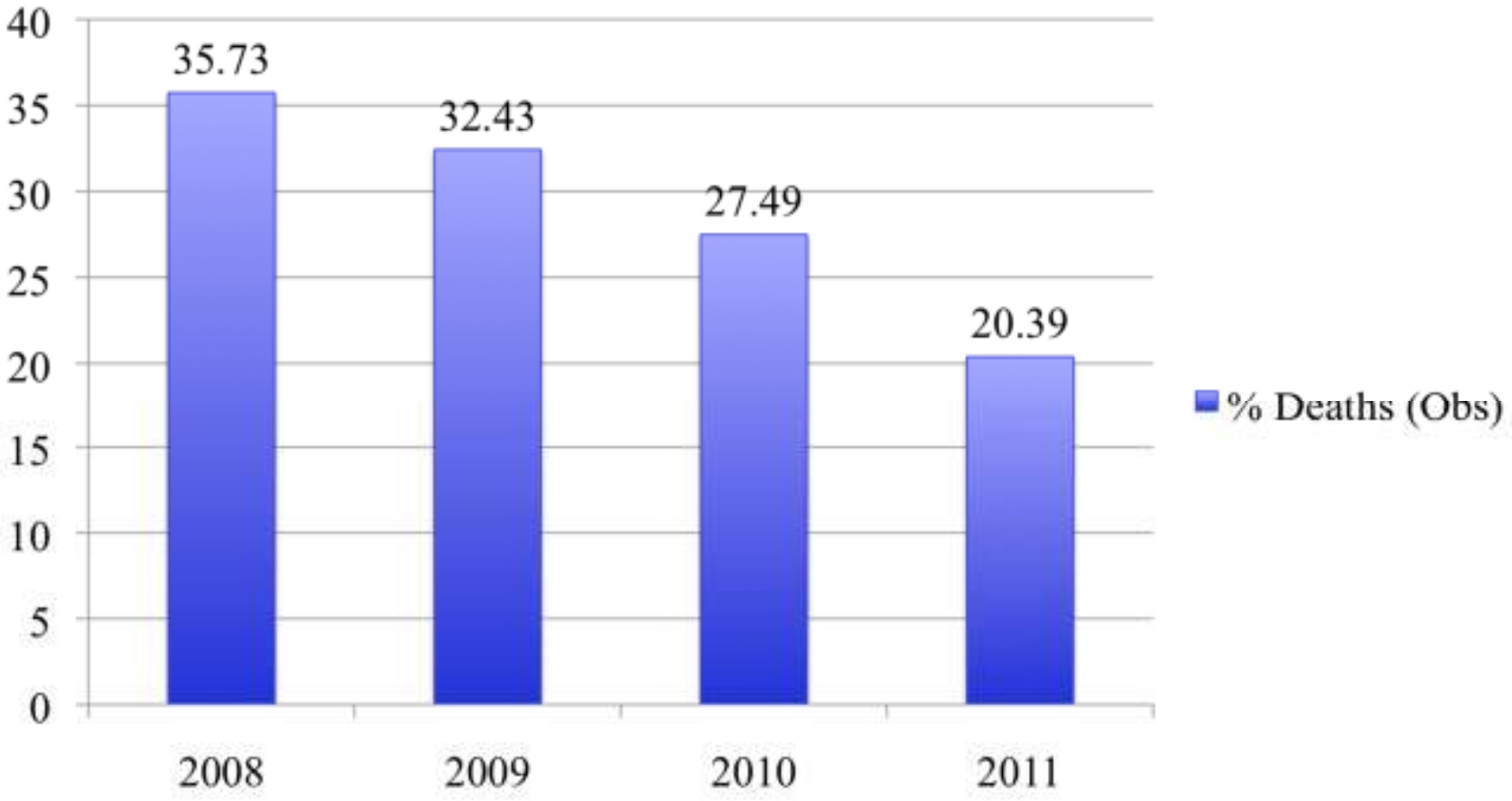


Dellinger RP, Levy MM, Carlet JM, et al. Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock. *Crit Care Med* 2008; [published correction appears in *Crit Care Med* 2008; 36:1394-1396] 36:296-327.
Rivers E, Nguyen B, Havstad S, et al. Early goal-directed therapy in the treatment of severe sepsis and septic shock. *N Engl J Med* 2001; 345(19):1368-77.

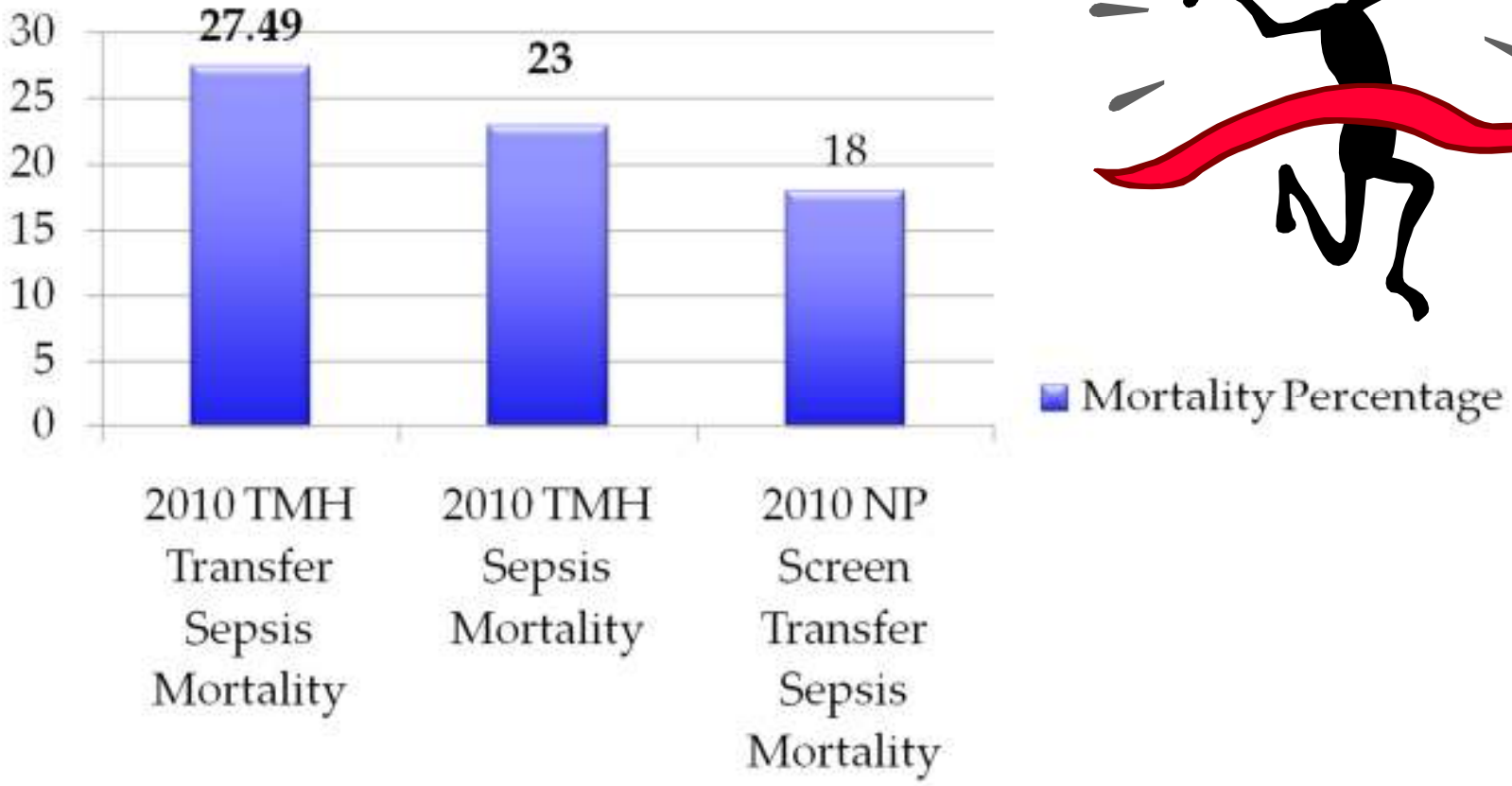
Screen Team Statistics

- **8,885 screens October 1, 2009 thru January 20, 2012**
  - 5,727 acute-care transfers
  - 117 clinical emergency response team (CERT) patients
  - 647 in-patient
  - 1817 emergency department admissions
  - 573 follow-up patients
- **667 positive SIRS screens**
- **300 sepsis protocols initiated**

2008-2011 Sepsis Mortality – Transfer Patients



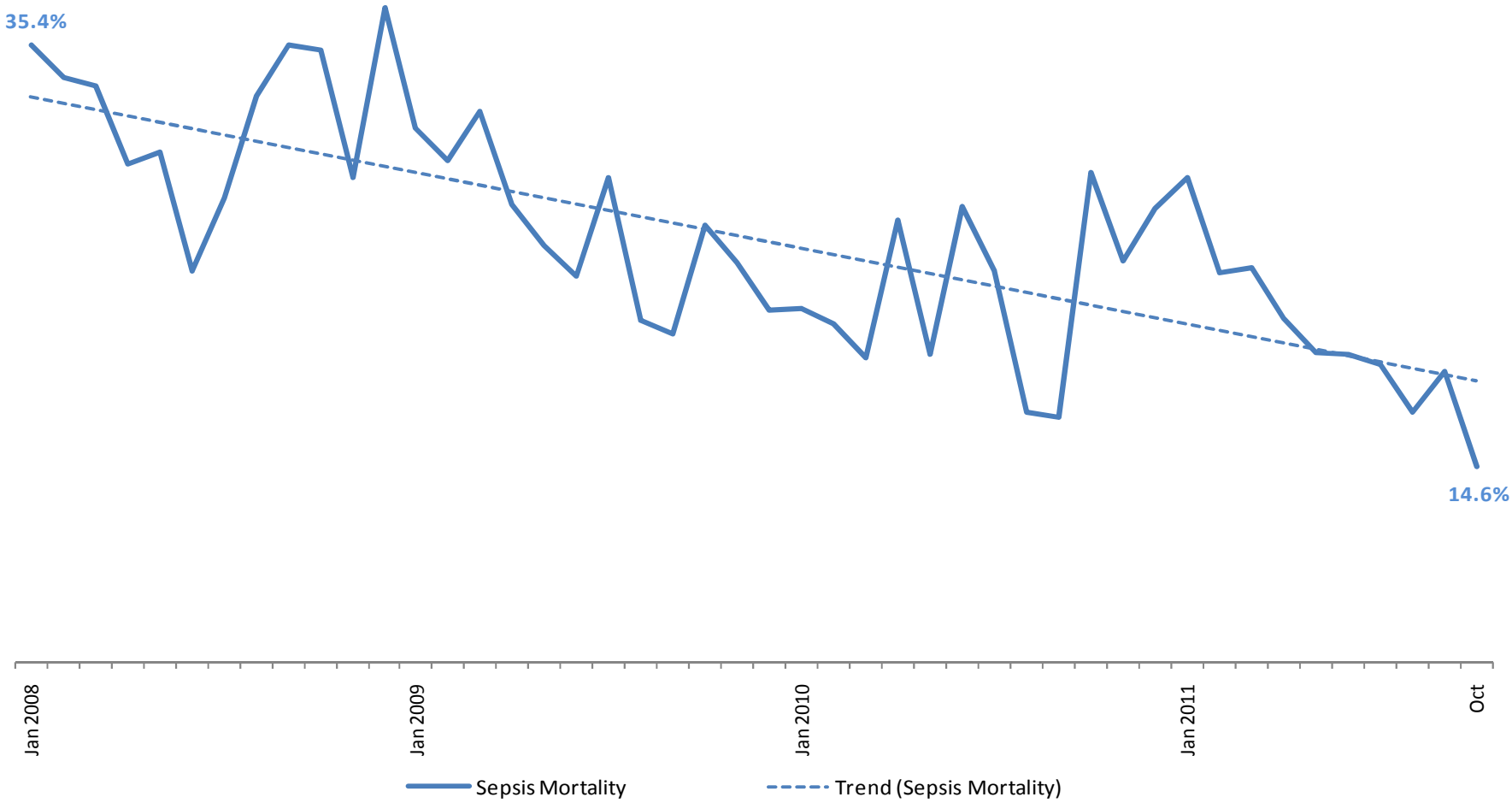
Sepsis Mortality



• Sepsis Mortality Results

Methodist The Methodist Hospital System

Percent Cases with Sepsis that Died, Jan 2008 – Oct 2011



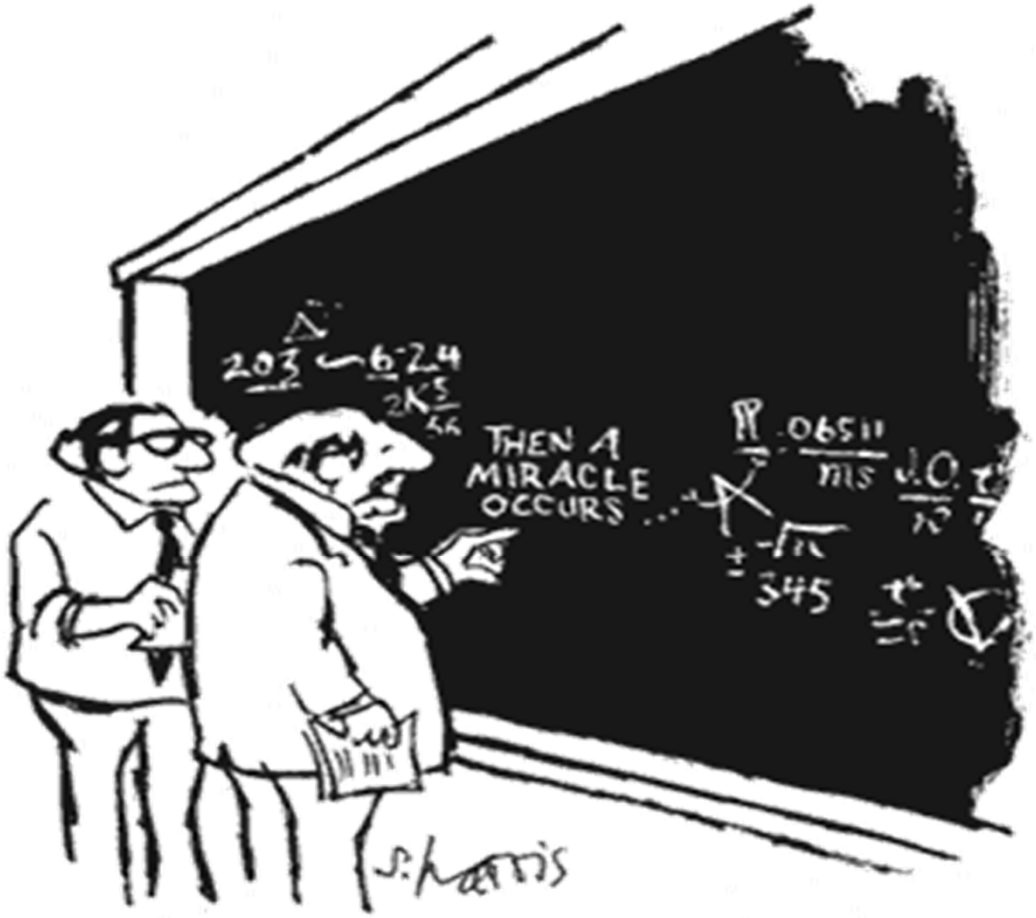
Data Source: TMH – Datamart as of 11/21/2011
Performance Improvement Dept (BRA)

Lessons Learned

- SCREENING SAVES LIVES!
- Nurses are the frontlines of early recognition and intervention.

- Physicians and Nurse champions are essential for creating buy-in and sustaining change.
- Ownership of clinical decision support tools and cultural quality shifting are also key in sustaining change.

The End



"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

Thank you

Methodist The Methodist Hospital System

Questions?

References and recommended readings

- American College of Chest Physicians / Society of Critical Care Medicine Consensus Conference: Definitions for sepsis and organ failure guidelines for the use of innovative therapies in sepsis (1992). *Critical Care Medicine, 20*, 864-874.
- Angus, D.C., Linde-Zwirble, W.T., Lidicker, J., Clermont, G., Carcillo, J, & Pinsky, M.R. (2001). Epidemiology of severe sepsis in the United States: analysis of incidence, outcome, and associated costs of care. *Critical Care Medicine, 29* (7), 1303–1310.
- Aitken, L.M., Williams, G., Harvey, M., Blot, S., Kleinpell, R., Labeau, S., … Ahrens, T. (2011). Nursing considerations to complement the Surviving Sepsis Campaign guidelines. *Critical Care Medicine, 39* (7), 1800-1818.
- Castellanos-Ortega, A., Suberviola, B., Garcia-Astudillo, L.A., Holanda, M.S., Ortiz, F., Llorca, J., … Delgado-Rodriguez, M. (2010). Impact of the surviving sepsis campaign protocols on hospital length of stay and mortality in septic shock patients: Results of a three-year follow-up quasi-experimental study. *Critical Care Medicine. 38* (4), 1036-1043. doi: 10.1097/CCM.0b0bl3e3181d455b6.
- Dellinger, R. P., Levy, M. M., Carlet, J. M., Bion, J., Parker, M. M., Jaeschke, R., … Vincent, J.L. (2008). Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock: 2008. *Intensive Care Medicine, 34* (1), 17-60. doi: 10.1007/s00134-007-0934-2.
- Eber, M. R., Laxminarayan, R., Perencevich, E. N., & Malani, A. (2010). Clinical and economic outcomes attributable to health care-associated sepsis and pneumonia. *Archives of Internal Medicine, 170* (4), 347-353.
- Gao, F., Melody, T., Daniels, D.F., Giles, S., & Fox, S. (2005). The impact of compliance with 6-hour and 24-hour sepsis bundles on hospital mortality in patients with severe sepsis: A prospective observational study. *Critical Care, 9* (6), 764–770.
- Girardis, M., Rinalid, L., Donno, L., Marietta, M., Codeluppi, M., Marchegiano, P., Venturelli, C., & the "Sopravvivere alla Sepsi" group of the Modena-University Hospital (2009). Effects on management and outcome of severe sepsis and septic shock patients admitted to the intensive care unit after implementation of a sepsis program: a pilot study. *Critical Care, 13* (5), 143. doi: 10.1186/cc8029.
- Hall, M.J., Williams, S.N., DeFrances, C.J., & Golosinskiy, A. (2011). *Inpatient care for septicemia or sepsis: A challenge for patients and hospitals.* NCHS data brief, no 62. Hyattsville, MD: National Center for Health Statistics. Retrieved from http://www.cdc.gov/nchs/data/databriefs/db62.htm
- Ho, B.C., Bellomo, R., McGain, F., Jones, D., Naka, T., Wan, L., & Braitberg, G. (2006). The incidence and outcome of septic shock patients in the absence of early-goal directed therapy. *Critical Care, 10* (3), R80.
- Hotchkiss, R., & Karl, I. E. (2003). The pathophysiology and treatment of sepsis. *New England Journal of Medicine, 343* (2), 138-150.
- Institute for Healthcare Improvement: Severe Sepsis Bundles. Available at: http://www.ihi.org. Accessed July 7, 2011.

References and recommended readings cont.

- Kleinpell, R. M., Graves, B. T., & Ackerman, M. H. (2006). Incidence, pathogenesis, and management of sepsis: an overview. *AACN Advanced Critical Care, 17* (4), 385-393.
- Kumar, A., Roberts, D., Wood, K.E., Light, B., Parrillo, J.E., Sharma, S., … Cheang, M. (2006). Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock. *Critical Care Medicine,* 34 (6), 1589–1596.
- Lo. E., Nicolle, L., Classen, D., Arias. K. M., Podgorny, K., Anderson, D. J., …Yokoe, D. S. (2008). Strategies to prevent catheter-associated urinary tract infections in acute care hospitals. *Infection Control and Hospital Epidemiology, 29,* S41-S50.
- Martin, G.S., Mannino, D.M., Eaton, S., & Moss, M. (2003). The epidemiology of sepsis in the United States from 1979 through 2000. *New England Journal of Medicine, 348,* (16), 1546-1554.
- Moore, L. J., Jones, S. L., Kreiner, L. A., McKinley, B., Sucher, J. F., Todd, S. R., … Moore , F. A. (2009). Validation of a screening tool for the identification of sepsis. *Journal of Trauma-Injury Infection and Critical Care, 66* (6), 1539-1547.
- Moore, L. J., Moore, F. A., Todd, R. S., Jones, S. L., Turner, K. L., & Bass, B. L. (2010). Sepsis in general surgery. *Archives of Surgery, 145* (7), 695-700.
- Neviere, R. (2008). Pathophysiology of sepsis. UptoDate online version 19.2.
- Retrieved from http://www.uptodate.com/contents/pathophysiology-of-sepsis?source=search_result&selectedTitle=4%7E150.
- Neviere, R. (2009). Sepsis and the systemic inflammatory response syndrome: definitions, epidemiology, and prognosis. UptoDate online version 19.2. Retrieved from http://www.uptodate.com/contents/sepsis-and-the-systemic-inflammatory-response-syndrome-definitions-epidemiology-and
- Nguyen, H. B., & Smith, D. (2007). Sepsis in the 21st century: recent definitions and therapeutic advances. *American Journal of Emergency Medicine, 25,* 564-571.
- Nguyen H.B., Corbett, S.W., Steele, R., Banta, J., Clark, R.T., Hayes, S.R., … Wittlake, W.A. (2007). Implementation of a bundle of quality indicators for the early management of severe sepsis and septic shock is associated with decreased mortality. *Critical Care Medicine, 35* (4), 1105–1112.
- Peake, S.L., Bailey, M., Bellomo, R., Cameron, P.A., Cross, A., Delaney, A. … Williams, P. (2009). Australasian resuscitation of sepsis evaluation (ARISE): A multi-centre, prospective, inception cohort study. *Resuscitation, 80* (7), 811–818.
- Picard. K. M., O'Donoghue, S. C., Young-Kershaw, D. A., & Russell, K. J. (2006). Development and implementation of a multidisciplinary sepsis protocol. *Critical Care Nurse, 26,* 43-54.
- Rivers, E., Nguyen, B., Havstad, S., Ressler, J., Muzzin, A., Knoblich, B., … Tomlanovich, M. (2001). Early goal-directed therapy in the treatment of severe sepsis and septic shock. *New England Journal of Medicine, 345,* (19), 1368-1377.

References and recommended readings cont.

- Sawyer, A.M., Deal, E.N., Labelle, A.J., Whitt, C., Thiel, S.W., Heard, K.,… Kollef, M.H. (2011). Implementation of a real-time computerized sepsis alert in nonintensive care unit patients. *Critical Care Medicine, 39,* 469-473. doi: 10.1097/CCM0b013e318205df85.
- Schramm, G.E., Kashyap, R., Mullon, J.J., Gajic, O., & Afessa, B. (2011). Septic shock: a multidisciplinary response team and weekly feedback to clinicians improves the process of care and mortality. *Critical Care Medicine, 39,* 252-258.
- doi: 10.1097/CCM.0b013e3181ffde08.
- Sucher, J. E., Moore, F. A., Todd, S. R., Sailors, R. M., & McKinley, B. A. (2008). Computerized clinical decision support: a technology to implement and validate evidence based guidelines. *Journal of Trauma-Injury Infection & Critical Care, 64* (2), 520-537. doi: 10.1097/TA/0b013e3181601812.
- The Joanna Briggs Institute (2000). Management of short-term indwelling urethral catheters to prevent urinary tract infections. *Best Practice: Evidence Based Practice Information Sheets for Health Professionals, 4* (1) 1-6.
- Xu, J.Q., Kochanek, K.D., Murphy, S.L., Tejada-Vera, B. Deaths: Final data for 2007. National vital statistics reports; vol 58 no19. Hyattsville, MD: National Center for Health Statistics. 2010. Available from: http://www.cdc.gov/NCHS/data/nvsr/nvsr58/nvsr58_19.pd
- Zubrow, M.T., Sweeney, T.A., Fulda, G.J., Seckel, M.A., Ellicot, A.C., Mahoney, D.D., … Faraj, M.B. (2008). Improving care of the sepsis patient. *Jt Comm J Qual Patient Safety,* 34 (4), 187–19.

LEADING MEDICINE®