

# Enhancing the Data Supply Chain



**Fourth Plenary**

**Chair: Dan Pollock, MD**

**9:00 AM – 10:15 AM**





## Key Question Addressed

- 2. With increasing adoption of electronic health record systems and advances in information technology for detecting and reporting HAIs and collecting and submitting closely related data, what actions need to be initiated or intensified to assure that the data supply chain is as fully developed and widely used as possible, produces data that are valid, and meets prevention, public reporting, and payment purposes?**



# EHR Adoption in the U.S.:

## From Meaningful Questions to Tides

**David R. Hunt, MD, FACS**

Medical Director, Office of Provider Adoption & Support  
HHS Office of the National Coordinator for Health IT





# John Donne 1532-1631

No man is an island  
entire of itself; every  
man is a piece of the  
continent, a part of  
the main...



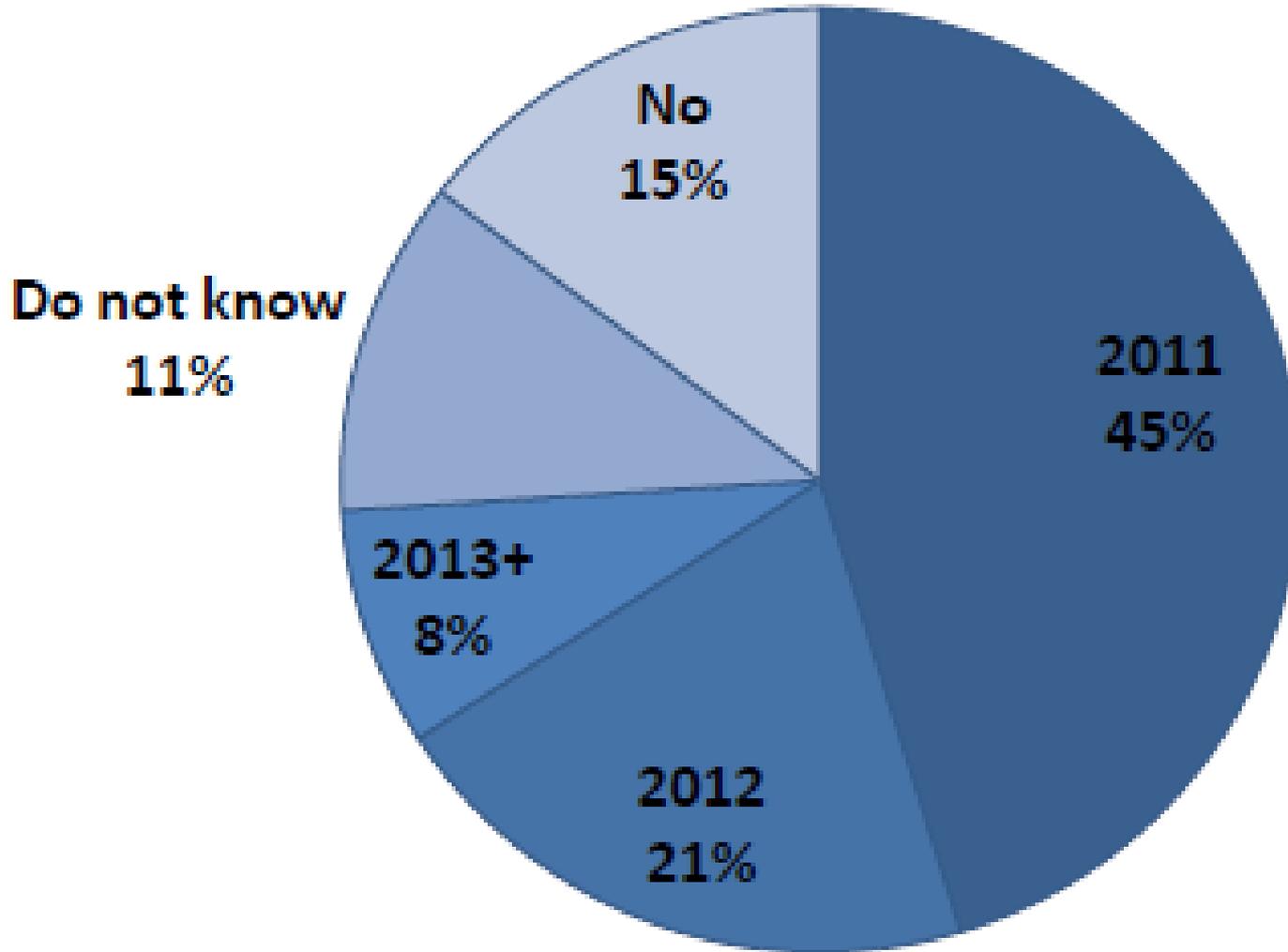
Oscar Björck (1860 – 1929) "Boat on Shore"

...any man's death diminishes me, because I am  
involved in mankind. And therefore never send to  
know for whom the bell tolls; it tolls for thee.



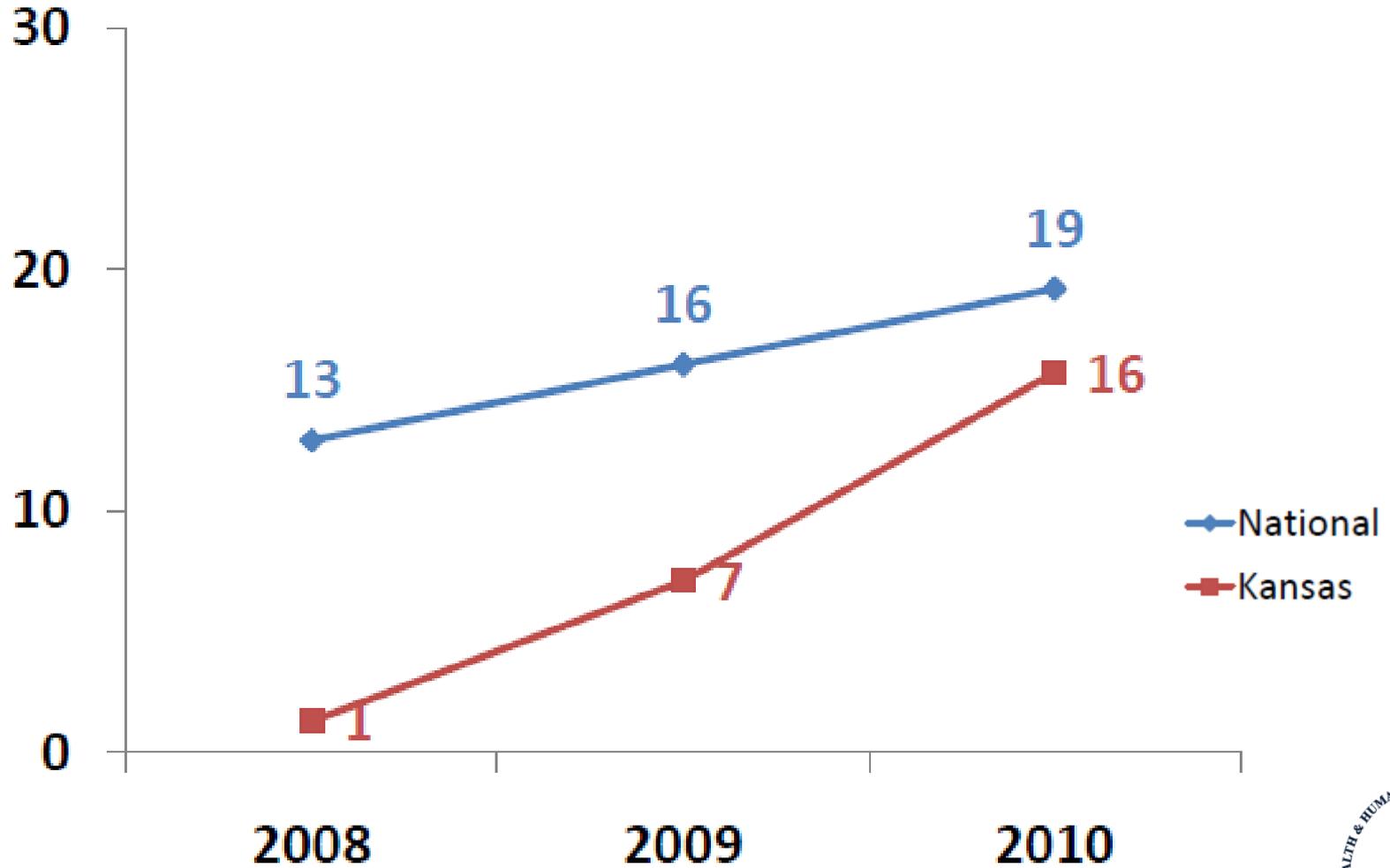


# Year Hospitals Intend to Apply for Meaningful Use





## Hospital EHR Adoption Nationally and in Kansas

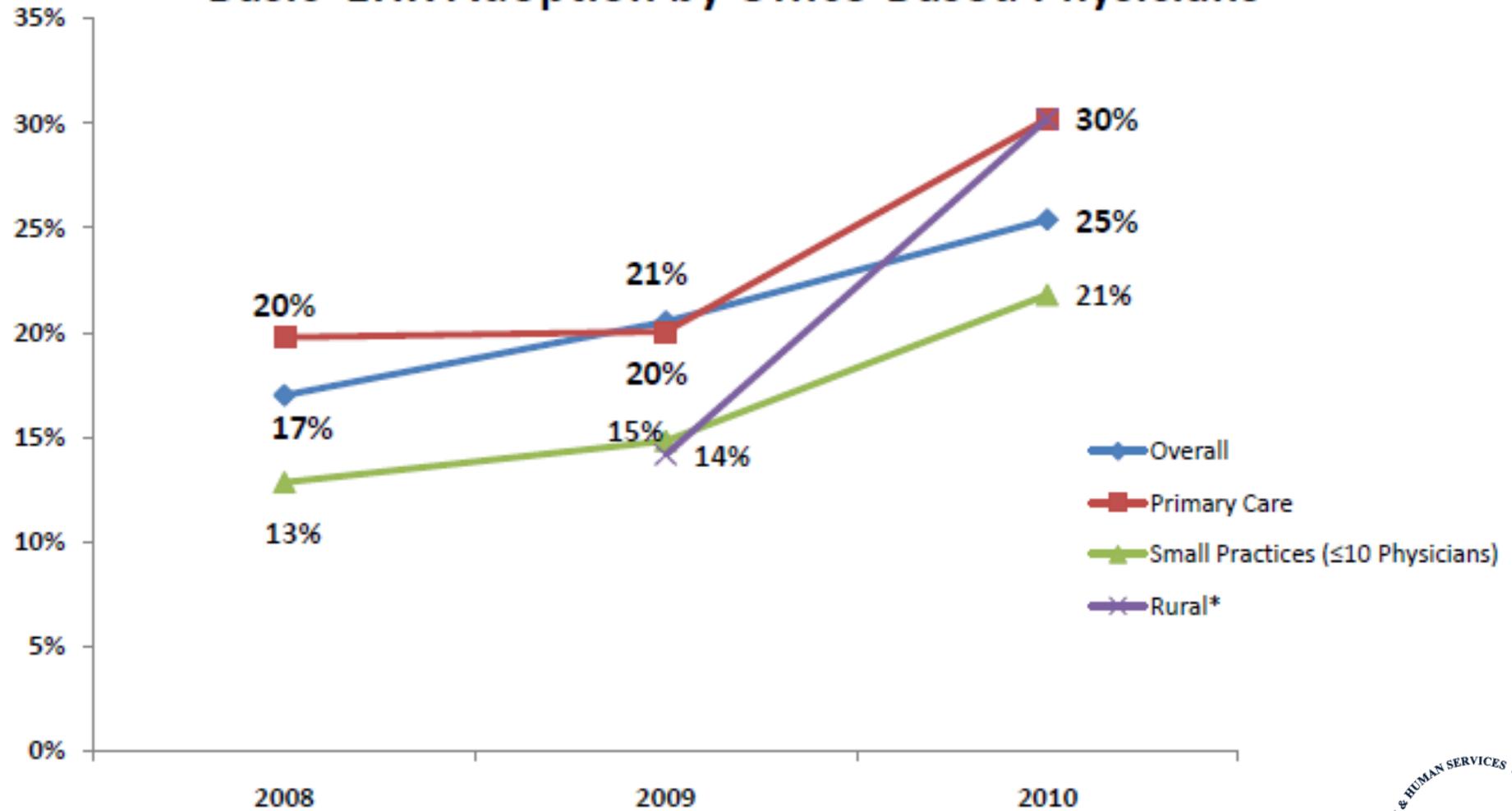


Data Source AHA Hospital Survey





## 'Basic' EHR Adoption by Office-Based Physicians



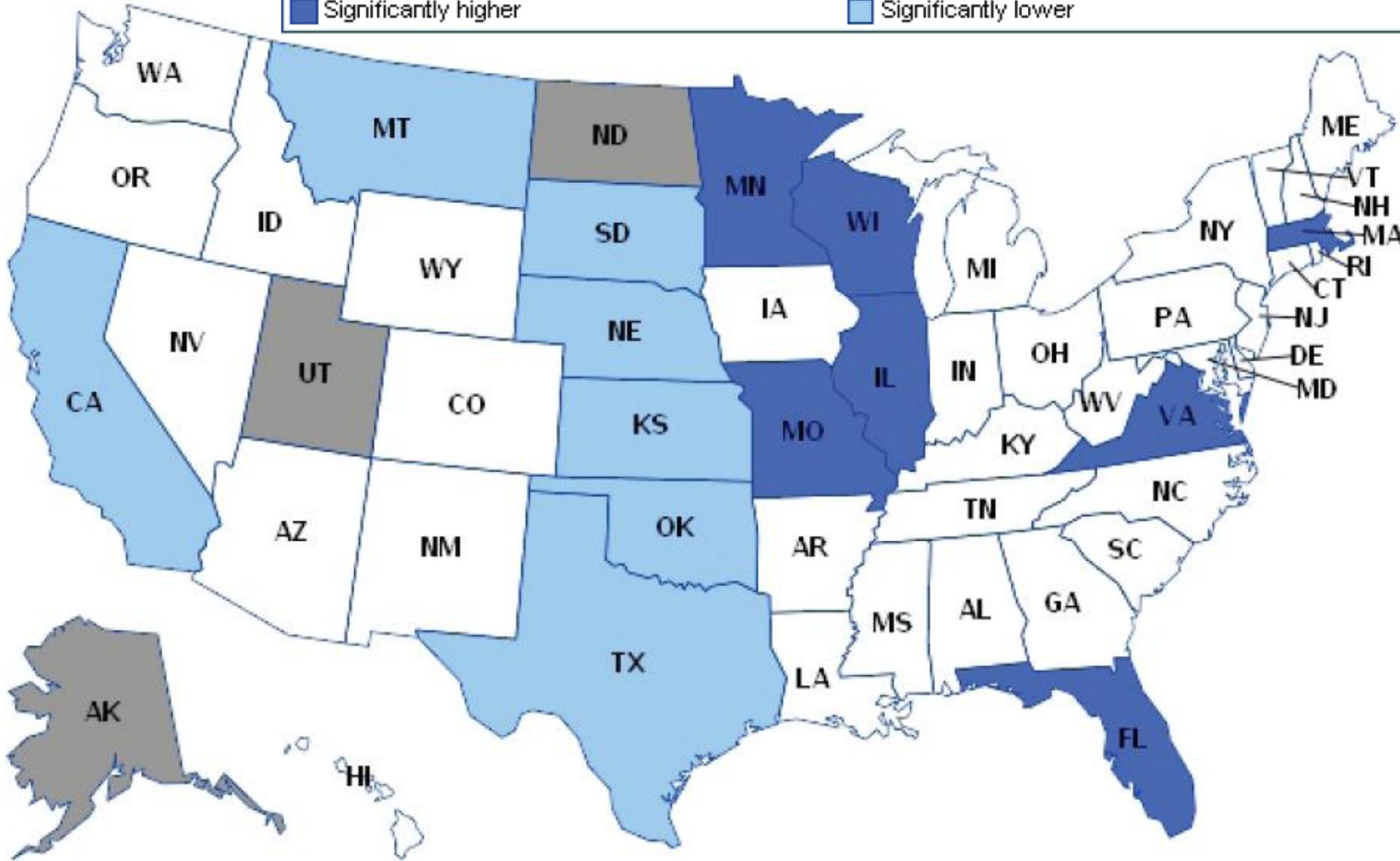
Source: NAMCS, 2008-10

\*Rural = Non-metropolitan, rural estimates not shown for 2008 because relative standard error >30%





# State EHR Adoption: Higher or Lower than National Average

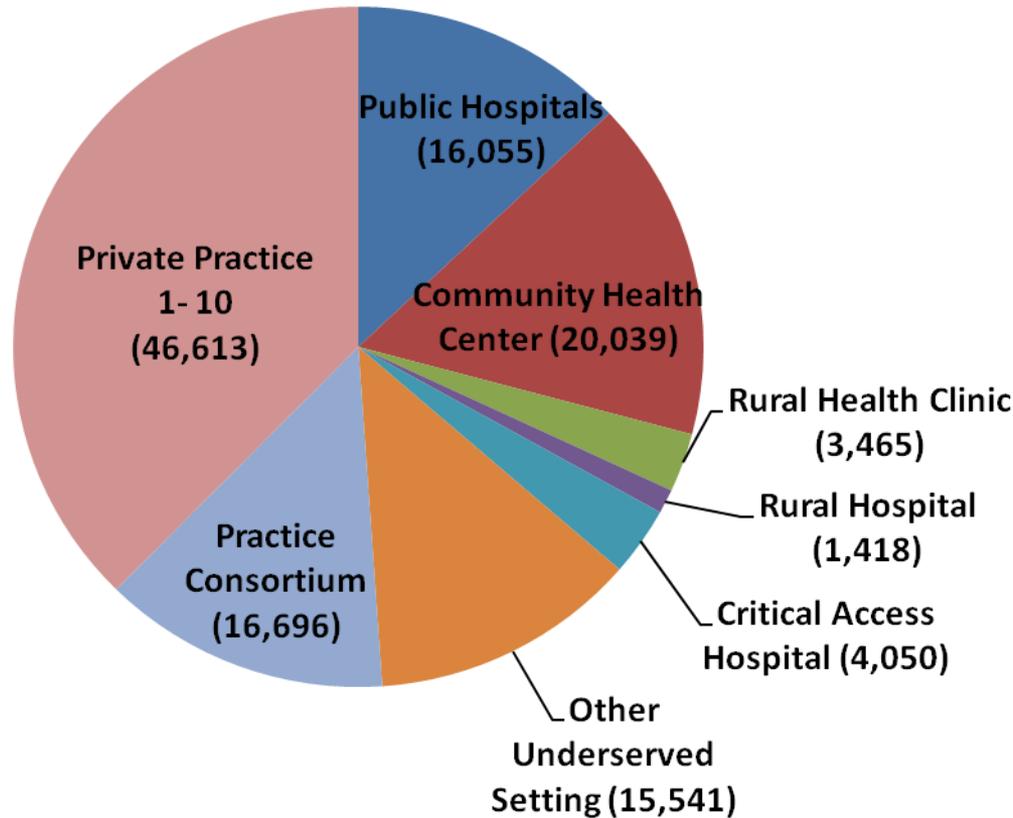






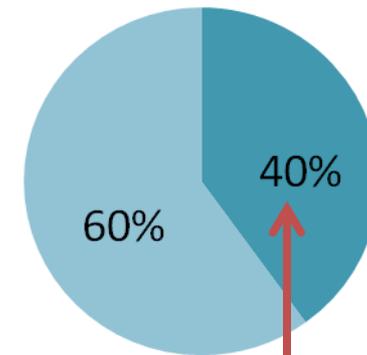
# Who RECs Are Helping

## Breakdown of Providers Working with RECs\*



## Primary Care Providers in the U.S.

- Working with RECs
- Not Working with RECs



**Over 120,000 providers:**  
 ≈ 40% of all PCPs in US  
 ≈ 70% of all rural providers  
 ≈ 70% of FQHCs  
 \*Not shown: 10,000+ specialists





# Rank Order Barriers

CHCs	CAHs	Small Practice (<11)	Large Practice 11+	Public Hospitals	Rural Health Clinic	Rural Hospital	Specialty Practice
Administrative	Staffing	Vendor Selection	Medicaid Program Not Up Yet	Delays in Implementation / Installation	Provider Engagement	Administrative	Vendor Selection
Certification	Upgrade	Provider Engagement	Vendor Selection	Vendor Selection	Workflow Adoption	Upgrade	Upgrade
Vendor Selection	Financial	Administrative	Administrative	Workflow adoption	Vendor selection	Technical	Workflow Adoption
MU Measures	Provider Engagement	Workflow Adoption	Workflow Adoption	MU Measures	Financial	Calculate patient volume	Technical
Delays in Implementation / Installation	Workflow Adoption	Reports slow/not available	Reports slow/not available	Administrative	Administrative	Financial	Provider engagement
<b>39%</b>	<b>60%</b>	<b>64%</b>	<b>89%</b>	<b>45%</b>	<b>43%</b>	<b>77%</b>	<b>84%</b>

**MU Measure**

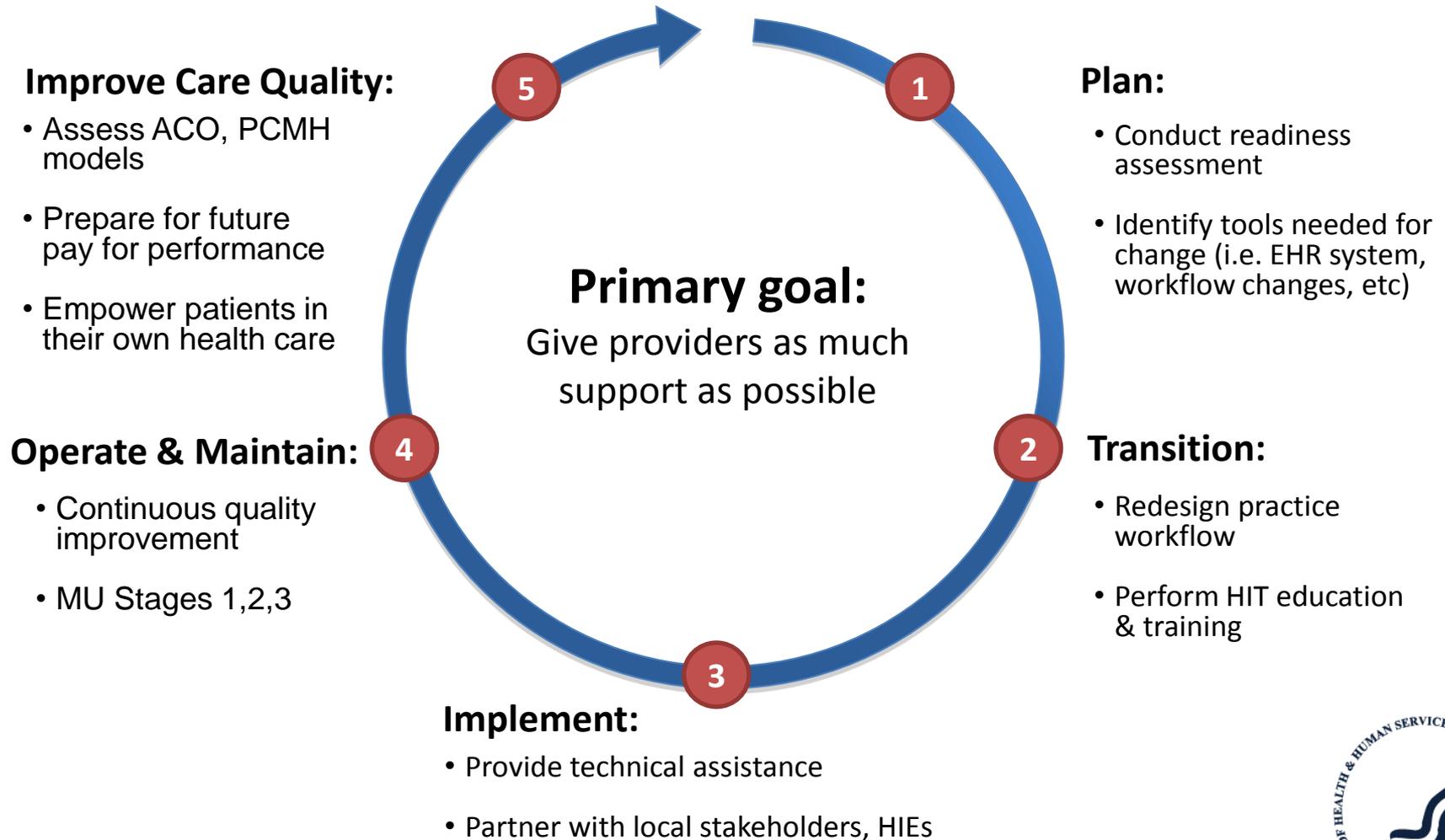
**Attestation Process**

**Practice Issue**

**Vendor Issue**

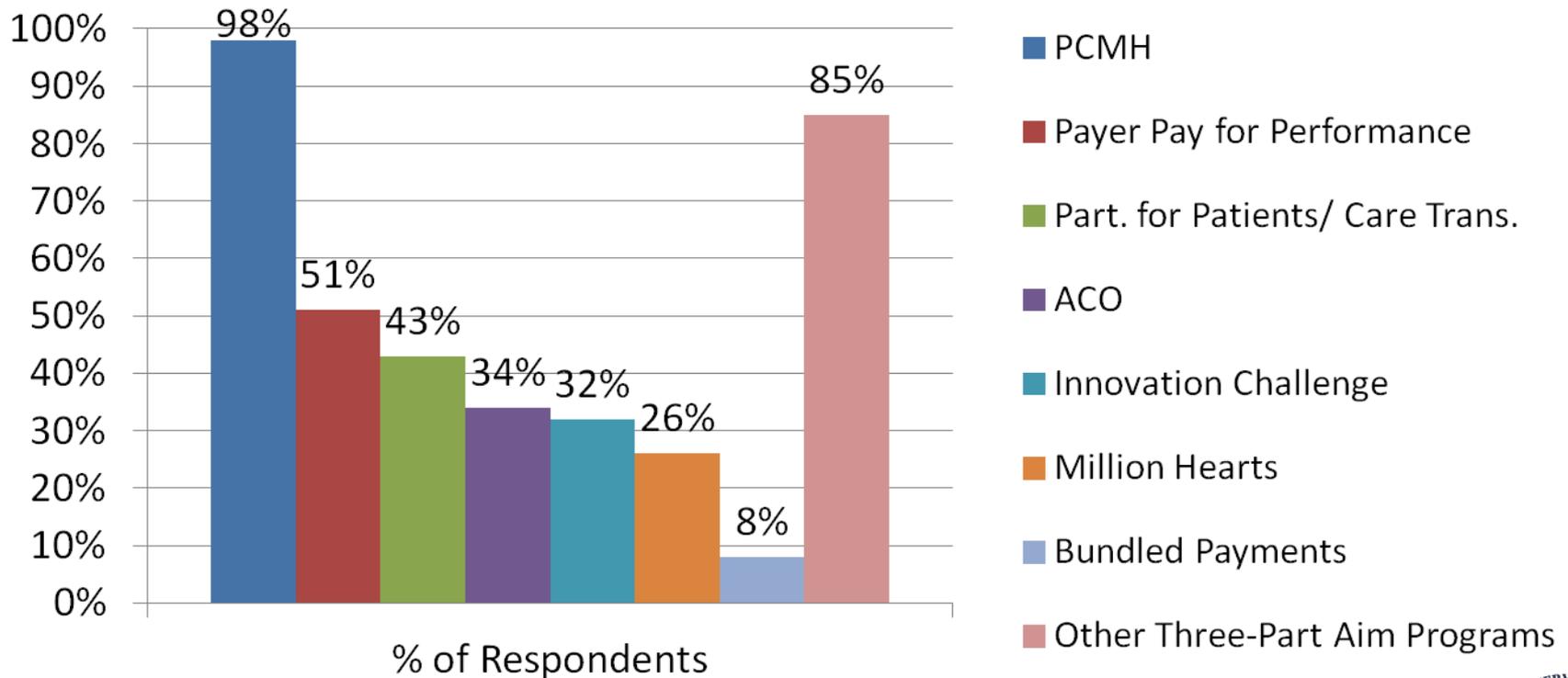


Data as of April 9, 2012. Non-priority hospitals did not report any barriers.



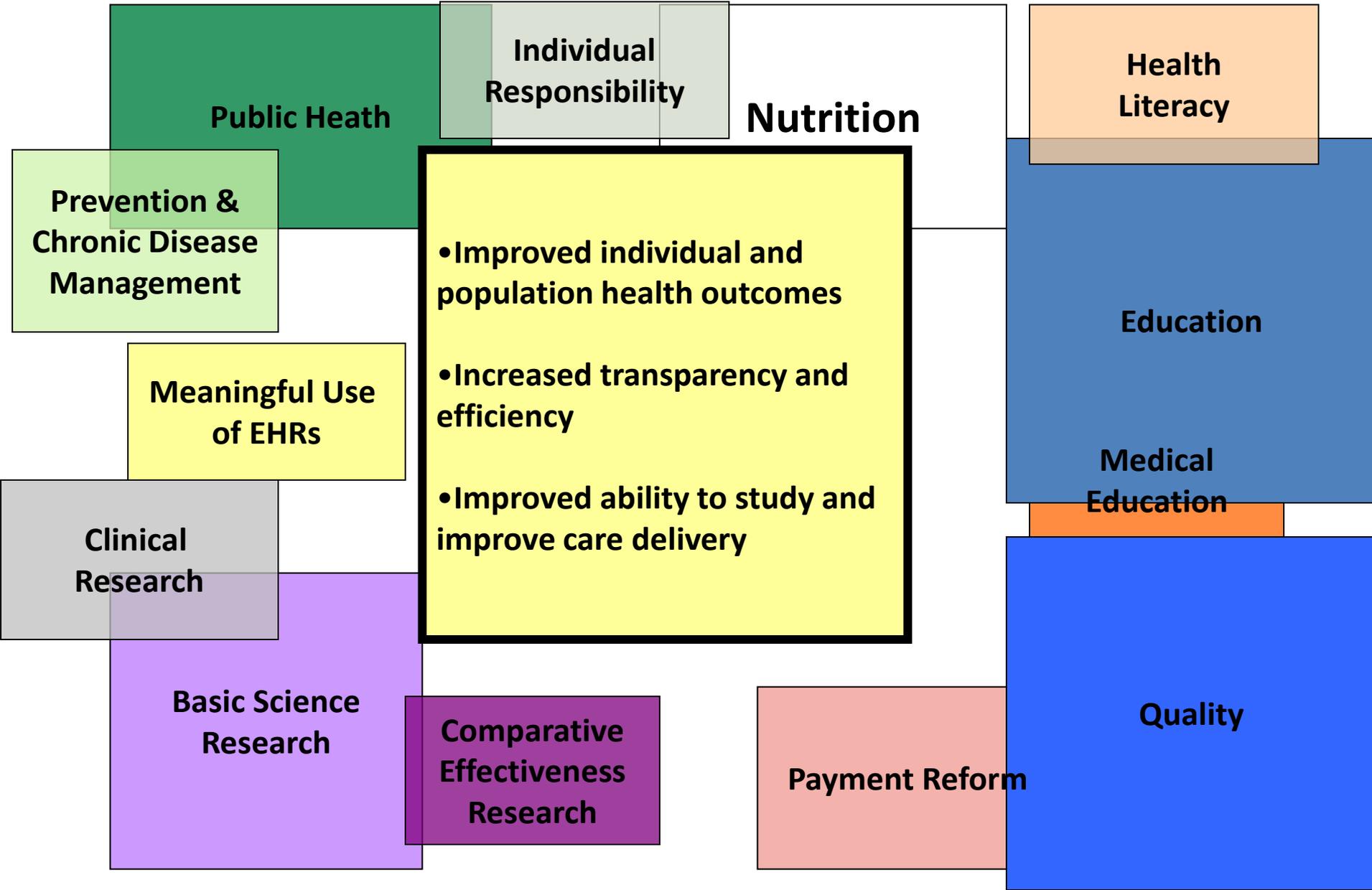


- RECs are currently working on over 190 different programs to help providers meet the Three-Part Aim goals



\* As reported by 53 out of 62 RECs. Some REC are working on several different Three-Part Aim Programs.







And  
therefore  
never send  
to know for  
whom the  
bell tolls...

Oscar Björck (1860 – 1929) “Boat on Shore” c. 1885 oil on canvas





[davidr.hunt@hhs.gov](mailto:davidr.hunt@hhs.gov)

<http://healthit.hhs.gov>



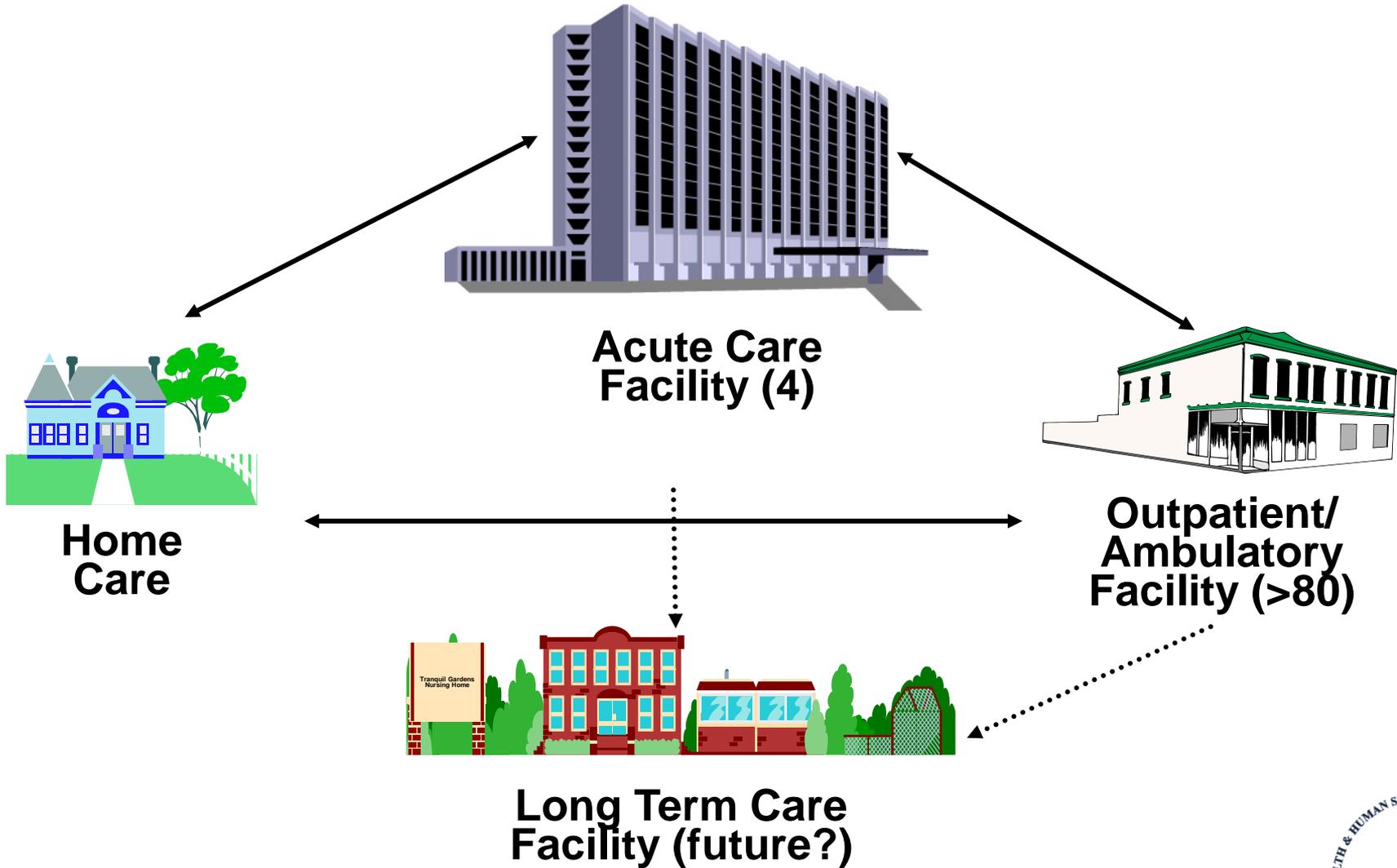
# EHR Systems Configuration to Automatically Produce HAI Data to CDC's NHSN

**Marc-Oliver Wright, MT(ASCP), MS, CIC**  
Director of Infection Control  
NorthShore University HealthSystem





# “The Web of Surveillance” at NorthShore



Modified from the





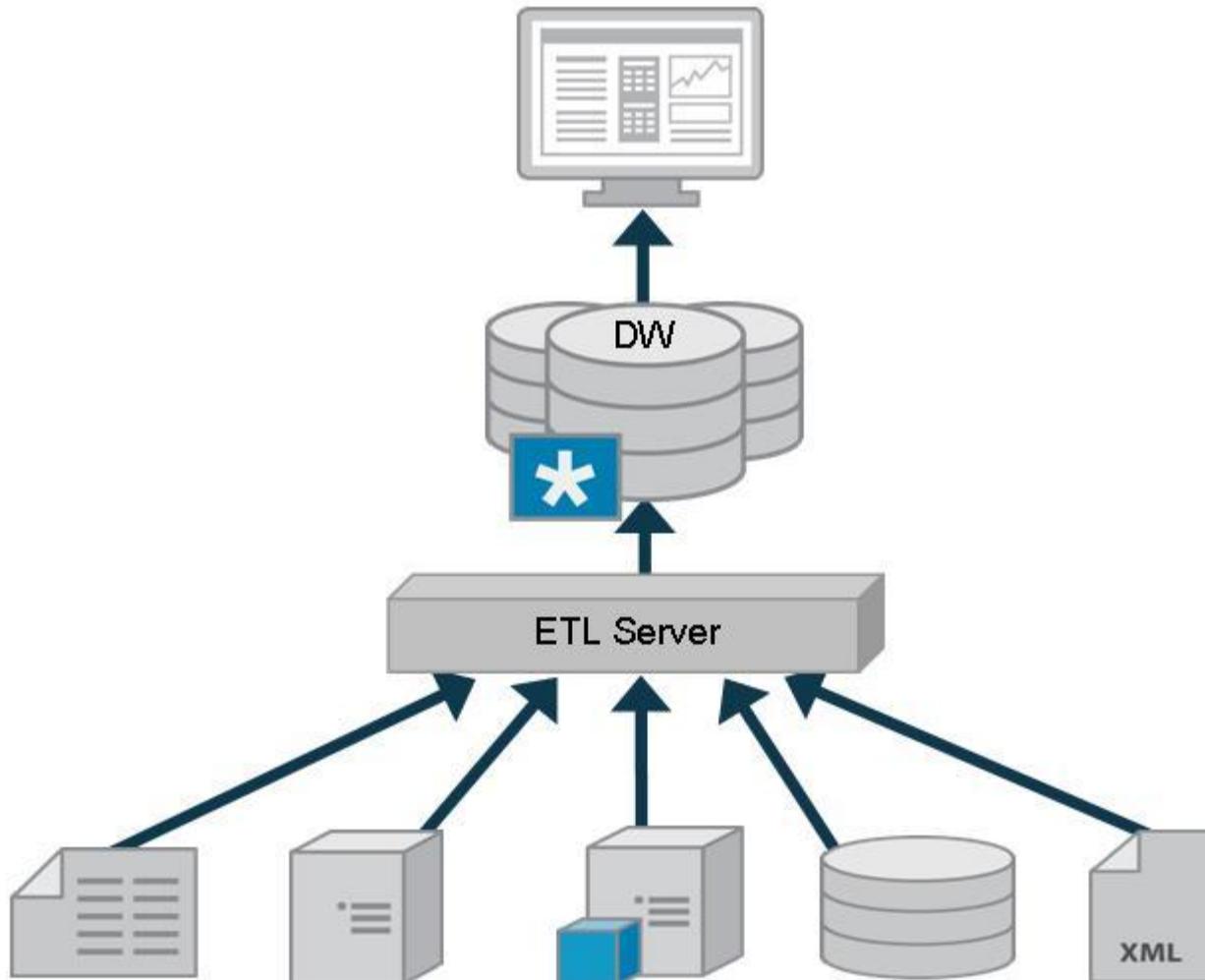
## Pros and Cons of EHR at NSUHS

- Communication throughout continuum of care
- In-house developed CDSS for QI
- Regulatory Compliance
- Expanded surveillance
- Research
- Communication (cut/paste)
- Regulatory compliance <> QI
- Overly dependent





# Basic EDW Schematic



EMR +/-  
LIS, etc →

<http://res.sys-con.com>





# High-Level Data in NorthShore's EDW

- ○ Patient demographics
- ○ Encounter
- ○ Provider clinical diagnoses
- ○ Problem list
- ○ Provider info
- ○ Reason for visit/chief complaint
- ○ Medication schedule
- ○ Medication administration
- ○ Associated medication diagnoses
- ○ Provider
- ○ Current medications
- ○ Order detail
- ○ Discrete result detail
- ○ Vitals information
- ○ Specific list of measurements selected by users
- ○ Admit / Discharge / Transfer

>700 Unique Data Categories





# Practical Examples from NSUHS

- Automated device days
- System List
- Best Practice Alerts
- Exposure workup
- Syndromic surveillance
- Clinical decision support for MDRO surveillance
- Automated surveillance

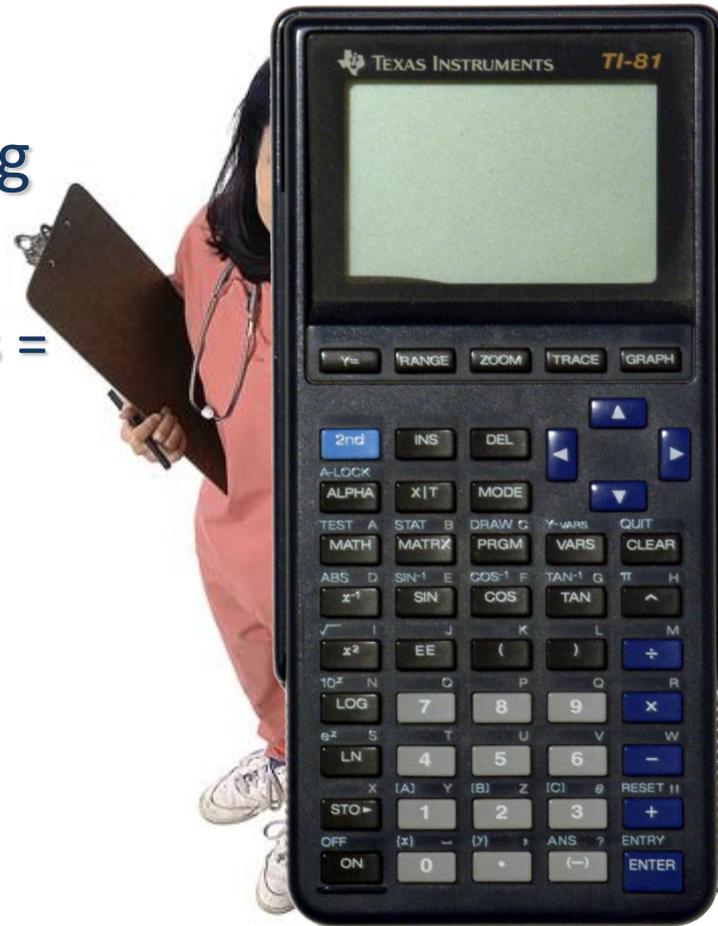
In the context  
of Foley  
catheter care





# Where 'device days' come from

- 1 person in ICU collecting data each day
  - 30 sec/patient X 67 beds = 204 hrs per year
  - Error potential, cost
- Error potential, cost



**ADULT SURVEILLANCE  
WORKSHEET FOR PATIENT DAYS**

MONTH & YEAR January 2009

MICU

SICU

CENTRAL LINES													CENTRAL LINES												
DATE	Census	Foley	Art	Port	PIC	IJ/SC	Swg	Tun	Fem/TI/DI	IABP	Other	Ven	DATE	Census	Foley	Art	Port	PIC	IJ/SC	Surg	Tun	Fem/TI/DI	IABP	Other	Ven
1	10	3	1	0	0	0	1	0	0	1	0	4	1	3	4	0	0	1	1	0	0	0	0	1	
2	10	3	1	0	0	0	1	0	0	1	0	5	2	4	4	0	0	1	1	0	0	0	0	1	
3	10	6	1	0	0	0	1	0	0	0	0	5	3	4	5	2	0	1	1	0	0	0	0	1	
4	8	5	1	0	0	0	0	0	0	0	0	3	4	7	5	0	0	1	0	0	0	0	0	1	
5	8	5	1	0	0	0	0	0	0	0	0	3	5	8	4	1	0	1	0	0	0	0	0	0	
6	8	4	1	0	0	0	0	0	0	0	0	3	6	8	4	1	0	1	0	0	0	0	0	0	
7	8	4	1	0	0	0	0	0	0	0	0	3	5	8	4	2	0	1	0	0	0	0	0	0	
8	8	4	1	0	0	0	0	0	0	0	0	3	6	8	4	2	0	1	0	0	0	0	0	1	
9	8	5	0	0	0	0	0	0	0	0	0	1	5	8	5	3	0	1	0	0	0	0	0	1	
10	9	5	0	0	0	0	0	0	0	0	0	1	5	9	5	3	0	1	0	0	0	0	0	1	
11	9	4	0	0	0	0	0	0	0	0	0	1	7	9	3	2	0	1	0	0	0	0	0	1	
12	10	4	0	0	0	0	0	0	0	0	0	2	8	3	3	0	0	1	0	0	0	0	0	0	
13	6	3	0	0	0	0	0	0	0	0	0	1	3	3	3	0	0	0	0	0	0	0	0	0	
14	9	3	0	0	0	0	0	0	0	0	0	1	5	4	1	3	0	1	1	0	0	0	0	1	
15	9	3	0	0	0	0	0	0	0	0	0	1	6	5	4	5	0	2	1	1	0	0	0	1	
16	2	2	0	0	0	0	0	1	0	0	0	2	6	5	5	5	0	1	2	0	0	0	0	2	
17	2	2	0	0	0	0	0	1	0	0	0	0	4	2	4	1	0	1	0	0	0	0	0	2	
18	2	1	0	0	0	0	0	1	0	0	0	0	6	2	1	4	0	1	0	0	0	0	0	0	
19								5				0	6	4	3	4	0	0	0	0	0	0	0	0	
20												0	4	4	3	4	0	0	0	0	0	0	0	1	
21	5	4	0	0	0	0	0	0	0	0	0	0	4	3	3	3	0	1	0	0	0	0	0	2	
22	9	4	0	0	0	0	0	0	0	0	0	0	3	3	2	2	0	2	0	0	0	0	0	1	
23	9	7	0	0	0	0	0	0	0	0	0	0	closed												
24	10	6	0	0	0	0	0	0	0	0	0	2	closed												
25	7	6	0	0	0	0	0	0	0	0	0	2													
26	7	5	0	0	0	0	0	0	0	0	0	2													
27	9	5	0	0	0	0	0	0	0	0	0	1													
28	7	4	0	0	0	0	0	0	0	0	0	1													
29	7	3	0	0	0	0	0	0	0	0	0	1													
30	9	3	0	0	0	0	0	0	0	0	0	1													
31	10	4	1	0	0	0	0	0	0	0	0	3													

0 4 1 0 4 4 16 3

122

0 25 11 16 7 14 1 0

23 PR days

68 central lines

83  
48  
74

STARTS

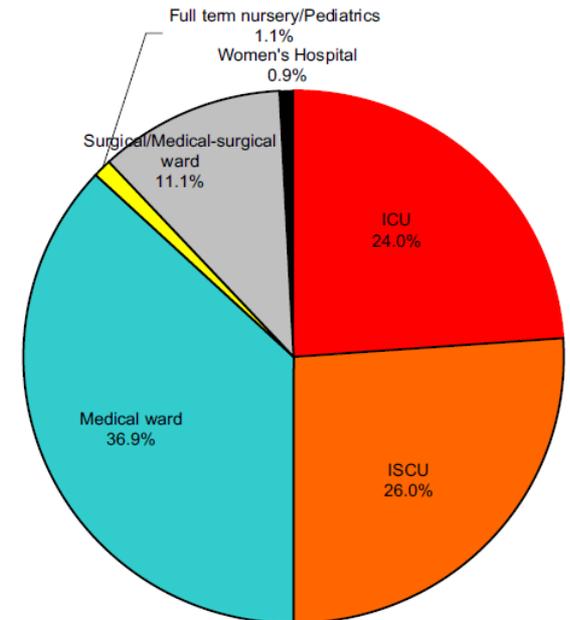
- LEGEND:
- Art: Arterial lines
  - PIC: PICC (peripherally inserted central catheters)
  - Swg: Swan-Ganz lines
  - Port: Port-a-caths
  - IJ/SC: Internal jugular/subclavian lines
  - Tun: Tunneled lines such as Gorshong, Hickman, Quinton
  - Ven: Ventilator
  - Fem/TI/DI: Femoral/Triple lumen/Double lumen catheter
  - Other: None of the above but known as a central line, such as a large bore catheter inserted as a central line
  - IABP: Intra Aortic Balloon Pump



- Medical devices not limited to the ICU.
- NHSN evaluating weekly prevalence and extrapolation; Hota et al found an algorithmic prediction from the EMR to be as accurate as manual data collection

-Denominator simplification update. NHSN-eNews.2011; 6:1.  
-Hota et al Infect Control Hosp Epidemiol. 2010 Jan;31(1):4-11.

Proportion of Central Venous Catheters by Population Served



**Fig 2.** Data output from the automated system subjected to additional analysis. ISCU is the Infant Special Care Unit. Proportion of total central venous catheter-days occurring in different units at the 3 NorthShore hospitals, October 1, 2007, to June 30, 2008. N = 17,529 central venous catheter-days.

- AJIC Jun;37(5):364-70 2009





# 2012 HAI Data Summit

Joyce, Validate

Age: 72YO Enc#: 34987828 Allergies Code Status: (None) LOS/GMLOS 277d/(None)\* Attending: Lerner, David \*  
DOB: 8/13/1938 Sex: F Penicillamine, P\* Isolation: AIRBORN\* Room/Bed GB-4012/01 \* PCP: ALI, AMAN

## Doc Flowsheets

File Add Row Add Group Add LDA Cascade Add Col Insert Col Device Last Filed Graph Details Go to Date Values By Refresh Legend LinkLine

Flowsheet: Tbs and Drns Gen RN Lines ED Bedside Testing Wnd and Inc Tbs and Drns IV INF Labor Anesthesia I and O Hemodialysis Gen I and O ISCU LINES and DRAINS Initial Assessment Screen

		Inpatient 08/13/10										
		9/14/10	9/16/10	9/29/10	10/4/10	1/17/11	2/16/11	3/21/11	5/12/11	5/17/11		
Tbs and Drns		1300	1500	1300	1000	1600	1000	1600	1300	1300	Last Filed Value	
Closed/Suction Drain 1 Abdomen A...												
Gastrostomy/Enterostomy Gastrosto...												
Nasogastric/Orogastric Nasogastric												
Urinary Catheter 09/27/10 1416 Strai...												
Urinary Catheter 10/04/10 1024 Foley												
Urinary Catheter 05/17/11 1413 Foley												
Straight Cath- In and Out												
Urethral Catheter Output		Urinary Catheter 10/04/10 1024 Foley										
Urethral Properties		Removal Date/Time: 05/16/11 1111 Placement Date/Time: 10/04/10 1024 Inserted by: MO Wright Catheter Location: Urethral Catheter Type: Foley										
Reason for Foley/Coude insertion:		Urinary r...	Need for ...								Urinary r...	Urinary retenti...
Catheter status		Patent	Patent	Patent	Patent	Patent	Patent	Patent	Patent	Patent	Patent	Patent
Urine Color		YELLOW						YELLOW	YELLOW	YELLOW	YELLOW	STRAW
Urine Character		CLEAR										CLOUDY
Collection Container		Standard...										Standard drain...
Tube Securement		Leg strap										Leg strap
Site/Skin Assessment												Clean, Intact
GU Device Patient Care		CARE C...										CARE COMPL...
Urethral Catheter Output					100							100 ml
		Urinary Catheter 05/17/11 1413 Foley										



Pav	Unit	Pat name	MRN	Adm Date	ADT Effective Time	Disch date	Placement Date	Removal Date	Description
E	S5S			04/01/2011	4/1/2011 11:58:00 PM	04/05/2011	4/1/2011 1:41:00 PM	4/2/2011 3:49:00 PM	Urinary Catheter 04/01/11 1341 Foley
E	3WH			03/31/2011	4/1/2011 11:58:00 PM	04/04/2011	4/1/2011 1:10:00 AM	4/2/2011 10:12:00 AM	Urinary Catheter 04/01/11 0110 Foley
E	3WH			04/01/2011	4/1/2011 11:58:00 PM	04/05/2011	4/1/2011 7:45:00 AM	11/19/2157 5:46:00 PM	Urinary Catheter 04/01/11 0745 Foley
E	S4S			03/30/2011	4/1/2011 11:58:00 PM	04/07/2011	4/1/2011 6:42:00 PM	4/2/2011 7:00:00 AM	Urinary Catheter 04/01/11 1842 Foley
E	3WH			04/01/2011	4/1/2011 11:58:00 PM	04/03/2011	4/1/2011 6:46:00 PM	11/19/2157 5:46:00 PM	Urinary Catheter 04/01/11 1846 Foley
E	LABR			04/01/2011	4/1/2011 11:58:00 PM	04/04/2011	4/1/2011 3:43:00 PM	11/19/2157 5:46:00 PM	Urinary Catheter 04/01/11 1543 Foley
E	S4S			03/22/2011	4/1/2011 11:58:00 PM	04/30/2011	4/1/2011 8:30:00 AM	4/3/2011 11:15:00 AM	Urinary Catheter 04/01/11 0830 Foley
G	GICU			04/01/2011	4/1/2011 11:58:00 PM	04/07/2011	4/1/2011 12:00:00 AM	4/3/2011 9:00:00 AM	Urinary Catheter 04/01/11 Foley
G	G4N			04/01/2011	4/1/2011 11:58:00 PM	04/04/2011	4/1/2011 7:43:00 AM	4/3/2011 7:06:00 AM	Urinary Catheter 04/01/11 0743 Foley
G	GER			04/01/2011	4/1/2011 11:58:00 PM	04/08/2011	4/1/2011 7:35:00 PM	4/11/2011 12:00:00 PM	Urinary Catheter 04/01/11 1935 Foley





## The System List

- Some EMRs have customizable patients lists based on select criteria
  - Patients with a Foley
  - Patients at risk for a pressure ulcer
- Allows dedicated staff to monitor in real-time and intervene





# Isolation System List

**Patient Lists**

Create Properties Remove Add Patient Copy Paste Open Chart Quick Validate

**Infection Control - EV Infection Control (4 Patients)**

Unit	Room/Bed	Patient Name	Age	Attending	Diagnosis Cmts	Actual Length of	Isolation
EV 4 SOUTH SEARLE	4901/01	Sandler, Sandy A	72YO	Lerner, David J., MD		197	<b>DROPLET</b>
EV 5 NORTH SEARLE	5949/01	Careplan, Two	61YO	Ables, Mark William, MD		163	<b>DROPLET</b>
EV CCC	2402/01	Test, Bug	3YO	Ables, Mark William, MD	whopping cough	29	<b>CONTACT</b>
EV EMERGENCY ROOM	EXAM 05/E05	Muhosp, Edevdepart1	36YO	Noxon, Bruce E., DPM		220	<b>AIRBORNE</b>

← Microbiology ENH NURSING KARDEX ENH NURSING CAREPLAN Sign Out Report D/C Summ. IP MAR REPORT Outpatient Contacts Admission

No Data Available





# Foley System List

- Unit-based list of all patients with RN documented Foley

**Foley LDA Patients - GB Active Foley Patients** (5 Patients) as of 1304

Unit	Room/Be	Patient Name/Age/Sex	Foley>48h	Foley Cont/DC Order Last 48hrs	Insert Foley Order	Last Insert Foley Order	Last Continue Foley Order	Last DC Foley Order	Foley LDA Active	Accc Code
GB 4 NORTH	4074/02	Vte5, T (40YO M)	Yes				2/16/11 12:59 Status: Sent		Yes	Stan Room

Navigation: LDA Foley Review | Admission | ENH NURSING KARDEX | Report: LDA Foley Review

**Vte5, Testrum** (Account#: 7500979) (Encounter#: 34992617) (40YO M) G4N-4074-02 (Adm: 11/17/10) **PCP: Manfred P. Man, DO**

**Active Urethral Catheter / 3 Way Catheter**

Name	Placement date	Placement time	Site	Days	Additional Info
<b>Urinary Catheter 02/10/11 Foley</b>	02/10/11	-PC		6	Catheter Location: Urethral -PC  Catheter Type: Foley -PC Tube size: 18 Fr -PC Balloon Fill: 10 ml -PC

**Inactive Urethral Catheter / 3 Way Catheter**

\*\*None\*\*

**User Key** (r) = User Recd, (t) = User Taken (c) = User Cosigned

Initials	Name	Effective Dates	Provider Type	Discipline
PC	Citron, Patricia J, RN	10/28/10 -	Registered Nurse	Nursing

**Foley BPA History**

ECR IP FOLEY MAINTENANCE BPA (BASE) Inactive

Date	User	Actions Taken	Triggers
02/16/11 1303	Braund, Victoria L., MD	Acknowledge: Urinary retention/obstruction [141]	Open Order Entry activity
02/16/11 1303	Braund, Victoria L., MD		General BPA section

- Allows unit champion to review and intervene in real-time





## Best Practice Alerts (BPAs)

- Automated rules based on decision algorithms of data entered into the EMR. When select criteria are met, an actionable alert or “pop up” appears to the EMR user.
- More effective alerts are
  - Timely
  - Targeted
  - Immediately actionable (link to an order)





## BPA: Foley Orders

- Foley present without an order? BPA
- Foley present >48 hours? BPA

BestPractice Alert - DGHTEST,ONE

**Foley catheter flowsheet documentation without a FOLEY INSERT order, please contact provider to order FOLEY INSERT CATHETER**

BestPractice Advisory - Vte2,Testrun

**Foley catheter in place for 48 hours, please discontinue or acknowledge reason to continue.**

Acknowledge Reason:   

- |                          |                        |                               |                 |
|--------------------------|------------------------|-------------------------------|-----------------|
| Not Responsible Provider | Open wound perineum    | Urinary retention/obstruction |                 |
| Limited pre & post-op    | Comp. Urological proc. | Accurate I & O                | Other (Comment) |

 Open order: FOLEY DC ORDER



# BPA Rules of Engagement

- Don't confuse the user
- BPA Fatigue
  - Click through
  - X Out
- Avoid BPA fatigue by frequent reassessment of existing alerts and retiring those no longer needed.





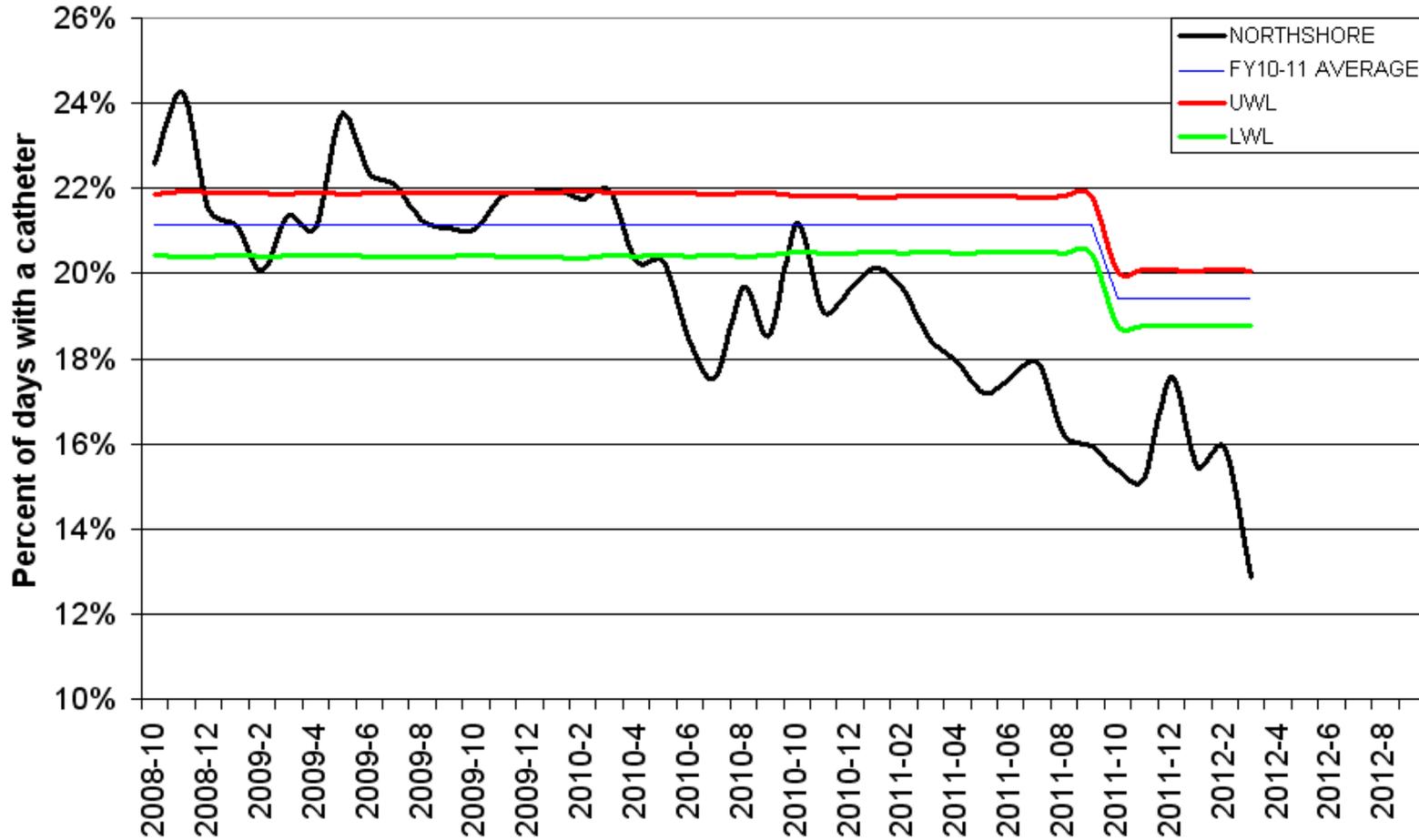
## Foley Experience Summary

- Automated device days allows organizational, facility and unit level data
- System lists decentralized authority and responsibility to the assigned individual
- BPAs engage and hold physicians accountable





## Foley Catheter Utilization





## Exposure Workup

- I have a patient with active pulmonary multi-drug resistant MTB who wasn't in airborne precautions with potentially hundreds of workers exposed. How do I find them?
- I need every HCW who opened the patient's Medical Record during the time of the exposure.
  - Audit trails





# 2012 HAI Data Summit

Exposure-enter MRN into Meds,Notes,HB and Flowsheet\* - Report Studio - Windows Internet Explorer

File Edit View Structure Table Data Run Tools Help

Font Size 1 pt

Insertable Objects

- Enterprise Data Warehouse
- Data Marts - Business View

Page Explorer

Data Items

- Patient Medical Record Number
- Patient Name
- Recorded Time
- Recorded User Name
- Recorded Employee Provider Type
- Recorded Employee Status
- Recorded Employee Login Department
- Date

Detail Filters

- [Patient Medical Record Number] in ('204298004')

Report Specification XML

```
</dataItem>
- <dataItem name="Patient Name" aggregate="none" rollupAggregate="none">
  <expression>[Data Marts - Business View].[Medication
  Orders/Administration].[Patient Name]</expression>
</dataItem>
- <dataItem name="Patient Contact Serial Number" aggregate="none"
rollupAggregate="none">
  <expression>[Data Marts - Business View].[Medication
  Orders/Administration].[Patient Contact Serial Number]</expression>
</dataItem>
- <dataItem name="Hospital Account Id" aggregate="none"
rollupAggregate="none">
  <expression>[Data Marts - Business View].[Medication
  Orders/Administration].[Hospital Account Id]</expression>
</dataItem>
- <dataItem name="MAR Entry User" aggregate="none" rollupAggregate="none">
  <expression>[Data Marts - Business View].[Medication
  Orders/Administration].[MAR Entry User]</expression>
</dataItem>
- <dataItem name="Medication Administration Result" aggregate="none"
rollupAggregate="none">
  <expression>[Data Marts - Business View].[Medication
  Orders/Administration].[Medication Administration Result]</expression>
</dataItem>
- <dataItem name="Date" aggregate="none" rollupAggregate="none"
label="Date">
```

Close



## 2012 HAI Data Summit



NorthShore University HealthSystem

Patient Medical Record Number	Date	Person	Employee ID	Employee Login Department	Employee Provider Type
203509930	Aug 21, 2010	LAGAYA, DINA	380684	Sk 4 East	Registered Nurse
203509930	Aug 21, 2010	MATHEW, CHERYL LESLIE	381218	Sk 4 East	Registered Nurse
203509930	Aug 21, 2010	NAIR, USHA	302310	Respiratory Therapy Sk	Respiratory Therapist
203509930	Aug 21, 2010	VILLALON, MARIA	381282	Sk 4 East	Registered Nurse
203509930	Aug 22, 2010	AQUENDE, VALENTINA	380053	Sk 4 East	Registered Nurse
203509930	Aug 22, 2010	JOSEPH, TOMY T	380593	Respiratory Therapy Sk	Respiratory Therapist
203509930	Aug 22, 2010	KORA, SARAMMA	380659	Vascular Access Team	Registered Nurse
203509930	Aug 22, 2010	LIMBUNGAN, ELLA	380733	Sk 4 East	Registered Nurse
203509930	Aug 22, 2010	PLAZAS, JOSEPH	115340	Respiratory Therapy Ev	Respiratory Therapist
203509930	Aug 22, 2010	VILLALON, MARIA	381282	Sk 4 East	Registered Nurse
203509930	Aug 23, 2010	KOPSIAS, CARYN	125253	Vascular Access Team	Registered Nurse
203509930	Aug 23, 2010	LAGAYA, DINA	380684	Sk 4 East	Registered Nurse
203509930	Aug 23, 2010	MATHEW, CHERYL LESLIE	381218	Sk 4 East	Registered Nurse
203509930	Aug 23, 2010	SIMON, TOSMY	381142	Sk 4 East	Registered Nurse
203509930	Aug 23, 2010	THUNDIYIL, SAM	381229	Respiratory Therapy Sk	Respiratory Therapist
203509930	Aug 24, 2010	BABY, VIBITHA	380077	Sk 4 East	Registered Nurse
203509930	Aug 24, 2010	BALASH, LYUBOV	380086	Respiratory Therapy Sk	Respiratory Therapist
203509930	Aug 24, 2010	BENEDICT, BENCY	380112	Respiratory Therapy Sk	Respiratory Therapist
203509930	Aug 24, 2010	KORA, SARAMMA	380659	Vascular Access Team	Registered Nurse
203509930	Aug 24, 2010	MATHEW, CHERYL LESLIE	381218	Sk 4 East	Registered Nurse





## Exposure Workup

- Used for communicable disease exposures
  - From patients to healthcare workers
  - From healthcare workers to patients
- ‘Exposure’ to recorded implants/devices
  - Non-sterile bone putty packaging





## Syndromic Surveillance Influenza Like Illness (ILI)

- Diagnosis codes are delimited and captured in the EMR
- We developed a query that looked for a combination of the following in outpatient or ED setting
  - Fever
  - Respiratory illness including cough, sore throat





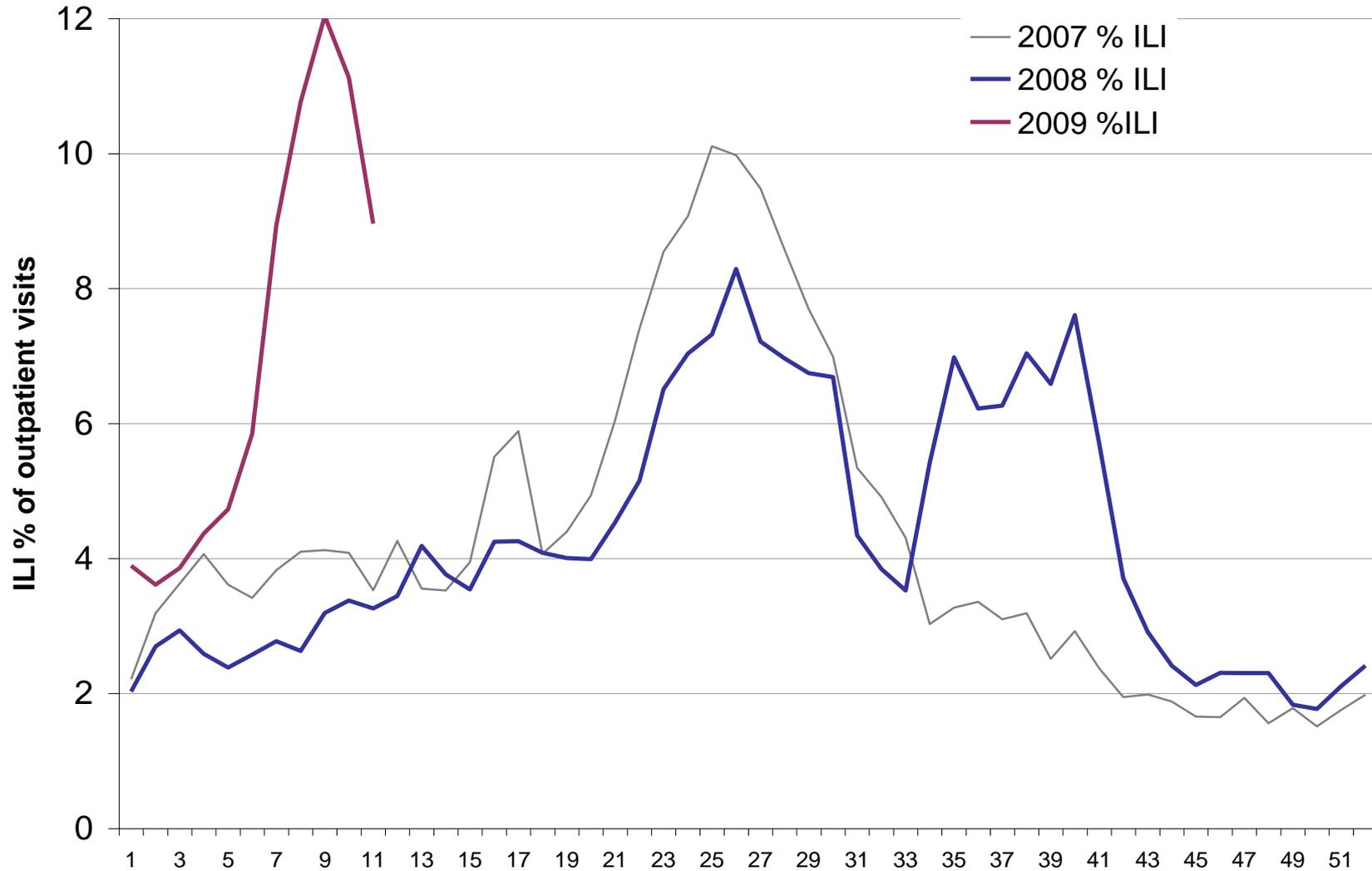
# From a Weekly Automated Email

Week	Week of	Count Encounters	Count ILI	% ILI
40	Oct 4, 2010	9420	190	2.0
41	Oct 11, 2010	9649	194	2.0
42	Oct 18, 2010	9373	251	2.7
43	Oct 25, 2010	9235	213	2.3
44	Nov 1, 2010	9520	238	2.5
45	Nov 8, 2010	9626	214	2.2
46	Nov 15, 2010	9894	261	2.6
47	Nov 22, 2010	7334	185	2.5
48	Nov 29, 2010	9780	259	2.6
49	Dec 6, 2010	9434	267	2.8
50	Dec 13, 2010	9654	335	3.5
51	Dec 20, 2010	7442	257	3.5
52	Dec 27, 2010	7695	304	<b>4.0</b>
1	Jan 3, 2011	10100	414	<b>4.1</b>
2	Jan 10, 2011	9979	432	<b>4.3</b>
3	Jan 17, 2011	10017	554	<b>5.5</b>
4	Jan 24, 2011	10260	676	<b>6.6</b>
5	Jan 31, 2011	7237	590	<b>8.2</b>
6	Feb 7, 2011	10135	575	<b>5.7</b>
7	Feb 14, 2011	10296	582	<b>5.7</b>
8	Feb 21, 2011	10421	574	<b>5.5</b>
9	Feb 28, 2011	10387	539	<b>5.2</b>
10	Mar 7, 2011	10807	564	<b>5.2</b>
11	Mar 14, 2011	10974	535	<b>4.9</b>
12	Mar 21, 2011	10680	481	<b>4.5</b>
13	Mar 28, 2011	9363	370	<b>4.0</b>
14	Apr 4, 2011	10305	323	3.1
15	Apr 11, 2011	10592	311	2.9
16	Apr 18, 2011	9887	272	2.8





## ILI percentage by week





# US Legislation for MRSA Testing

- Illinois (2007)
  - ICU and “high risk”
- New Jersey (2007)
  - ICU and other “high risk” units
- Pennsylvania (2007)
  - LTCF and “high risk” patients
- California (2008)
  - ICU, certain surgical patients, readmits, LTCF residents, dialysis patients
- Washington (2009)
  - ICU and “high risk” patients





## Background

- MRSA surveillance programs are inefficient, and false-positive tests are a concern
- Prediction rules have been proposed to allow targeted testing of high risk patient
  - Furuno et al: “admission in the past year” – test 65% of patients and identify 76% of MRSA colonized-patients
  - Harbarth et al: Hx of hospitalization, Abx, age – test ~60% of patients and detect 79% of all MRSA carriers
- Small added efficiency, must be done “manually”

Furuno JP, et al. Arch Intern Med 2006 March 13;166(5):580-5.  
Harbarth S, et al. J Am Coll Surg 2008 November;207(5):683-9.





# Methods

- Population
  - 3 community-academic hospitals in Chicago suburbs, *universal surveillance* for MRSA using nasal swab
  - Derivation cohort: all patients admitted and tested for MRSA colonization at Hospital 1 from April 19, 2007 through December 31, 2008 *who were not known to be MRSA colonized previously*
  - Validation cohort: all patients admitted and MRSA-tested at Hospitals 2 and 3 during same period
- Microbiologic methods
  - qPCR with culture confirmation and *lukF* qPCR to detect PVL
  - Validation against PFGE for USA300: PPV 94.9%, NPV 100%
- Data collection
  - Electronic health record → clinical data warehouse
  - Limited to variables available within first day of admission





# Methods

- Variables (40)
  - **Demographics:** age, gender, race, LTCF residence
  - **Admission details:** admission service, ICU on the first day of admission, inpatient within the past year, ICU > 2 days within the past year, surgery in the last 90 days
  - **Physiological and laboratory characteristics on admission:** weight, central line in place on admission, diarrhea on admission, feeding tube on admission, pressure ulcer on admission, supplemental oxygen on admission, microbiology test done on admission or in prior week, skin or bone infection on admission
  - **Laboratory results within a day of admission:** albumin, glucose, hemoglobin, sodium
  - **Medications taken within a month prior to admission:** aspirin, corticosteroids, antimicrobials
  - **Past Medical History:** cancer (past year), *Clostridium difficile* infection, culture of VRE or ESBL in the past, Cystic Fibrosis, Diabetes Mellitus, heart disease (CHF or acute coronary syndrome), renal dialysis in the prior year, Hepatitis B or C, HIV, inflammatory bowel disease, lung disease (COPD or bronchiectasis), psoriasis, psychiatric disease (depression, mania or psychosis), rheumatological disease (RA, SLE, dermatomyositis, vasculitis), stroke or TIA, venous thromboembolism





## Results

- Derivation cohort
  - 23,314 (89.9% of patients) were tested on admission
    - 520 (2.2%) were MRSA colonized
    - 107 (20.6%) were PVL-positive
- Validation cohort
  - 26,650 (94.9% of patients) were tested on admission
    - 1065 (4.0%) were MRSA colonized
    - 112 (10.5%) were PVL-positive



Risk Factor	MRSA negative n = 22794	MRSA positive n = 520	Univariate analysis			Parsimonious Multivariable Model		
			Odds Ratio	95% Wald Confidence Limits	P value	Odds Ratio	95% Wald Confidence Limits	P value
<b>Demographics</b>								
Age: mean (standard deviation), [OR per decade] • ■ * †	55.5 (21.4)	66.2 (21.8)	1.3	1.2, 1.3	<0.001	1.1	1.0, 1.2	0.005
Male (data missing on 3 patients) • ■ * †	7381 (32.4)	236 (45.4)	1.7	1.5, 2.1	<0.001	1.3	1.1, 1.6	0.004
Race (data missing on 3 patients) • ■ * †					<0.001			<0.001
Black	2898 (12.7)	118 (22.7)	1.8	1.5, 2.3		1.9	1.5, 2.4	
White (reference group)	14806 (65.0)	328 (63.1)	1.0	NA		1.0	NA	
Other non-white race	5087 (22.3)	74 (14.2)	0.7	0.5, 0.8		1.0	0.8, 1.3	
Nursing Home residence • ■ † ‡	573 (2.5)	72 (13.8)	6.2	4.8, 8.1	<0.001	2.8	2.1, 3.7	<0.001
<b>Admission details (current and recent)</b>								
Admission Service • ■ †					<0.001			<0.001
Internal Medicine	10175 (44.6)	382 (73.5)	5.6	4.0, 7.8		2.2	1.4, 3.3	
Obstetrics (reference group)	5658 (24.8)	38 (7.3)	1.0	NA		1.0	NA	
Psychiatry	885 (3.9)	18 (3.5)	3.0	1.7, 5.3		2.4	1.3, 4.3	
Surgery	6076 (26.7)	82 (15.8)	2.0	1.4, 3.0		1.2	0.8, 1.9	
ICU on the first day of admission *	2067 (9.1)	56 (10.8)	1.2	0.9, 1.6	0.183			
Inpatient within the past year • * †	7442 (32.6)	250 (48.1)	1.9	1.6, 2.3	<0.001			
ICU > 2 days within the past year • *	570 (2.5)	30 (5.8)	2.4	1.6, 3.5	<0.001			
Surgery in the last 90 days † ‡	2087 (9.2)	40 (7.7)	0.8	0.6, 1.1	0.253			
<b>Physiological and laboratory characteristics on admission</b>								
Weight < 50 kg	1167 (5.1)	35 (6.7)	1.3	0.9, 1.9	0.101			
Central line in place on admission †	244 (1.1)	10 (1.9)	1.8	1.0, 3.4	0.068			
Diarrhea on admission •	426 (1.9)	18 (3.5)	1.9	1.2, 3.0	0.010			
Feeding tube on admission • ■ †	275 (1.2)	26 (5.0)	4.3	2.9, 6.5	<0.001	2.4	1.5, 3.7	<0.001
Pressure ulcer on admission • ■ †	788 (3.5)	80 (15.4)	5.1	4.0, 6.5	<0.001	2.0	1.5, 2.7	<0.001
Supplemental oxygen on admission	14564 (63.9)	311 (59.8)	0.8	0.7, 1.0	0.056			
Microbiology test done on admission or in prior week • ■	8069 (35.4)	301 (57.9)	2.5	2.1, 3.0	<0.001	1.3	1.1, 1.6	0.008
Skin or bone infection on admission • ■ †	685 (3.0)	42 (8.1)	2.8	2.1, 3.9	<0.001	1.7	1.2, 2.3	0.004

Risk Factor	MRSA	MRSA	Univariate analysis			Parsimonious Multivariable Model		
	negative n = 22794	positive n = 520	Odds Ratio	95% Wald Confidence Limits	P value	Odds Ratio	95% Wald Confidence Limits	P value
Laboratory results within a day of admission								
Albumin < 3 • *	2696 (11.8)	133 (25.6)	2.6	2.1, 3.1	<0.001			
Glucose >= 23 • *	2170 (9.5)	93 (17.9)	2.1	1.6, 2.6	<0.001			
Hemoglobin < 8.6 • ■ *	1367 (6.0)	59 (11.3)	2.0	1.5, 2.6	<0.001	1.5	1.1, 2	0.006
Sodium < 131 or > 143 • *	985 (4.3)	47 (9.0)	2.2	1.6, 3.0	<0.001			
Medications taken within a month prior to admission								
Aspirin	3837 (16.8)	97 (18.7)	1.1	0.9, 1.4	0.273			
Corticosteroids (systemic)	2878 (12.6)	79 (15.2)	1.2	1.0, 1.6	0.082			
Antimicrobials								
Cephalosporins • ■	2119 (9.3)	23 (4.4)	0.5	0.3, 0.7	<0.001	0.3	0.2, 0.4	<0.001
Fluoroquinolones •	2234 (9.8)	71 (13.7)	1.5	1.1, 1.9	0.004			
MRSA-active antimicrobials	1922 (8.4)	48 (9.2)	1.1	0.8, 1.5	0.517			
Other antimicrobials • ■	4856 (21.3)	157 (30.2)	1.6	1.3, 1.9	<0.001	1.4	1.1, 1.7	0.003
Past Medical History								
Cancer (visit to an affiliated oncology center in the past year)	1924 (8.4)	40 (7.7)	0.9	0.7, 1.3	0.544			
Clostridium difficile infection	66 (0.3)	4 (0.8)	2.7	1.0, 7.4	0.058			
Culture of VRE or ESBL in the past •	196 (0.9)	13 (2.5)	3.0	1.7, 5.2	<0.001			
Cystic Fibrosis • ■ †	20 (0.1)	4 (0.8)	8.8	3.0, 25.9	<0.001	8.8	2.8, 27.7	<0.001
Diabetes Mellitus •	2912 (12.8)	108 (20.8)	1.8	1.4, 2.2	<0.001			
Heart disease (CHF or acute coronary syndrome) • ■ †	1705 (7.5)	91 (17.5)	2.6	2.1, 3.3	<0.001	1.4	1.1, 1.8	0.006
Renal dialysis in the prior year • ‡	735 (3.2)	31 (6.0)	1.9	1.3, 2.8	<0.001			
Hepatitis B or C	162 (0.7)	4 (0.8)	1.1	0.4, 2.9	0.875			
HIV infection	59 (0.3)	4 (0.8)	3.0	1.1, 8.3	0.035			
Inflammatory bowel disease	343 (1.5)	7 (1.3)	0.9	0.4, 1.9	0.769			
Lung disease (COPD or bronchiectasis) • ■ †	587 (2.6)	35 (6.7)	2.7	1.9, 3.9	<0.001	1.6	1.1, 2.4	0.010
Psoriasis	173 (0.8)	5 (1.0)	1.3	0.5, 3.1	0.600			
Psychiatric disease (depression, mania or psychosis)	574 (2.5)	13 (2.5)	1.0	0.6, 1.7	0.979			
Rheum. disease (RA, SLE, Dermato/polymyositis, vasculitis)	462 (2.0)	19 (3.7)	1.8	1.1, 2.9	0.011			
Stroke or Transient Ischemic Attack •	865 (3.8)	34 (6.5)	1.8	1.2, 2.5	0.002			
Venous thromboemolism •	844 (3.7)	37 (7.1)	2.0	1.4, 2.8	<0.001			



Predicted probability of MRSA =  $e^{LO} / (1 + e^{LO})$

where LO = - 4.655

- + 0.083 x (*Age/10*)
- + 0.135(*if Male*)
- + 0.421(*if Black or African-American<sup>†</sup>*)
- 0.229(*if other, non-White race<sup>†</sup>*)
- + 1.010(*if Nursing Home Resident*)
- + 0.267(*if Admission Service<sup>‡</sup> = Internal Medicine*)
- + 0.421(*if Admission Service<sup>‡</sup> = Psychiatry*)
- 0.249(*if Admission Service<sup>‡</sup> = Surgery*)
- + 0.006(*if Inpatient within last year*)
- + 0.339(*if ICU > 2 days within last year*)
- + 0.153(*if Diarrhea on admission*)
- + 0.780(*if Feeding Tube on admission*)
- + 0.663(*if Pressure Ulcer on admission*)
- + 0.234(*if Microbiology test done on admission or in prior week*)
- + 0.480(*if Skin or Bone Infection on admission*)
- + 0.231(*if Albumin < 3*)
- + 0.245(*if Glucose ≥ 23*)
- + 0.355(*if Hemoglobin < 8.6*)
- + 0.133(*if Sodium < 131 or > 143*)
- 1.409(*if Cephalosporins in past month*)
- 0.212(*if Fluoroquinolones in past month*)
- + 0.316(*if Other Antimicrobials in past month*)
- + 0.322(*if Past VRE or ESBL*)
- + 2.146(*if Cystic Fibrosis*)
- + 0.019(*if Diabetes Mellitus*)
- + 0.324(*if Heart Disease*)
- 0.187(*if Dialysis past year*)
- + 0.479(*if Lung Disease*)
- 0.135(*if Stroke or TIA*)
- + 0.175(*if Venous Thromboemolism*)





# 2012 HAI Data Summit

Hyperspace - Production - ID EVSS - ARI A ROBCSEK

Epic Home Patient Station Schedule In Basket Encounter Tel Enc. Patient Lists Send Letter Epic Help ? Secure Remind Me Print Log Out

Patient Lists Actions

Create Properties Remove Add Patient Copy Paste Open Chart Sign Out Rpt Patient Report

Attendings F-G  
Attendings H-K  
Attendings L-M  
Attendings N-R  
Attendings S  
Attendings T-Z  
BPA Alert Last 48 hrs  
Cryoprecipitate Test  
Discharges- Inpatient  
DRG  
ED Module Admin.  
EV Dieticians  
EV Pharmacy  
EV Tray List  
Evanston Units  
Foley LDA Patients  
GB Dieticians  
GB Pharmacy  
GB Tray List  
Glenbrook Units  
Highland Park Units  
Hospital Census  
HP Dieticians  
HP Pharmacy  
HP Tray List  
Hyperglycemia  
Infection Control  
Initial Assessment  
Insulin Pump

**MRSA Screening - HP Hospital (132 Patients)** as of 1149

Unit	Patient Name/Age/Sex	Actual Length of Stay (Days)	Isolation	ZZMRSA Screen Score	ZZMRSA Swab Needed	MRSA Infection Dx
HP 4 NORTH		1	N/A	1.1626	●	No
AMBULATORY SURGERY HP		0	N/A	1.1709	●	No
HP ICU		1	N/A	-0.5659	●	No
HP ICU		4	N/A	0.5063	●	No
HP ICU		2	DROPLET	0.1744	●	No
HP ICU		9	CONTACT	0.8518	●	Yes
HP ICU		20	N/A	3.5397	●	No
HP ICU		2	N/A	0.055	●	No
HP ICU		0	N/A	0.5115	●	No
HP ICU		1	N/A	1.0016	●	No
HP ICU		5	N/A	0.4233	●	No
HP ICU		4	N/A	0.2957	●	No
HP ICU		9	CONTACT	2.2475	●	Yes
HP 4 NORTH		6	N/A	1.0796	●	No
HP 4 NORTH		4	N/A	1.0922	●	No
HP 4 NORTH		7	N/A	1.5199	●	No
HP 4 NORTH		8	N/A	1.1076	●	No
HP 4 NORTH		8	N/A	1.422	●	No
HP 4 NORTH		0		1.0661	●	No
HP 3 NORTH		4	N/A	1.1709	●	No
HP 3 NORTH		6	CONTACT	1.913	●	Yes
HP 2 SOUTHEAST		6	N/A	1.1962	●	No
HP 2 SOUTHEAST		0	N/A	1.0329	●	No
HP 2 SOUTHEAST		1	CONTACT	1.4777	●	No



Patient Lists ? Actions

Create Properties Remove Add Patient Copy Paste Open Chart Sign Out Rpt Patient Report

- Attendings F-G
- Attendings H-K
- Attendings L-M
- Attendings N-R
- Attendings S
- Attendings T-Z
- BPA Alert Last 48 hrs
- Cryoprecipitate Test
- Discharges- Inpatient
- DRG
- ED Module Admin.
- EV Dieticians
- EV Pharmacy
- EV Tray List
- Evanston Units
- Foley LDA Patients
- GB Dieticians
- GB Pharmacy
- GB Tray List
- Glenbrook Units
- Highland Park Units
- Hospital Census
- HP Dieticians
- HP Pharmacy
- HP Tray List
- Hyperglycemia
- Infection Control
- Initial Assessment
- Insulin Pump
- Midwest Palliative Care
- MRSA Screening
  - EV Hospital
  - GB Hospital
  - HP Hospital
  - SK Hospital
- No Active Problem Admt > 24 hr
- OB LD/FBC
- Observation Patients
- Pastoral Care
- Pathways
- Pathways by Prb
- Pharmacy PI
- Pharmacy PI Lovenox
- Procedure Billing Treatment

**MRSA Screening - HP Hospital (132 Patients)** as of 1156

Unit	Patient Name/Age/Sex	Actual Length of Stay (Days)	Isolation	ZZMRSA Screen Score	ZZMRSA Swab Needed	MRSA Infection Dx
AMBULATORY SURGERY HP		0	N/A	1.1709	●	No
HP 4 NORTH		1	N/A	1.1626	●	No
HP ICU		9	CONTACT	2.2475	●	Yes
HP ICU		4	N/A	0.2957	●	No
HP 2 SOUTHEAST		5	CONTACT	2.5174	●	No
HP ICU		5	N/A	0.4233	●	No
HP ICU		1	N/A	1.0016	●	No
HP 2 NORTH		21	N/A	1.1279	●	No
HP ICU		0	N/A	0.5115	●	No
HP 3 NORTH		6	CONTACT	1.913	●	Yes
HP 4 NORTH		0	N/A	1.0661	●	No
HP 2 NORTH		12	N/A	1.0827	●	No
HP 2 NORTH		1	DROPLET	1.0495	●	No
HP 3 NORTH		4	N/A	1.1709	●	No
HP 2 SOUTHEAST		5	CONTACT	1.941	●	Yes

← ECR IP MRSA SCREENING Admission ENH NURSING KARDEX ENH MD RESULTS MD Report: ECR IP MRSA SCREENING

**Attending Provider: Goel, Smiti, MD**  
 Allergies: **No Known Allergies**    Isolation: CONTACT    HT: 5' 5" (1.651 m)    Anticipated Dx: pneumonia, pneumonitis    BMI: 28.76 kg/m<sup>2</sup>  
 Code Status: Not on File    WT: 172 lb 13.5 oz (78.4 kg)    BSA: 1.90 m<sup>2</sup>

**Patient is Colonized or Infected with a Drug Resistant Organism**

**ZZMRSA SCREENING PATIENT SCORING : 2.2475** [\[Add/Edit comment\]](#)

MRSA Age: 0.5395 points (Up 0.5395 points since last review) - [Last updated: 06/07/11 1156] [\[Add/Edit comment\]](#)  
 .083 x (age/10)

Nursing Home Resident: 1.016 points (Up 1.016 points since last review) - [Last updated: 06/07/11 1130] [\[Add/Edit comment\]](#)  
 Based upon FLO ID LIVING ARRANGEMENTS-R [109101] = NURSING HOME or INTERMEDIATE CARE FACILITY[

CHF or Acute Coronary Syndrome Diagnosis: 0.344 points (Up 0.344 points since last review) - [Last updated: 06/07/11 1156] [\[Add/Edit comment\]](#)

Tube Feeding Order or Documentation: 1.73 points (Up 1.73 points since last review) - [Last updated: 06/07/11 1156] [\[Add/Edit comment\]](#)  
 Tube Feeding Order or Documentation

Cephalosporin in last 30 days: -1.382 points (Down 1.382 points since last review) - [Last updated: 06/07/11 1156] [\[Add/Edit comment\]](#)  
 Based upon ERX Pharm Class Cephalosporin ERX 110

**All Microbiology Results**

Collected: 6/5/11 1350    **C. DIFFICILE DETECTION PCR**    Order ID: 165652324  
 Order#: D8051450  
 Source: STOOL    Collected: 06/05/11 13:50



## Logic

- Alert will “fire” if:
  - Score is high enough (“**magic number**”) OR
  - MRSA on problem list OR
  - **ICU admission** (**LAW**) OR
  - Last digit in Encounter Number is ‘0’ (random sample for ongoing model validation in the event of epidemiologic change)





# 2012 HAI Data Summit

Zzbpa, Test

6 y.o. M (12/3/2004) Allergies PCP  
E3N-3305-01 205057995 Not on File None

## Doc Flowsheets

File | Add Row | Add Group | Add LDA | Cascade | Add Col | Insert Col | Device | Last Filed | Graph | Details | Go to Date | More

Flowsheet: Gen RN [Search] [Magnify] [Gen RN] [Assessment] [Peds Discharge Planning] [School Age Development Screen]

Gen RN [Check] [Up Arrow]

Covering BestPractice Advisory - Zzbpa,Test

Initial A:

Advanc

Patient/

Patient/

Nursing

Infectio

Ht/Wt \*

Vital Sig

Pain: In

Respira

Oxygen

Cardiovascular: WNL=Apical or Rad... [Check]

**⚠ Patient meets criteria for MRSA testing. Please click accept to order the swab.**

Open order: ADMISSION MRSA SCREEN  
(Last done by Patrick McNulty at 3:22 PM on 2/24/2011)

Accept

Cancel



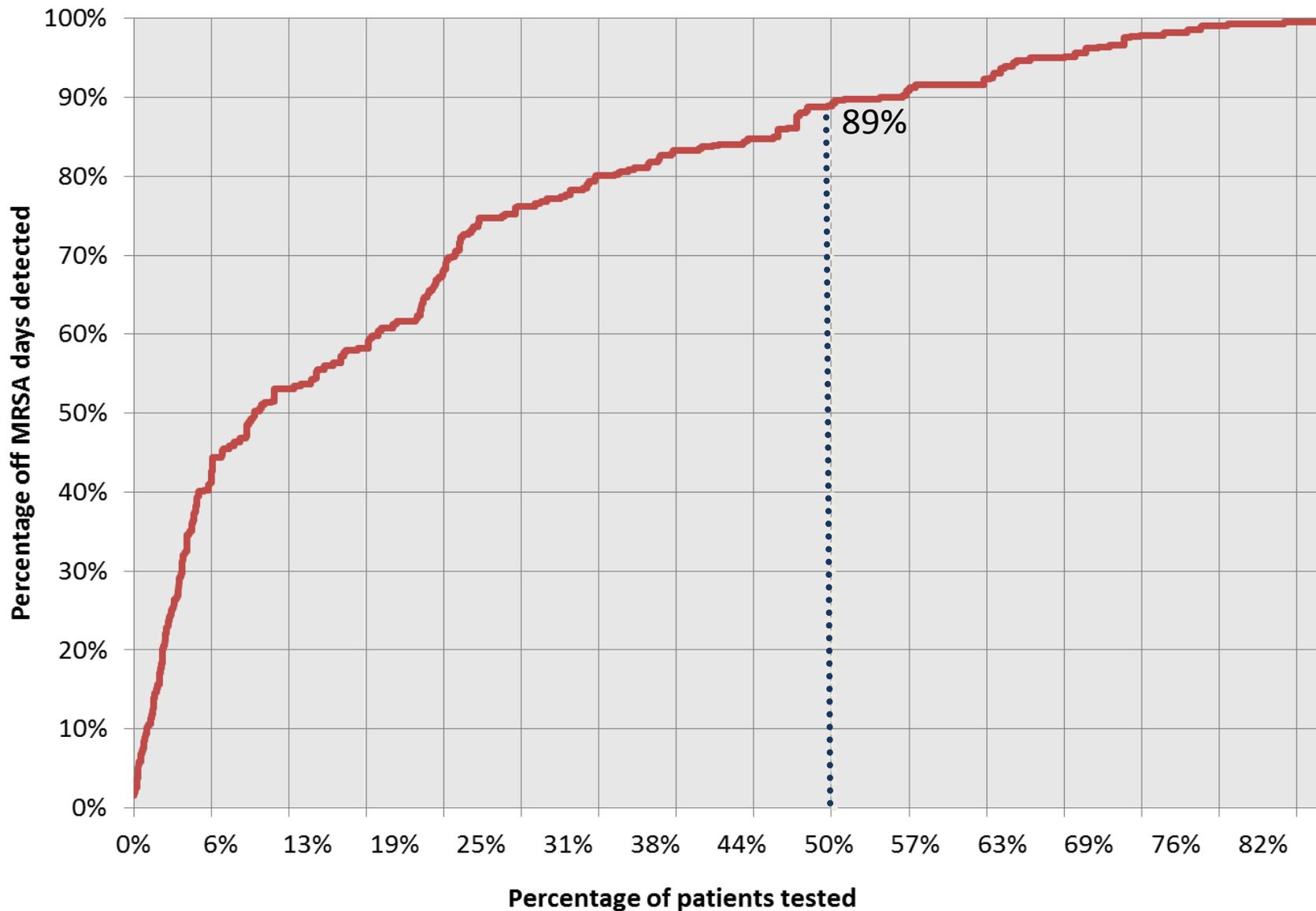


## Real-life prospective validation

- All patients admitted and MRSA tested in Sept-Nov 2011 (~8899 patients)
- Ranked patients by scoring and determined MRSA 'capture' at a spectrum of threshold
- Layered additional criteria into analysis

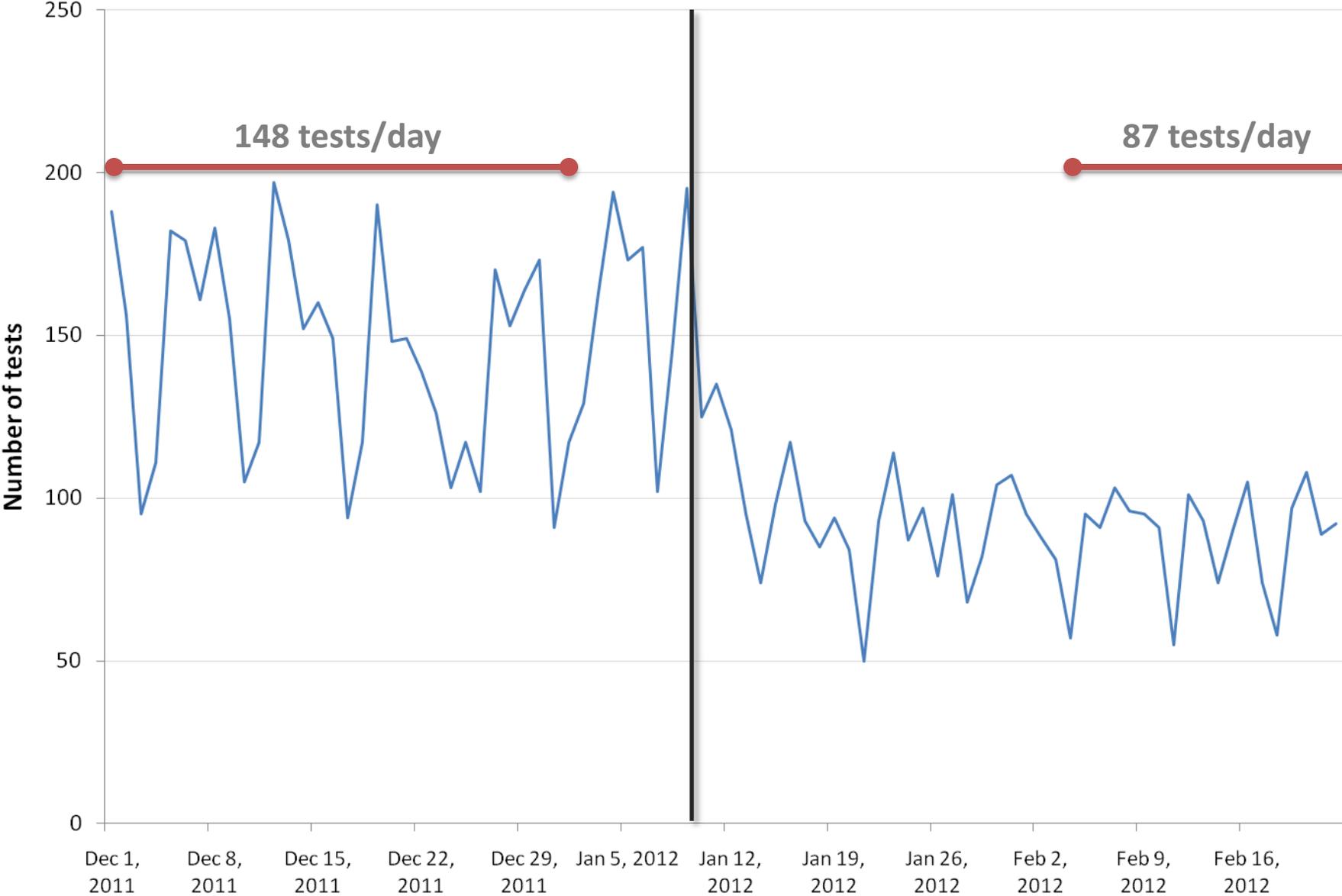


# Day 1: no recent Staph PCR, MRSA past yr, ICU, random, score



Prospective validation, Sept-Nov 2011

# MRSA test volume





## MRSA CDSS Summary

- Leveraging EDW data from a universal surveillance program able to build a mathematical model that predicts 'high risk'
- Built model into EHR for CDSS; tested in the background, captures ~90% of MRSA days while testing ~50% of patients
- Built ongoing random sampling to continually evaluate/update model as needed





## Surveillance Assisted, Automated and Otherwise

- Infection preventionists spend the majority of their working hours on HAI surveillance
- Manual review subjective, prone to error and influence
- Automation has the potential to reduce error and time, freeing the IP to prevent



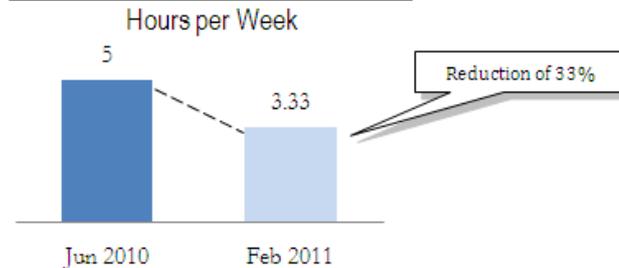


## Shifting From Infection Control to Prevention

Electronic Surveillance has allowed for a coordinated approach towards surveillance resulting in a shift from surveillance activities to proactive interventions.

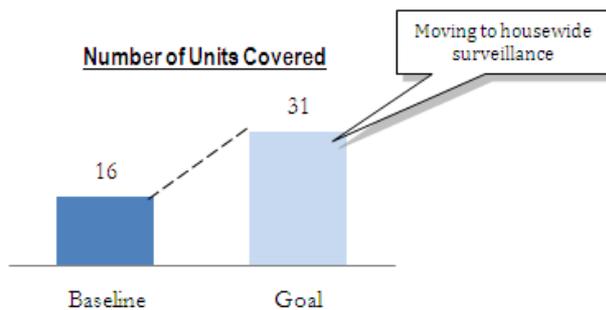
Decreasing the Burden...

### Time Spent to Identify MDROs

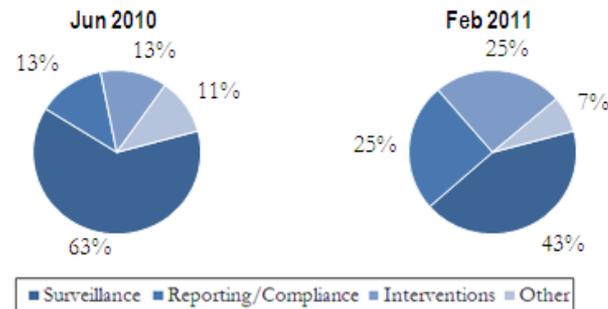


...While Expanding Surveillance and Interventions

### Shift from Targeted to Housewide Surveillance



### ICP FTE Time Audit





# Electronically Assisted Surveillance

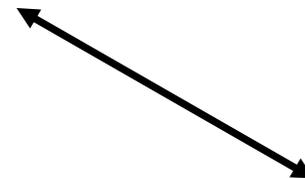
- 2001 Friedman and colleagues show that just having an EMR caused their infection rate (via enhanced case finding) to triple for TKA.

– 1.3 to 4.5 per 100 procedures ( $p < 0.01$ )

– Facilitated post-discharge surveillance (outpatient visits)

**Acute  
Care  
Facility**

**Outpatient/  
Ambulatory  
Facility**





## Assisted Surveillance via the EMR

- With some EMRs, the same “tricks” you might use in common computer programs work. Examples in Epic include
  - After loading all notes of an admission, select the first record, hold the “Shift” key and select the last record (all notes are now selected)
  - Click “Search” (magnifying lens)
  - Enter key terms or phrases





# 2012 HAI Data Summit

## Joyce, Validate

Age: 72YO Enc#: 34987828 Allergies Code Status: (None) LOS/GMLOS 284d/(None)\* Attending: Lerner, David \*  
 DOB: 8/13/1938 Sex: F Penicillamine, P\* Isolation: CONTACT\* Room/Bed GB-4012/01 \* PCP: ALI, AMAN

### Notes - Viewing all notes

New Note Edit Note Copy Delete Note Legend Filter My Last Note Search Time Mark Refresh

All Notes Prog Notes Consults Procedures H&P Physician DC ED Notes Init. Assessment Specialty Events Transcription Pended

Time Mark the patient to be notified of new updates. [Timemark](#)

	Author	Service	Author Type	New	Cosign	Status	Filed Time	Note Time	Category
⌘	Diprima, Carol		Physical Therapis	↓			01/27/2011 1530	01/27/2011 1530	Progress Notes
⌘	Abraham, Akshay, I		Registered Nurse	↓			01/19/2011 1110	01/19/2011 1109	Events
■	Joyce, Benjamin		Other	↓	⚠		01/19/2011 1005	01/19/2011 1005	H&P
■	Joyce, Benjamin		Other	↓			01/18/2011 1337	01/18/2011 1336	Progress Notes
■	Joyce, Benjamin		Other	↓			01/17/2011 1626	01/17/2011 1626	Progress Notes
⌘	Fromm, Cynthia M, I		Registered Nurse	↓			01/13/2011 1515	01/13/2011 1515	Events
⌘	Fromm, Cynthia M		Registered Nurse	↓			09/28/2010 1632	09/28/2010 1632	Events
■	Wright, Marc Oliver	Infectious Dise	Other	↓			05/24/2011 1249	09/28/2010 0000	Consults
⚡	Ali, Aman	Hospitalist	Physician	↓			08/13/2010 1340	08/13/2010 1335	H&P

- Rash, Skin [782.1AC] 08/13/2010  
 Class: Minor  
 Rash on left leg.

**Find** ✕

Find:

Match whole word only
  Match case

**Wright, Marc Oliver** Other **Service: Infectious Disease**  
 Ground glass opacification in left lung. Atelectasis, pleural effusion, pneumonia or MTB cannot be ruled out.

**Joyce, Benjamin, RN** Registered Nurse  
 Pat update note test.

**Joyce, Benjamin, RN** Registered Nurse  
 Testing new note type.

**Joyce, Benjamin, RN** Registered Nurse

**Problem: NEONATAL / PEDIATRIC PAIN**  
**Goal: MAINTAIN AND PROMOTE OPTIMAL LEVELS OF COMFORT AND MAXIMUM PAIN RELIEF**  
 This is a test andffjkahfja ajfs ajsfas asdf asdjf asdfj asdkjfasd

- Patient Summary
- Chart Review
- Results Review
- Problem List
- RN Initial Assessm...
- History
- Synopsis
- Notes**
- Demographics
- Medications
- Allergies
- Order Entry
- Order Review
- Order Release
- Order Set
- Immunizations
- MAR
- Intake/Output
- Doc Flowsheets
- Care Plan
- Patient Education
- D/C Instructions
- View Scans
- Standing Orders



# Electronically Assisted Surveillance

- Survey of 207 hospitals in CA
- 23% (N=44) use EAS
  - 13% data mining
- Predictors: org. support and larger facility
- EAS did not decrease time IPs spent on HAI identification

**Table 1.** Reported proportions of time spent on infection prevention activities and locations from hospitals with and without an ESS

	Proportion of time ( $\pm$ SD)		
	ESS (n = 40)*	No ESS (n = 147)*	P value
Type of activity			
Surveillance: collecting, analyzing, and interpreting data	40.6 (16.6)	35.9 (15.9)	.13
Policy development and meetings	13.1 (11.6)	13.9 (9.7)	.43
Consultation and unit rounds	12.2 (7.4)	12.2 (8.1)	.8
Teaching: infection control policies and procedures	9.9 (6.6)	10.9 (6.4)	.66
Product evaluation, workman's compensation, research	7.9 (6.7)	8.7 (13)	.94
Daily isolation issues	5.7 (9.6)	7.6 (6.7)	.68
Activities related to outbreaks	4.3 (5.0)	4.3 (3.3)	.12
Employee/occupational health	3.7 (3.8)	7.1 (8.3)	.03 <sup>†</sup>
Emergency preparedness	3.3 (2.5)	4.3 (3.3)	.11

Grota PG, et al. AJIC 2010

Courtesy of R. Olmsted





# Electronically Assisted Surveillance

- Survey of 241 hospitals in CA
- 32% use EAS
  - 30% custom pgm
  - 26% surv. Software
  - 24% data mining service
- Use of EAS did correlate with greater use of evidence-based practices to prevent HAIs, esp. CLABSI and VAP

**Table 1.** Reported proportions of time spent on infection prevention activities and locations from hospitals with and without an ESS

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Halpin H, et al. AJIC 2011

Courtesy of R. Olmsted





# Economics of infection control surveillance technology: Cost-effective or just cost?

Jon P. Furuno, PhD,<sup>a</sup> Marin L. Schweizer, BS,<sup>a</sup> Jessina C. McGregor, PhD,<sup>b</sup> and Eli N. Perencevich, MD, MS<sup>a,c</sup>  
Baltimore, Maryland, and Portland, Oregon

Systematic review of studies involving cost effectiveness of technology

## Findings:

- Only 2 studies assessed cost variables;
  - CAUTI surveillance and MRSA screening
- Does surveillance technology lead to improved patient safety?
- Difficult to make business case based on available evidence

Furuno J, et al. AJIC 2008;36:S12-7





## EAS Challenges

- Most vendor-based systems are costly and hard to continually cost-justify
- In-housed constructed EAS systems require infrastructure that comes with cost
- Neither removes the human element





## EAS vs. Automated Surveillance

- EAS does not necessarily perform the surveillance itself; it sifts the hospital data to construct 'useful' information
  - Identifies sentinel events (+BSI in patient with LOS >2)
    - More sophisticated models aimed at true HAI surveillance have had limited validation
  - May identify patterns / data mining (>2s.d. + urine cultures from ICU vs. baseline)





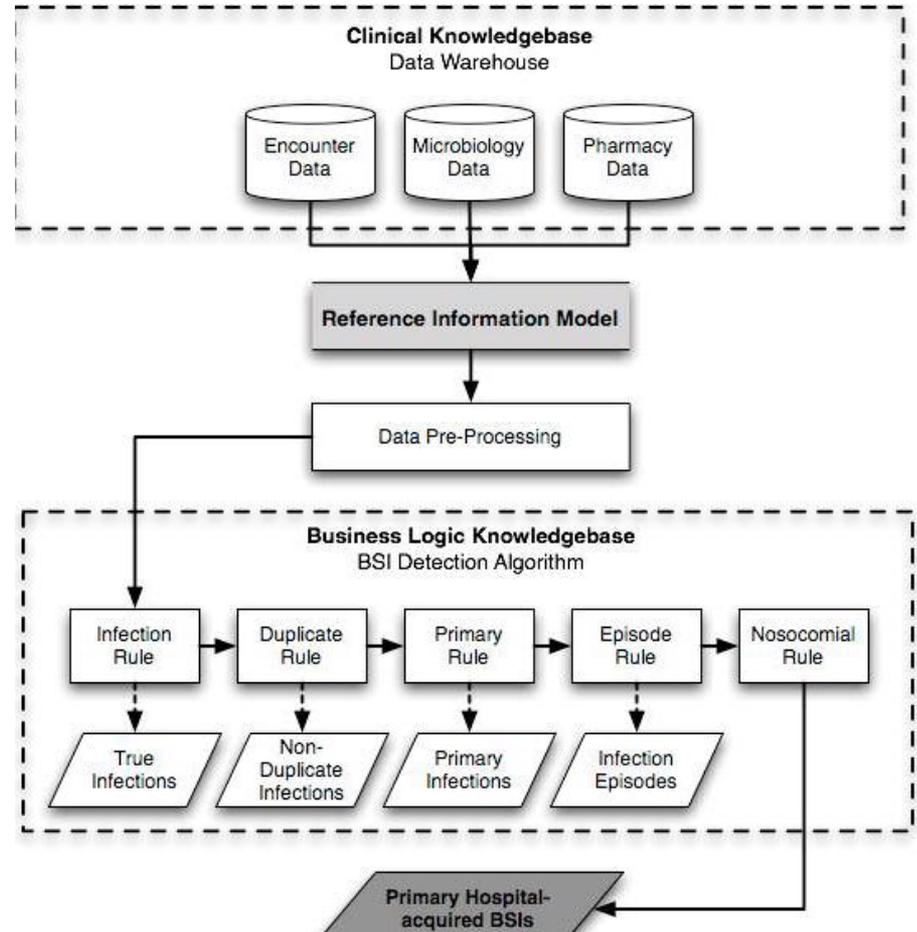
# Truly Automated Surveillance

- The most successful and validated example of automated surveillance is with CLABSIs from Stroger Hospital (fka Cook County) in Chicago, IL
- Algorithms, schema and final SQL code open access at <http://bsi.cchil.org/index.html>





- EDW-based algorithms performed well vs. expert review
- Similar model successfully expanded beyond initial facility





# The 'Final' CLABSI Model

Positive Blood Culture



Hospital Onset >2<sup>nd</sup> Hospital Day

↓ Yes

## Infection vs. Contamination\*

Rule A:	Rule B:	Rule C:	Rule D:	Rule E:
Infection: Non CSCs	Infection: 2 of ≥2 with same CSC	Infection: 2 of ≥2 with same CSC	Infection: 1 of ≥1 with CSC + Vanco on same day	Infection: 2 of ≥2 with same CSC
Contaminants: All CSCs	Contaminants: All non-CSCs	Contaminants: All non-CSCs	Contaminants: All non-CSCs	Contaminants: All non-CSCs
	Contaminants: All other combinations of CSCs	Infection Probability: 1 of 1 with CSC: 0.5 1 of 2 with CSC: 0.2	Contaminants: All other combinations of CSCs	Infection Probability: 1 of ≥1 cultures + Vanco on same day: 0.5
		Contaminants: All other combinations of CSCs		Contaminants: All other combinations of CSCs



## Deduplication

For rules A, B, & D, only the earliest isolate in a 30 day period is counted; others of the same species are ignored. For infection isolates in rules C & E with scores of 0.2 or 0.5, subsequent isolates of same species are counted until total score in 30 day period equals/exceeds 1; remaining are ignored.



## Episode Grouping

Group by 5 day intervals, with earliest isolate in a 5 day period to start episode. Label each episode with unique number.

Assign ward location based on first isolate in episode.



## Primary vs. Secondary

CSC's: Detection of identical species or genus from a wound culture during a specified interval (both -3 to +7 days of culture (sub rule S1), or entire admission (sub rule S2))

Non CSCs: Detection of identical species or genus from any non-blood culture during a specified interval (both -3 to +7 days of culture (sub rule S1), or entire admission (sub rule S2))





# Challenges and Solutions to Diffusion

**Table 1**

Hospitals, database systems and challenges encountered in automated bloodstream infection surveillance

Hospital	Database system	Challenges	Solutions
Hospital A	Microsoft SQL Server 2000	Leveraging knowledge dimensions	Consultation among knowledge experts
Hospital B	None—extract of data given to Hospital A	Free text, unstructured microbiology data	Use of templates to import data to flat files (Datawatch Monarch)
		Ad hoc requests needed for individual data extracts	Python script to standardize free text data Bed information obtained from billing data warehouse
Hospital C	SYBASE	Negative cultures not available	Could not run 1 of 5 rules (Rule C)
Hospital D (30)	Oracle	Free text, unstructured microbiology data	Natural language processing Review of business processes of microbiology reporting
		SQL language version incompatibility (ie, T-SQL vs PL/SQL)	Algorithm rewritten from conceptual flowchart





# Automated Surveillance Summary

- Attainable, scalable, and open access; at least for CLABSIs
- Next steps will require vital signs and more granular data elements from EMRs rather than LIS/ADT/Rx
- Balance between letting a hundred flowers bloom and the need for diffusion and standardization





# Thank you

Marc-Oliver Wright  
mwright@northshore.org



# Future of Reporting Quality Data and Using Data for Various Accountability Purposes



**James (Jim) Poyer, MS, MBA**

Director, Division of Quality Improvement Policy for  
Acute Care

Quality Improvement Group

Office of Clinical Standards and Quality

Centers for Medicare & Medicaid Services





# Agenda

- Summary of current CMS quality initiatives
- Electronic health records – Current programs reporting quality data
- Future intended direction – quality measures and domains





# CMS Quality Initiatives using HAI data

- -Value based Purchasing (VBP) – linking quality **performance** to paying providers for services to Beneficiaries
  - Hospital VBP
  - ESRD Quality Incentive Program
- Quality Reporting programs – linking quality **reporting** to paying for services to Beneficiaries
  - Hospital (inpatient, outpatient, long-term acute), inpatient rehabilitation facilities, ambulatory surgical centers
- Nonpayment for infections associated with hospital (Medicare) and health care acquired conditions (Medicaid)





# Electronic Health Records and Quality Measures – current CMS initiatives

- Physician Quality Reporting System (PQRS) – pay for reporting
- E-Prescribing initiative
- Medicare E H R Incentive program – meaningful use
  - 2013 Hospital Medicare – Stroke, VTE, Emergency Dept. Throughput
  - 2014 Hospital Medicare (proposed) – 2013 measures plus AMI, Heart Failure, Pneumonia, Asthma, SCIP, Pediatric ICU, perinatal care, immunization
- Medicaid E H R Incentive program – meaningful use





## Future Direction – CMS Medicare Payment and E H R Meaningful Use

- Starting with Fiscal Year 2015 payment, Medicare Inpatient PPS Hospital market basket update is linked to the following:
  - (3/4 of update) Meaningful user of E H R's
  - (1/4 of update) Reporting quality data to CMS
- The HHS Secretary shall provide preference to Hospital IQR measure for meaningful use reported measures
- Hospital VBP measure must be included in the Hospital IQR program





# Implications of Future Statutory Guidance

- E H R measures will likely be used for the following:
  - Determining meaningful use requirement
  - CMS hospital quality reporting initiatives
  - CMS Hospital VBP program
  - Most importantly.....improving quality of care to patients, better health for populations, and lowering cost!





## CMS 3-Part Aim

- **Better Care:** Improve the overall quality, by making health care more patient-centered, reliable, accessible, and safe.
- **Healthy People and Communities:** Improve the health of the U.S. population by supporting proven interventions to address behavioral, social, and environmental determinants of health in addition to delivering higher-quality care.
- **Affordable Care:** Reduce the cost of quality health care for individuals, families, employers, and government.





# HHS National Quality Strategy

## HHS National Quality Strategy – 6 Domains

- Making care safer by reducing harm caused in the delivery of care.
- Ensuring that each person and family are engaged as partners in their care.
- Promoting effective communication and coordination of care.
- Promoting the most effective prevention and treatment practices for the leading causes of mortality, starting with cardiovascular disease.
- Working with communities to promote wide use of best practices to enable healthy living.
- Making quality care more affordable for individuals, families, employers, and governments by developing and spreading new health care delivery models.





# CMS Future Direction of Quality Measures

- Alignment with the 6 National Quality Strategy domains
- CMS proposed using these domains starting with the FY 2016 Hospital VBP program (please submit comments)
- Adding settings of care consistent with the HAI action plan





# CMS Future Direction of Quality Measures and Reporting (continued)

- Collaborate with the Secretary's Measure Endorsement Entity to harmonize measures across settings
  - Reduces burden to providers/practitioners through simplified quality measures
  - Facilitates care coordination through more seamless quality information exchange
  - CMS and HHS Quality Reporting using standard E H R exchange, libraries, and format across settings should increase E H R usage and standardized data elements across settings





**Thanks!**



# Questions & Answers

