



## **Time and Lives**

# **Using Clinical Surveillance to Drive Performance Improvement**

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*Clinical Consulting Manager*

*Thomson Reuters*

# Clinical Surveillance Outcomes



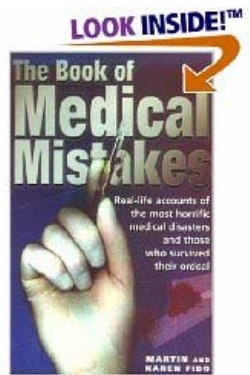
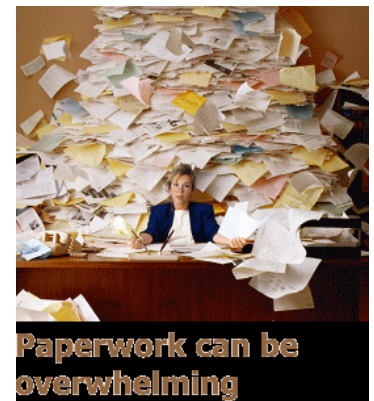
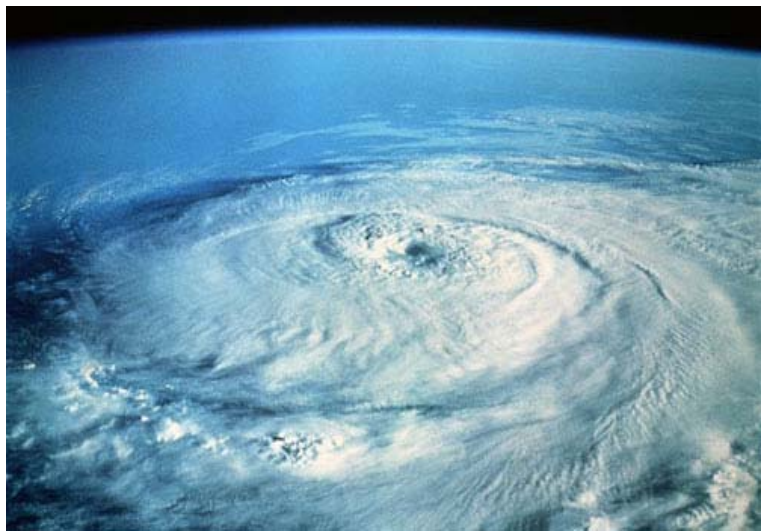
Decrease in mortality/1000 discharge	<b>15.6%</b>
Decrease in inpatient cardiac/respiratory arrests	<b>13%</b>
Reduction in cardiac/respiratory arrests outside critical care	<b>22%</b>
Increase in calls to the rapid response team for critical care support/assessments	<b>115%</b>
Reduction in ICU mortality for patients transferred from medical-surgical units with a diagnosis of sepsis	<b>38%</b>
Increase in number of Congestive Heart Failure patients receiving CMS bundle measures	<b>35%</b>



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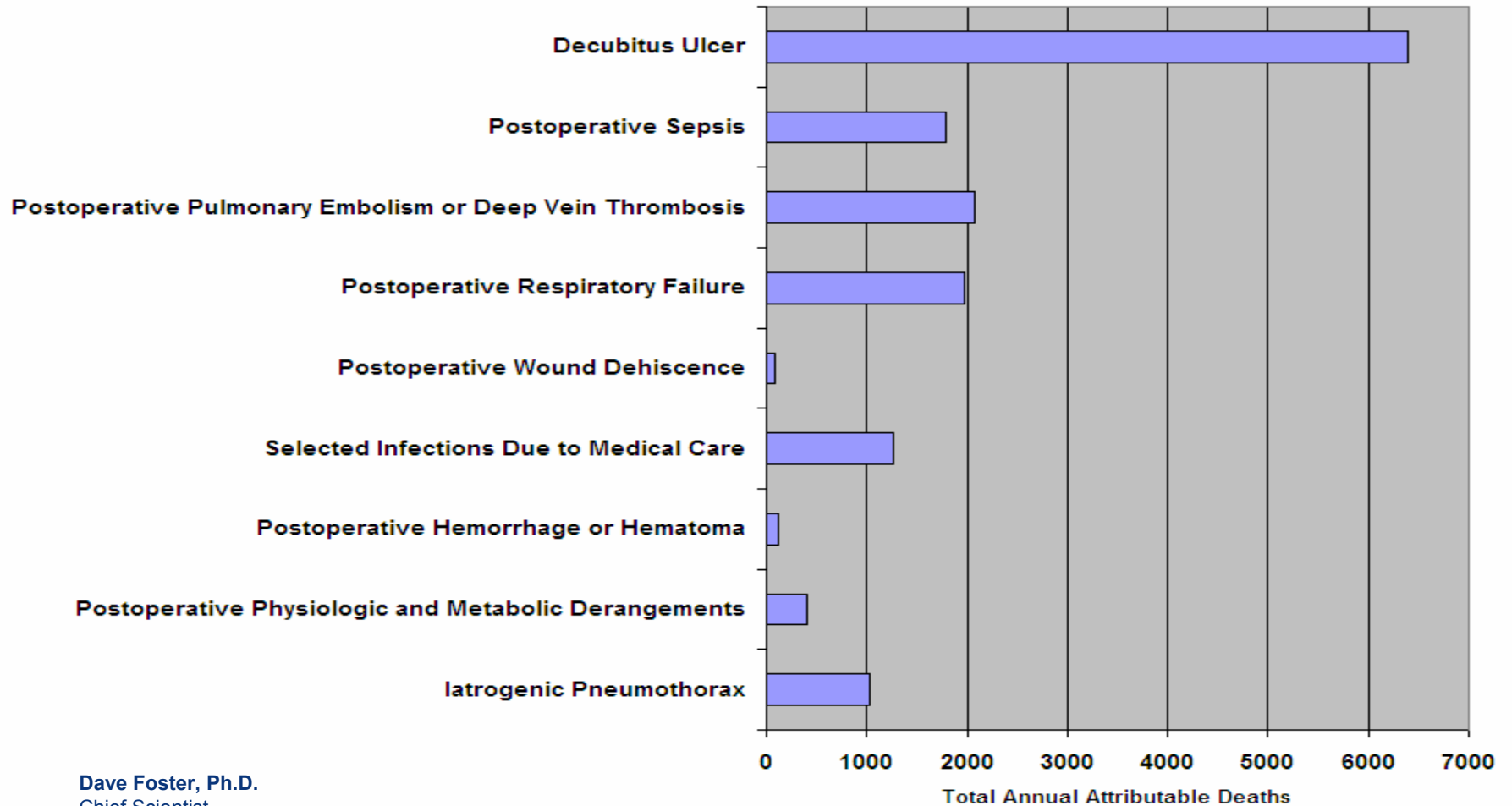
“The Nursing Information Technology Innovation Award”,  
Health Data Management, March 31, 2008

# The Perfect Storm



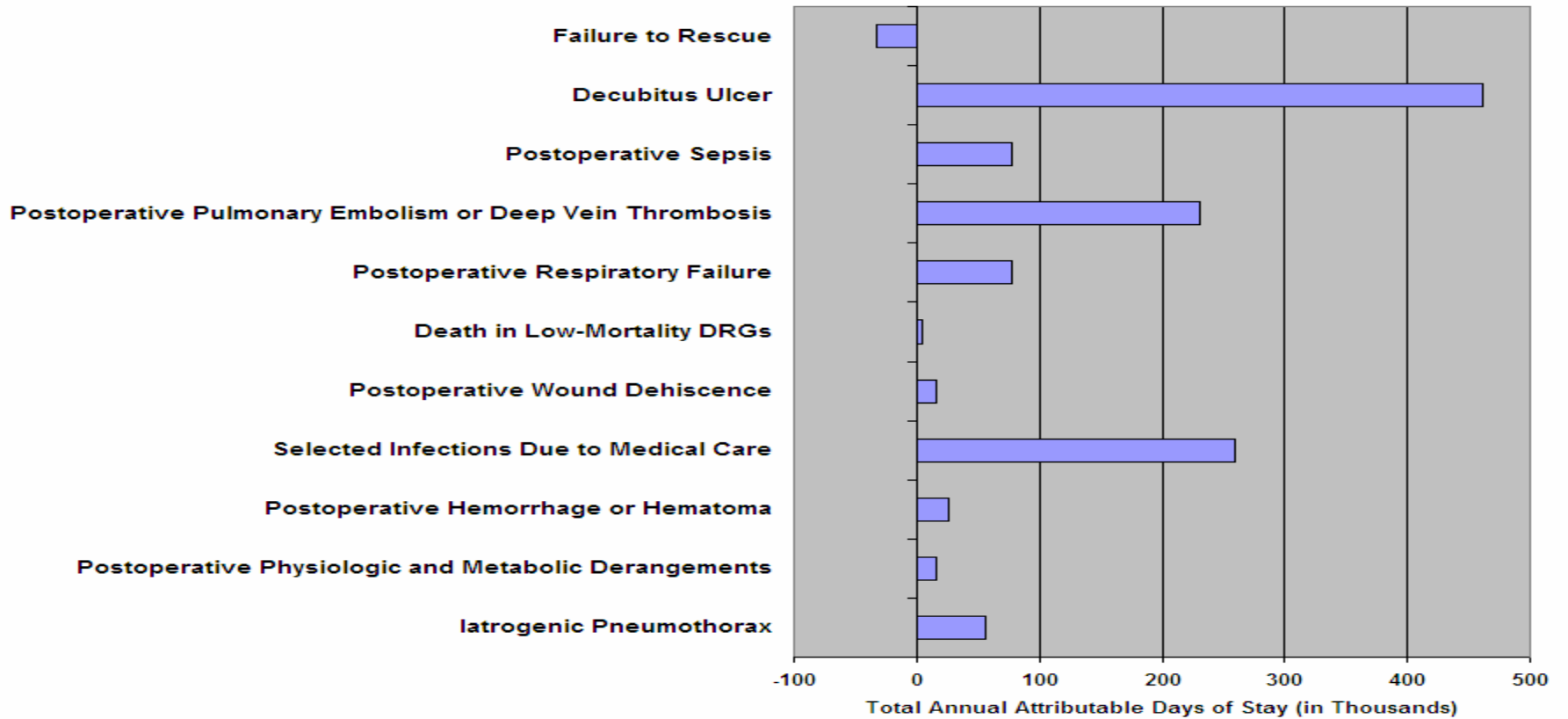
Paperwork can be overwhelming

# Estimated Annual Attributable Mortality



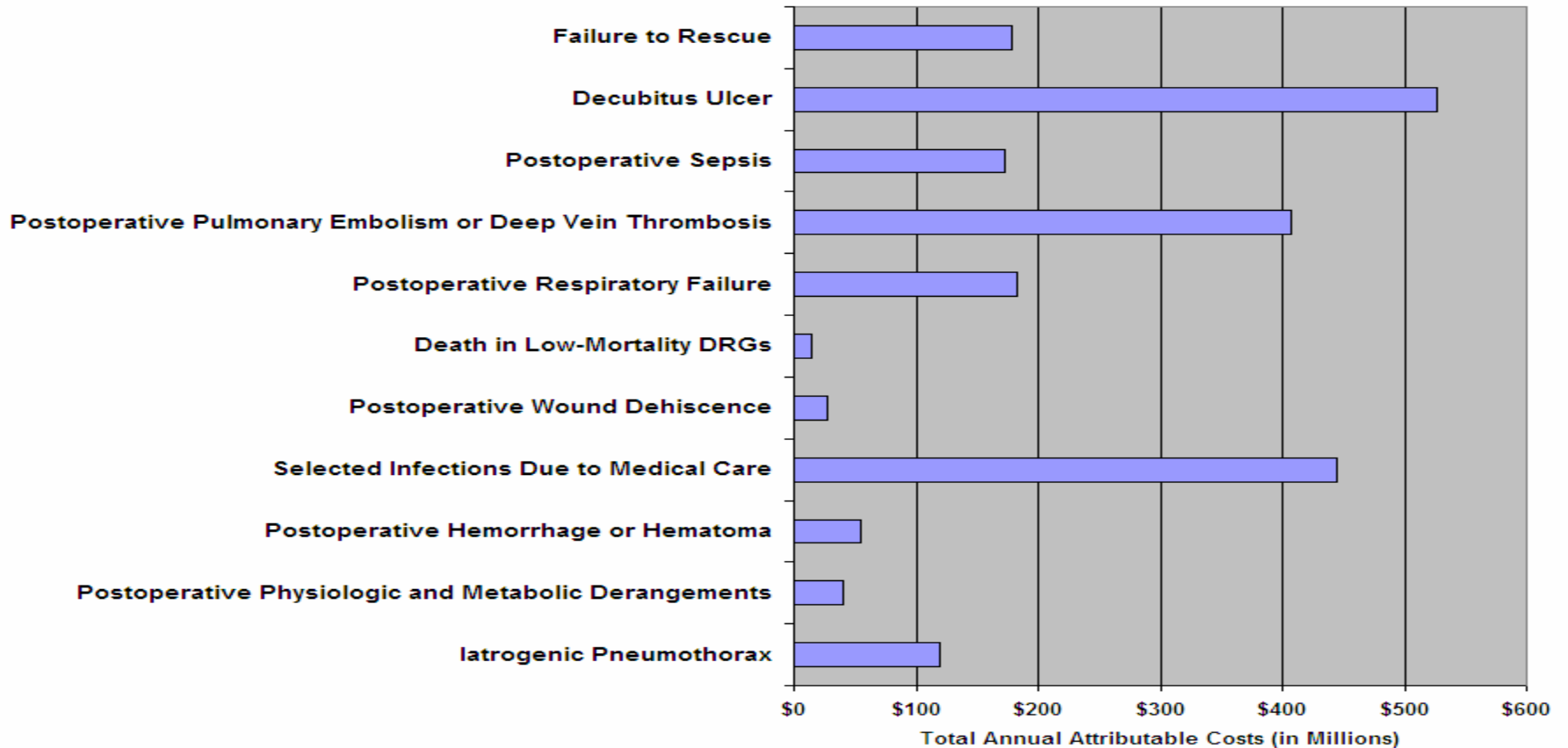
Dave Foster, Ph.D.  
Chief Scientist  
Thomson Reuters Healthcare

# Estimated Annual Attributable LOS



**Dave Foster, Ph.D.**  
Chief Scientist  
Thomson Reuters Healthcare

# Estimated Annual Attributable Costs



Dave Foster, Ph.D.  
Chief Scientist  
Thomson Reuters Healthcare

# Complications / Cost (Per Case) Non-Reimbursed



Catheter-Associated Urinary Tract Infections	<b>\$40,347</b>
Pressure Ulcers	<b>\$40,381</b>
Serious Preventable Event--Object Left in during Surgery	<b>\$61,962</b>
Air Embolism	<b>\$66,007</b>
Blood Incompatibility	<b>\$46,492</b>
Staphylococcus Aureus Bloodstream Infection/Septicemia	<b>\$82,678</b>
Ventilator Associated Pneumonia (VAP)	<b>\$88,781</b>
Clostridium Difficile-Associated Disease (CDAD)	<b>\$52,464</b>
Methicillin-Resistant Staphylococcus Aureus (MRSA)	<b>\$31,088</b>

Centers for Medicare & Medicaid Services, 2008

# Non-Reimbursed Conditions and PSI's



<b>Falls</b>	<b>Postoperative hip fracture (PSI 8)</b>
<b>Mediastinitis</b>	<b>Selected infections due to medical care (PSI 7) Postoperative sepsis (PSI 13)</b>
<b>UTI from improper use of catheters</b>	<b>Selected infections due to medical care (PSI 7) Postoperative sepsis (PSI 13)</b>
<b>Pressure ulcers (Stage III and IV)</b>	<b>Decubitus ulcer (PSI 3)</b>
<b>Vascular infections that result from improper use of catheters</b>	<b>Selected infections due to medical care (PSI 7) Postoperative sepsis (PSI 13)</b>
<b>Objects left in the body during surgery</b>	<b>Foreign body left in during procedure (PSI 5)</b>
<b>Air embolisms</b>	<b>Complications in anesthesia (PSI 1)</b>
<b>Blood incompatibility</b>	<b>Transfusion reaction (PSI 16)</b>



# CMS Non-Reimbursed Events

- Healthcare-associated infections
  - Catheter-associated urinary tract infections
  - Vascular catheter-associated blood stream infection
  - Surgical site infection
- Other Hospital-acquired conditions
  - Object left in surgery
  - Air embolism
  - Blood incompatibility
  - Pressure ulcers
  - Falls
  - VTE after hip and knee replacement
  - Poor glycemic control

# Right Now, an Opportunity For Improvement Exists...

The data below are based on complications observed for your facility.

Complication	% total observed comp	Qual comp disch	Obs comp cases	Obs comp rate
<a href="#">Hemorrhage, hematoma or seroma complicating a procedure (BOTH MEDICAL and SURGICAL Risk Groups)</a>	16.43%	18,607	194	0.01
<a href="#">Venous thrombosis (BOTH MEDICAL and SURGICAL Risk Groups)</a>	11.18%	18,369	132	0.01



...IN ROOM 114

Welcome, WILL MOYE [Last login 11/13/2007]  
 My Profile Log Off Switch To..

**VTE Prophylaxis Needed**

Main Census

Patient List Schedule Handoff ESign Pharmacy Intervention Add Patient

View: All(1) Critical(0) Rounding(1) Outpatient(0) Facility: CRH List: AMI NO Aspirin Refresh

Name	Facility	Room	MRN	Role
<b>X</b> LACEY, HARRY M.	CRH	<b>A114.01</b>	975740	

**X** LACEY, HARRY M. CRH **A114.01** 975740

**LACEY, HARRY M**  
 (expand all | collapse all) View: (All) Type: (All)

**VITALS** SBP: 103 DBP: 56 HR: 62 RESP: 18 TEMP: 97.4 SAO2: 93 LPM: 2L  
 11/14/07 15:38

**CBC** 8.8 9.8 49  
 11/14/07 14:33 28.6

**HT/WT** KG: - LB: 188.7 GM: - HT: 70  
 11/14/07 12:36

**VITALS** SBP: 115 DBP: 54 HR: 68 RESP: 16 TEMP: 98.4 SAO2: 97 LPM: 2L  
 11/14/07 07:38

# So How Does One Connect the Opportunity.....

# With Real-Time Surveillance

Indicator	Qualified discharges	Observed	Compare group	Observed/compare group index	Observed PSI rate(%)	Compare group PSI rate(%)	Stat sig	Opportunity
<u>Decubitus Ulcer - 2.1</u>	6,089	186	93.93	1.98	3.05%	1.54%	■	92.07
<u>Postoperative Pulmonary Embolism or Deep Vein Thrombosis - 2.1</u>	8,255	66	30.12	2.19	0.80%	0.36%	■	35.88
<u>Accidental Puncture or Laceration - 2.1</u>	18,531	57	21.35	2.67	0.31%	0.12%	■	35.65
<u>Failure to Rescue - 2.1</u>	1,201	120	95.81	1.25	9.99%	7.98%	■	24.19
<u>Postoperative Sepsis - 2.1</u>	1,401	23	2.74	8.40	1.64%	0.20%	■	20.26



✓ Save Lives

✓ Improve Patient Safety & Clinical Outcomes

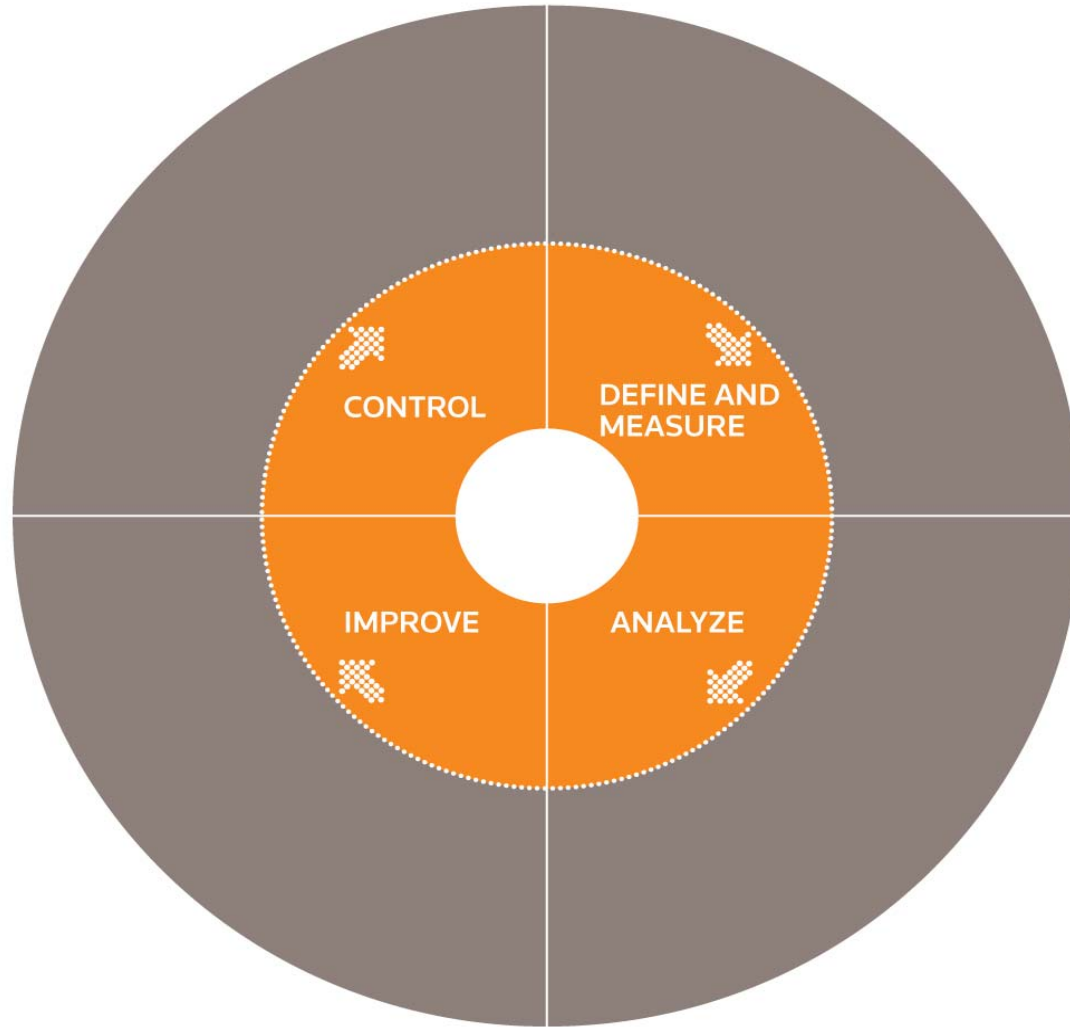
✓ Address the National Quality Agenda



Joint Commission  
on Accreditation of Healthcare Organizations  
Setting the Standard for Quality in Health Care



# The Continuous Cycle of Performance Improvement



## *True Performance Improvement occurs when...*



# It All Begins with a Step...

**What process does your hospital currently use to monitor at-risk/high-risk patients within the active census?**

Chart/result review



Run manual reports within HIS



Formal rounds



Electronic surveillance system



No formal process exists



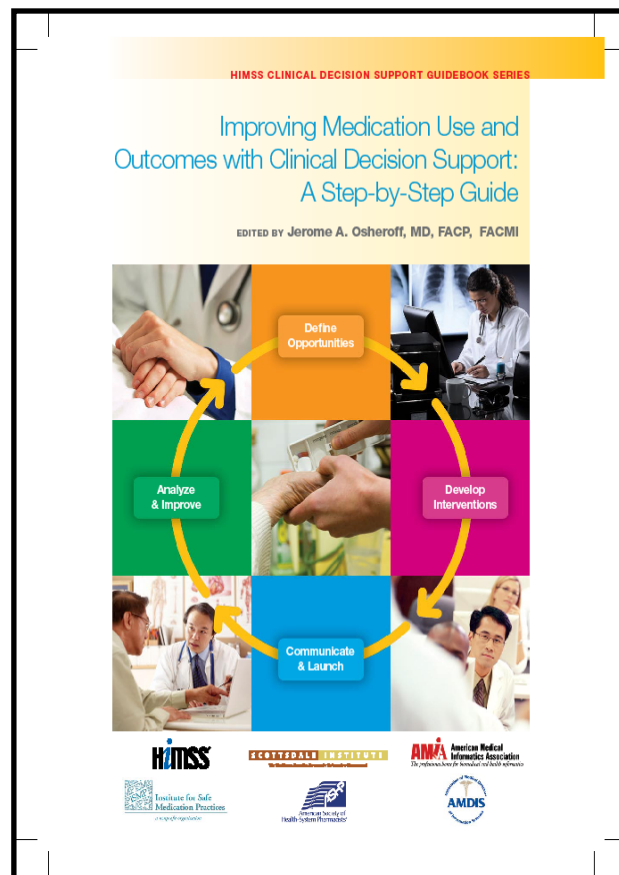
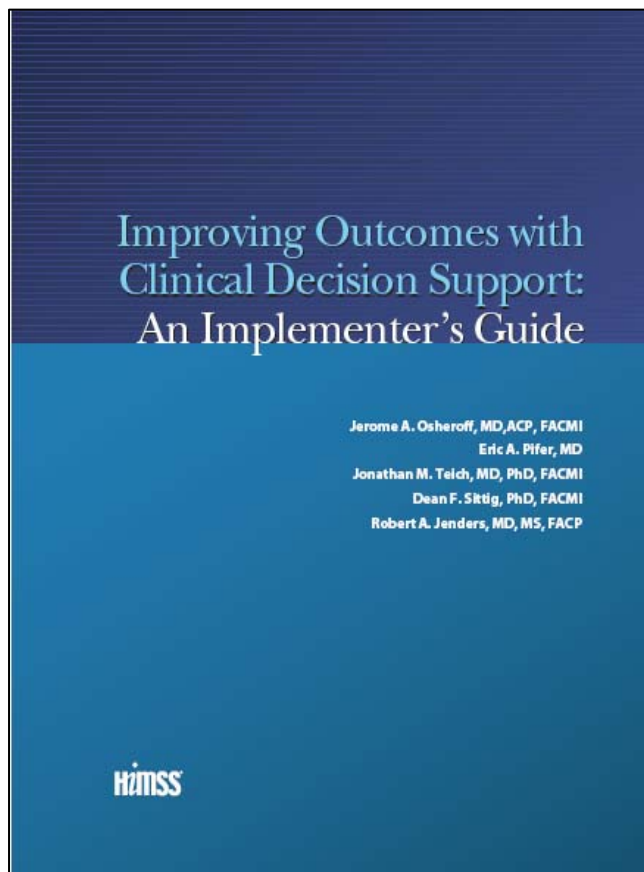
Healthcare IT News; On-Demand Web Seminar: Time and Lives -  
Using Clinical IT to Identify High-Risk Patients; 9/18/08

# Quality Improvement begins by...



- Connecting the dots
- Developing a protocol
  - Leverage evidence-based medicine
  - Construct an identification algorithm
  - Deploy a surveillance system
  - Maintain a tracking mechanism
- Standardize optimal care

# How Can Healthcare Organizations Improve the Care Process and Clinical Outcomes with CDS?



For more info, see: [www.himss.org/cdsguide](http://www.himss.org/cdsguide)



# PI and the Five “Rights” of CDS



CDS, *well developed and deployed*, provides

- the right information (evidence-based, guides action...),
- to the right person (clinicians *and* patients...),
- in the right intervention format (alert, order set, answer...),
- through the right channel (CIS, internet, mobile...),
- at the right point in workflow (decision/action...)

**to improve health care decisions and outcomes.**

# How Can We Improve the Care Process/Outcomes with CDS?

I. Identify  
Goals / People

II. Survey  
Info Systems

III. Select  
Interventions

IV. Specify  
and Build

V. Test and  
Launch

VI. Evaluate  
and Enhance



# I. Identify Goals / People

# Goals



- Improving Patient Safety
- Preventing “Never Events”
- Preventing ADEs
- Preventing Hospital Acquired Infections
- Improving Core Measures
- Improving Clinical Outcomes
- Improving Efficiency
- Maximizing Resources

# Clinical Surveillance Addresses Risk Management and Quality Improvement Issues



- Risk Management
  - Falls
  - Medication Management
  - Anticoagulation Management/Intervention
  - Antibiotic Protocols/Intervention
- Quality Improvement
  - Early Warning System (Failure-to-Rescue)
  - Quality Initiatives (Core Measures, Performance Improvement)
  - Chronic Disease Management (Diabetes, Heart Failure)
  - Special Populations (Elderly, HIV, Ventilator)
  - Patient Safety Initiatives

# Clinical Surveillance Addresses Infection Control and Case Management Opportunities



- Infection Control
  - Identification of Pathogens
  - Optimal Utilization of Resources
  - Global Reporting
  - Infectious Disease/Epidemiology (MRSA, C.Diff, VRE, Pneumonia)
- Case Management
  - Length of Stay
  - 23-hour Observation

# Clinical Surveillance Addresses CMS Non-Reimbursed Events



- Healthcare-associated infections
  - Catheter-associated urinary tract infections
  - Vascular catheter-associated blood stream infection
  - Surgical site infection
- Other Hospital-acquired conditions
  - Blood incompatibility
  - Pressure ulcers
  - Falls
  - VTE after hip and knee replacement
  - Poor glycemic control

# Who Benefits?



- Quality
- Risk Management
- Nursing
- Pharmacy
- Infection Control
- Care/Case Management
- Physicians
- Respiratory Therapy
- Nutrition Services
- Patients



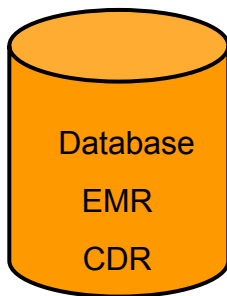
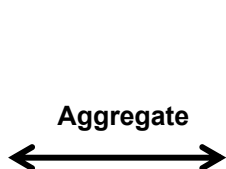


## II. Survey Info Systems

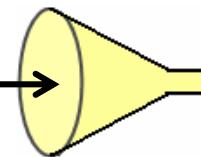
# Survey Information Systems (Access to Data and Throughput)

## Clinical Applications

- Demographics
- Labs
- Radiology
- Pathology
- Other Transcribed Reports
- Vitas; I/Os
- Medications (Orders / MAR)
- More.....



Analyze



Distribute



Document Interventions

## Point-of-Care



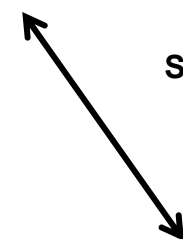
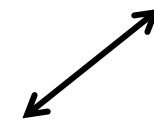
Paper Reports



Smartphone / PDA



PC / Laptop / Tablet PC



## III. Select Interventions

# Leverage EBM to Define Surveillance Measures



- **Sepsis:** (The documented or suspected infection or invasion of sterile tissue and two of more of the following clinical markers):
  - Fever  $> 100.4$  or  $< 96.8$
  - Heart rate  $> 90$  beats per minute
  - Respiratory rate  $> 20$  breaths per minute or  $\text{PaCO}_2 < 32$
  - Altered mental status
  - WBC  $> 12,000/\text{mm}^3$  or  $< 4,000/\text{mm}^3$  or a differential count  $> 10\%$  immature neutrophils
  - Blood glucose  $> 120\text{mg/dL}$  (in absence of diabetes)
- **Severe Sepsis:** (Sepsis + one organ dysfunction, hypoperfusion or hypotension):
  - $\text{PaO}_2/\text{FIO}_2$  ratio  $< 300$
  - Urine output  $< 0.5$  ml/kg/hr despite adequate fluid resuscitation for 2 hours
  - Creatinine increase  $> 0.5$  mg/dL
  - INR  $> 1.5$  or aPTT  $> 60$  seconds
  - Platelet counts  $< 100,000$
  - Plasma total bilirubin  $> 4$  mg/dL
  - Serum lactate level  $\geq 4$  mmol/L
  - MAP  $< 65$  mmHg despite adequate fluid resuscitation for 2 hours
  - $\text{SvO}_2 \leq 70\%$
  - Cardiac index  $< 3.0$
  - Lactate  $> 2\text{mMol/L}$



## IV. Specify and Build

# Develop a Surveillance Protocol...

# Develop a Surveillance Protocol



**IC\_Sepsis**

**Properties**

**Name** IC\_Sepsis  
**Type** Account  
Account Type profiles identify patients who meet the profile criteria within a single account.

**Query**

AND

PLUS

- AdmitDx *contains* SEPSIS
- Sepsis Labs
- Sepsis Cardiac & Vitals

**Publish**

**Update Interval** Never  
**Publish As List** Yes  
**List Name** IC\_Sepsis  
**List Note**  
**Publish as F.Y.I.** No



## III. Select Interventions

# Early Warning Surveillance and EBM



- Early Warning Scoring System (EWS)
  - UK, 2002
  - Proved reduction in incidence of and reduced mortality from cardiac arrest\*
  - 39% of all patients admitted to adult critical care were admitted “late” in their clinical course\*
  - Based on methodology in combination with clinical observations to predict risk for deterioration
  - Assigns points for each:
    - LOC, Temperature, Systolic BP, Heart Rate, Respiratory rate, and urine output
  - Determines risk based on total score

\*Sharpley J, Holden J. Introducing and early warning system. *Nursing in Critical Care*. May 2004.



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# Early Warning System Parameters



- Not restricted by diagnosis
- Criteria for evaluation:
  - Two abnormalities must be present to be included on the list:
    - ✓ WBC
    - ✓ Hematocrit
    - ✓ Sodium
    - ✓ Platelets
    - ✓ Potassium
    - ✓ INR
    - ✓ Oxygen >50% (administered)
    - ✓ SaO<sub>2</sub> <88%
    - ✓ Respiratory Rate
    - ✓ Heart Rate
    - ✓ MAP



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## IV. Specify and Build

### Develop a Surveillance Protocol...

# Early Warning System (EWS) Trigger – “Failure-to-Rescue”

**EWS\_TRIGGER 2**

**Name** EWS\_TRIGGER 2  
**Type** Account  
Account Type profiles identify patients who meet the profile criteria within a single account.

**Properties**

**Query**

```

AND
├── PLUS
│   ├── AND
│   │   ├── EWS_WBC
│   │   └── EWS_HEME
│   ├── AND
│   │   ├── EWS_WBC
│   │   └── EWS_VITALS
│   ├── AND
│   │   ├── EWS_WBC
│   │   └── EWS_LYTES
│   ├── AND
│   │   ├── EWS_HEME
│   │   └── EWS_VITALS
│   ├── AND
│   │   ├── EWS_HEME
│   │   └── FWS_LYTES
│   ├── AND
│   │   ├── EWS_VITALS
│   │   └── EWS_LYTES
│   └── AND
│       ├── EWS_GLUCOSE
│       └── EWS_WBC
    
```

```

AND
├── EWS_GLUCOSE
├── EWS_HEME
├── AND
│   ├── EWS_GLUCOSE
│   └── EWS_VITALS
├── AND
│   ├── EWS_GLUCOSE
│   └── EWS_LYTES
├── Has Attending? = True
├── Has Bed? = True
├── Has Room? = True
├── Is Discharged? = False
├── Patient Type =(text) IP
├── Ward does not contain NSY, PED, BCNH, BHCC, OB
└── Admission Type does not contain NEWBORN
    
```

**Publish**

**Update Interval** every hour  
**Publish As List** Yes  
**List Name** EWS\_TRIGGER 2  
**List Note**  
**Publish as F.Y.I.** No

# Additional Surveillance Examples (DVT, Decubitus Ulcer, AMI Core Measures, IV to PO Antibiotics)



### DVT PREVENTIVE SURVEILLANCE

**Properties**

**Name** DVT PREVENTIVE SURVEILLANCE  
**Type** Patient  
 Patient Type profiles identify patients who meet the profile criteria regardless of which account they occur in.

**Query**

MINUS

- AND
  - PLUS
    - Age > 60
    - Ward =(text) ICU
  - Has Attending? = True
  - Has Bed? = True
  - Has Room? = True
  - Is Discharged? = False
  - Patient Type =(text) IP
  - Ward does not contain NSY, PED, BCNH, BHCC, OB
  - Admission Type does not contain NEWBORN

Name Summary contains WARFARIN, COUMADIN, FRAGMIN, DALTEPARIN, HEPARIN, LOVENOX, ENOXAPARIN  
 AND restrict to Active Meds

**Publish**

**Update Interval** every hour  
**Publish As List** Yes  
**List Name** DVT PREVENTIVE SURVEILLANCE  
**List Note**  
**Publish as F.Y.I.** No

### AMI No Aspirin and Beta Blocker

**Properties**

**Name** AMI No Aspirin and Beta Blocker  
**Type** Account  
 Account Type profiles identify patients who meet the profile criteria within a single account.

**Query**

MINUS

- PLUS
  - AdmitDx contains AMI, MI, MYOCARDIAL INFARCTION, HEART ATTACK
  - Result Key =(text) CK-MB  
 AND Result > 8.8
  - Result Key =(text) TROPONIN-I  
 AND Result > 0.4
- AND
  - Name Summary =(text) ASPIRIN, ASPIRIN EC  
 AND restrict to Active Meds
  - Name Summary =(text) ATENOLOL, METOPROLOL, LEVATOL, BISOPROLOL, ACEBUTOLOL, BETAXOLOL, APENDOLOL, INDERAL, LOPRESSOR, VJSKEN, TENORMIN, BLOCADREN, LOPRESSOR, TENORMIN, LABETOLOL, TOPROL XL, ZEBETA, COGARD, BREVIBLOC  
 AND restrict to Active Meds

**Publish**

**Update Interval** every 30 minutes  
**Publish As List** Yes  
**List Name** AMI No Aspirin and Beta Blocker  
**List Note**  
**Publish as F.Y.I.** No

### DU PREVENTIVE SURVEILLANCE

**Properties**

**Name** DU PREVENTIVE SURVEILLANCE  
**Type** Patient  
 Patient Type profiles identify patients who meet the profile criteria regardless of which account they occur in.

**Query**

MINUS

- PLUS
  - Age > 65
  - AdmitDx contains DIABETES MELLITUS, DM, HUMAN IMMUNODEFICIENCY SYNDROME, HIV
  - AdmitDx contains HIP FRACTURE, TRAUMA
  - Result Key =(text) Norton Scale  
 AND Result < 14  
 AND Days since test performed < 1
- Hospital Days > 4
- Has Attending? = True
- Has Bed? = True
- Has Room? = True
- Is Discharged? = False
- Patient Type =(text) IP

### IV to PO ABX Surveillance

**Properties**

**Name** IV to PO ABX Surveillance  
**Type** Account  
 Account Type profiles identify patients who meet the profile criteria within a single account.

**Query**

Medication Key =(text) Vancomycin, Vancochin, Cipro, Ciprofloxacin, Levaquin, Levofloxacin, Avelox, Moxifloxacin, Metronidazole, Flagyl  
 AND for > 2 days

**Publish**

**Update Interval** every 30 minutes  
**Publish As List** Yes  
**List Name** IV to PO ABX Surveillance  
**List Note**  
**Publish as F.Y.I.** No

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# V. Test and Launch

# Patient Identification

Clinical Xpert, Patient Navigator from Thomson Healthcare (MMD) - Windows Internet Explorer

Welcome, SEAN DEEGAN [Last login 03/10/2008]

My Profile Log Off Switch To...

### Main Census

Patient List Schedule Handoff ESign Add Patient

View: All(14) Critical(1) Rounding(14) Outpatient(0) Facility: (ALL) List: AMI No ASA & BB Refresh

Name	Facility	Room	MRN	Role
ANDERSON, JAMES	CRH	A230.2	125436	
ANDERSON, SUSAN	CRH	A235.2	348239	
AARON, JAMIE	CRH	A237.2	348293	
ACKERLAN, WILMA	CRH	A237.2	457637	
BATTER, IMA	CRH	A237.2	983213	
AJOURN, WILL	CRH	A237.2	839341	
ABOVIAN, DAVE	CRH	A237.2	222837	
BAXTER, BLAKE	CRH	A238.2	983213	
BALDWIN, GODDARD	CRH	A239.2	543726	
BALKIN, FIONA	CRH	A240.2	283763	
BARNED, COWLEY	CRH	A240.2	003832	
BANNE, JUNTA	CRH	A240.2	993833	
BARRY, LARRY	CRH	A240.2	003832	
ADAMS, DIANNE	CRH	B450.2	873232	

Select An Item To View Details

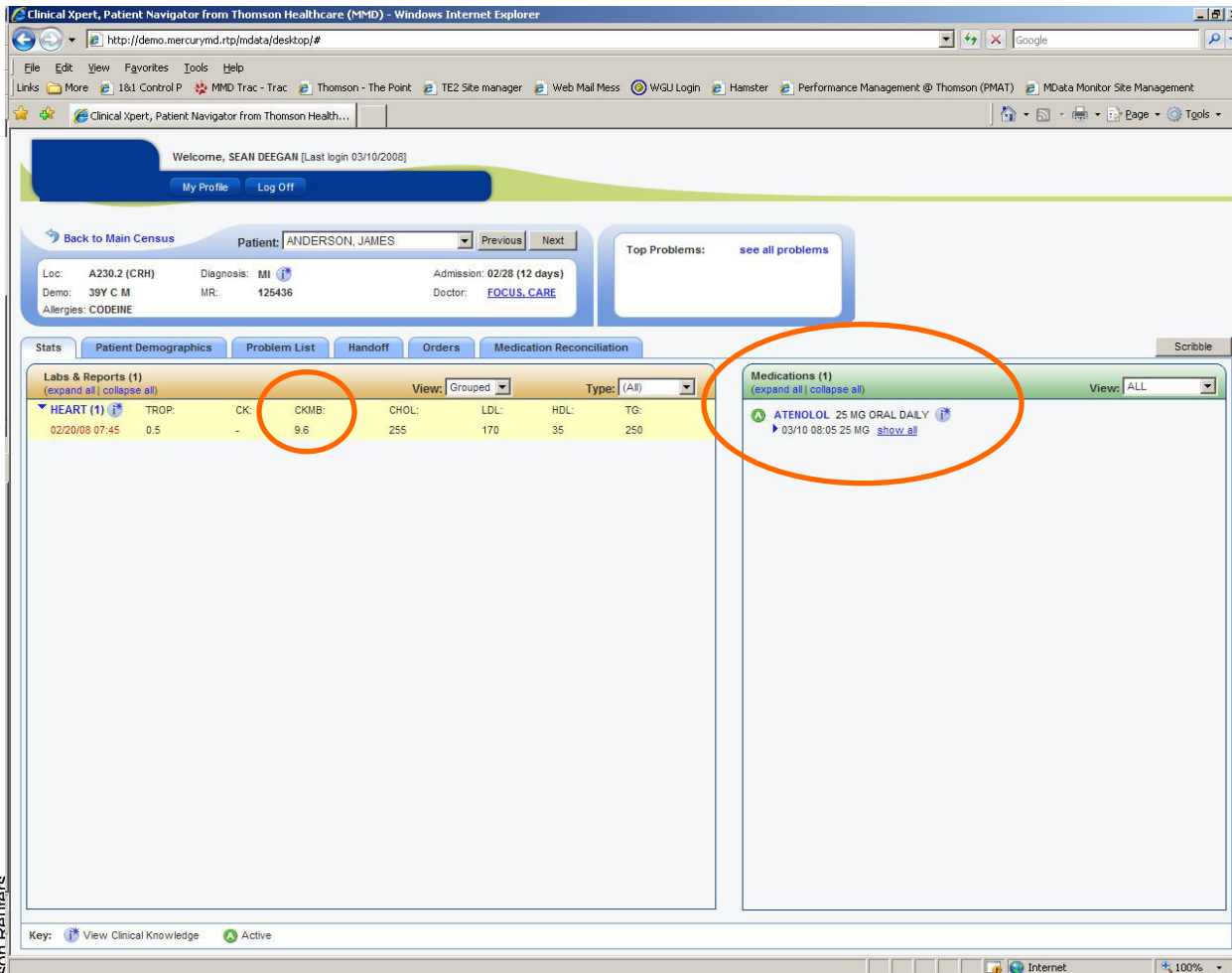
Key: New Lab Data Critical Lab Data View Labs & Reports Edit Lists

MOBILE



DESKTOP

# Patient Detail Across Platforms



Clinical Xpert, Patient Navigator from Thomson Healthcare (MMD) - Windows Internet Explorer

http://demo.mercurymd.rtp/mdata/desktop/#

Welcome, SEAN DEEGAN [Last login 03/10/2008]

My Profile Log Off

Back to Main Census Patient: ANDERSON, JAMES Previous Next

Top Problems: see all problems

Loc: A230.2 (CRH) Diagnosis: MI Admission: 02/28 (12 days)  
 Demo: 39Y C M MR: 125436 Doctor: FOCUS\_CARE  
 Allergies: CODEINE

Stats Patient Demographics Problem List Handoff Orders Medication Reconciliation Scribble

Labs & Reports (1)		Medications (1)				
(expand all   collapse all)		(expand all   collapse all)				
View: Grouped	Type: (All)	View: ALL				
HEART (1)	TROP: CK: CKMB: CHOL: LDL: HDL: TG:	<ul style="list-style-type: none"> <li>ATENOLOL 25 MG ORAL DAILY</li> <li>03/10 08:05 25 MG show all</li> </ul>				
02/20/08 07:45	0.5 - 9.6 255 170 35 250					

Key: View Clinical Knowledge Active

MOBILE



DESKTOP

# VI. Evaluate and Enhance



# Facilitate Analysis, Tracking, and Reporting of Interventions

Welcome, SEAN DEEGAN [Last login 10/13/2008] My Profile Log Off

Back to Main Census Patient: ANDERSON, JAMES Previous Next Demo: 73Y C M Loc: B104.2 (CRH) MR: 125467 Top Problems View All...

Diagnosis: MYOCARDIAL INF... Admission: 09/29 (15 days) Doctor: FOCUS\_CARE Allergies: CODEINE

Results & Meds Patient Demographics Problem List Handoff Orders Clinical Intervention Medication Reconciliation

Status: Incomplete Type: (ALL) Assigned: (ALL)

Time Id	Type	Assigned	Actions
10/13/2008 01:37 PM	Antimicrobial Monitoring: Appropriateness for Indication	DEEGAN, SEAN	
10/13/2008 01:33 PM	Quality Measures: AMI NO ASPIRIN & BETA BLOCKER	DEEGAN, SEAN	

Other E...  
No Info

- Diabetic Monitoring--
- Antimicrobial/Antifungal
- Elevated Serum Creatinine
- Metformin
- Hematologic Agent--
- Erythropoietic Agent (Erythropoietin)
- IV to PO Conversion--
- H2 Antagonist (H2A)
- Proton Pump Inhibitor (PPI)
- Kinetics--
- Aminoglycosides
- Vancomycin
- Miscellaneous--
- Vaccinations
- Will Test
- Quality Measures--
- AMI - Aspirin
- AMI - Beta Blocker
- AMI NO ASPIRIN & BETA BLOCKER
- HF - ACEI or ARB
- Pneumonia - Antimicrobial Selection
- Pneumonia - Vaccinations
- Renal Dosing--
- Antimicrobial
- H2 Antagonist
- LMWH

New In...  
Create New Definition...

Type: (Select One) Assign to: Add Clear

Quality Measures: AMI NO ASPIRIN & BETA BLOCKER  
10/13/08 01:33 PM

Aspirin w/in 24hrs:  
 Yes  
 No  
 Contraindicated

BB w/in 24hrs:  
 Yes  
 No  
 Contraindicated

Aspirin at Discharge:  
 Yes  
 No  
 Contraindicated

BB Prescribed @ D/C:  
 Yes  
 No  
 Contraindicated

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**Measure Outcomes...**

# Quality Improvement Through Clinical Surveillance



- Identify Opportunities
- Assess Access to Data for Profiling High-Risk Patient Populations
- Develop Protocols by Leveraging EBM
- Address the Five “Rights” of CDS
  - Deliver the Right Information, to the Right Person, in the Right Intervention Format, Through the Right Channel, at the Right Point in Workflow (preferably real-time)
- Provide “Preventive” Care
- Deliver the Highest Quality Care and Reduce Costs

# The Proven Value and Power of Clinical Surveillance



- Decreased time spent searching through charts
- Eliminated piecing together reports from multiple HIS systems
- Increased time spent on patient care
- Improved workflow efficiency and use of resources
- Improved clinical outcomes
- Decreased mortality, complications, LOS, “never events” and costs
- Improved Core Measures compliance
- Improved patient safety

# QUESTIONS



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