Journey to the Electronic Health Record: Enabling Seamless Care Delivery & Healthcare Transformation

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We will cover …

- A little bit about Aurora Health Care
- Aurora Health Care: An Electronic Health Record (EHR) Case Study
  - Use our experiences to exemplify key points about the EHR implementation process
  - Describe the benefits and challenges we've seen
  - Discuss where we've been; what we've learned
  - Elaborate on where we're going next and why
- Wrap-up
- Questions

Aurora Health Care At a Glance
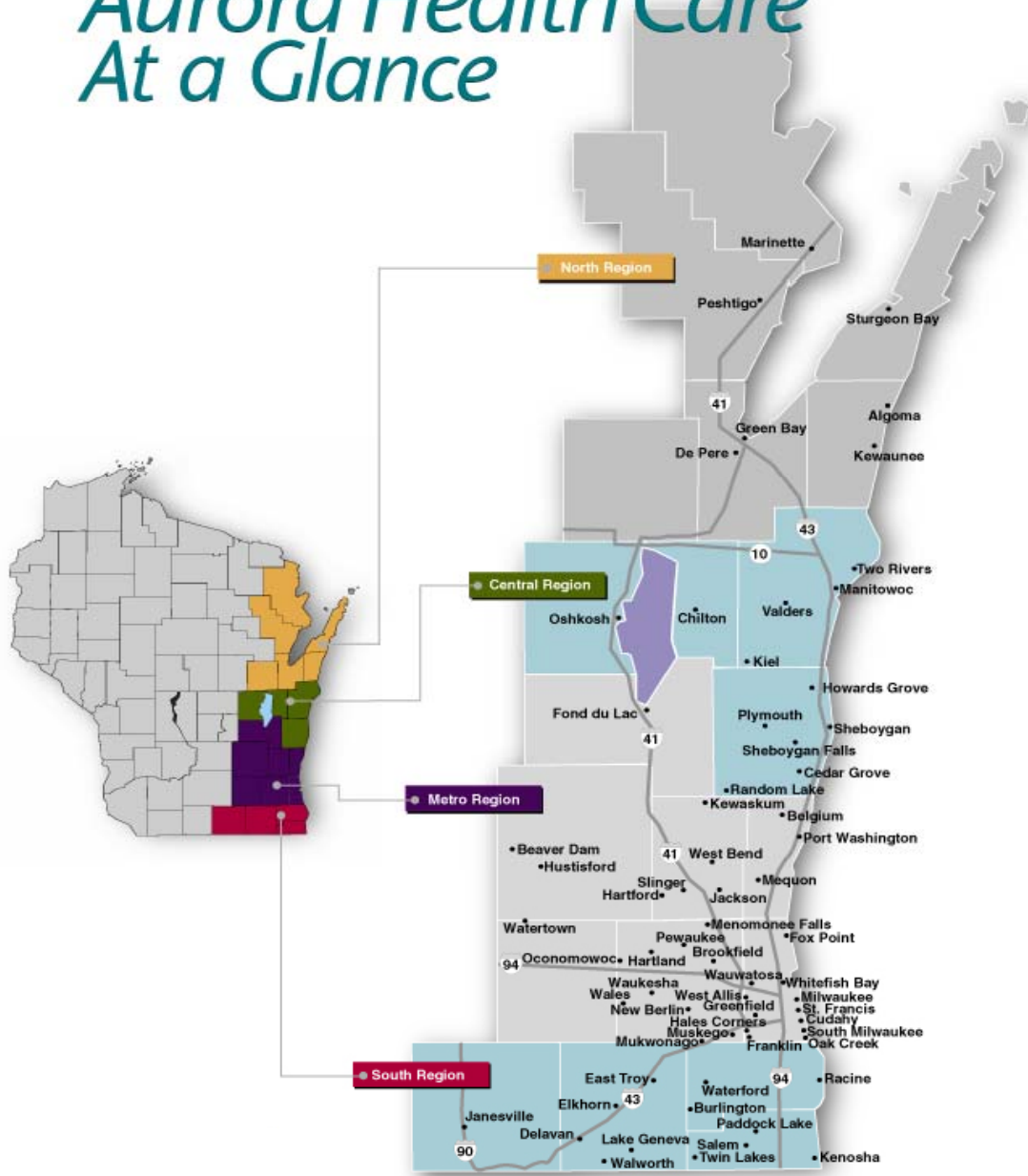
- Integrated Delivery Network
- Private, non-profit, teaching
- 14 Hospitals (60-900 beds)
- 120 Clinics
- 130 Retail Pharmacies
- 18 QuickCare Clinics
- Home Health Services
- Hospice Services
- Laboratory Services

- 26,000 employees
- 3,700 physicians on staff
- 950 employed physicians

- $3.2 billion annual revenue
- 0.5 million IP days/year
- 1.1 million OP visits/year
- 250,000 ED visits/year
- 2.5 million clinic visits/year
- 284,000 Home visits/year
- 5.4 million prescriptions/year

Aurora Information Technology

- Average annual Capital budget – $32m USD
- Average annual Operating budget – $56m USD (about 3% of total)
  - 550 employees
  - 6 departments
- Electronic Health Record
  - $200m+ USD investment over 10 years (hardware, software, labor)
  - 17,000 user logins with 6,500 concurrent users during prime shifts
  - 19,000 connected devices, including 5,000 mobile devices
- One of the nation's "Most Wired" hospitals – 2004, 2005, 2006, 2007 and 2008

The EHR is a
Journey ...

Not a
Destination

*The EHR is a
Means to an
End ...*

*Not an End
Unto Itself*

UNDER
CONSTRUCTION

# *Aurora Health Care*

Finding Better Ways

Aurora's Vision

Aurora Health Care was created around a single idea:
There is a better way to provide health care.

We will be satisfied only when Aurora gives people
better access, better service, and better results
than they can get anywhere else.

Working together, the people of Aurora
will find a better way.

OLD WAY:
Hospital as Center of the Universe

Patient
eHealth
Home Care
Primary Care
Specialists
Hospitals
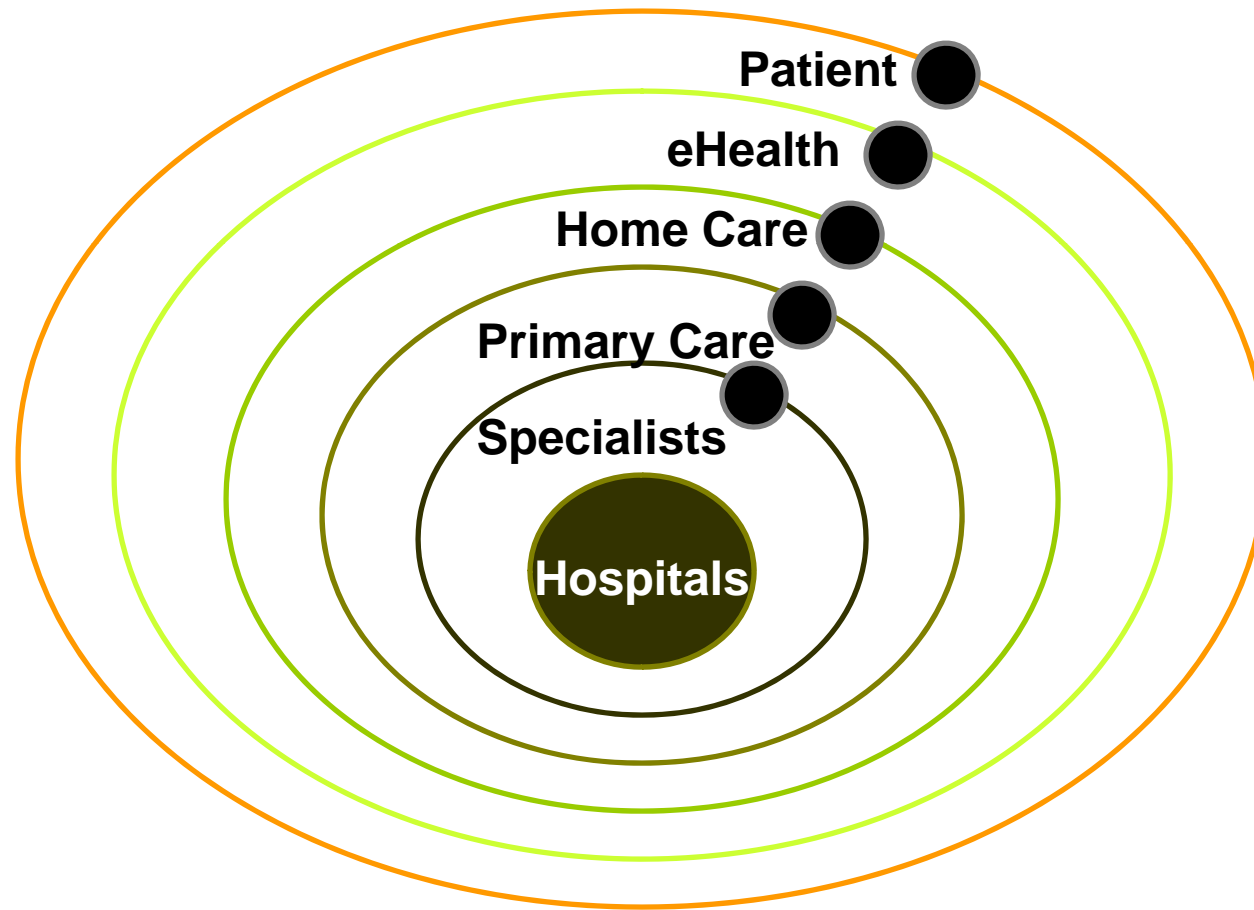
NEW WAY:
Patient as Center of the Universe

Hospitals

Specialists

Primary Care

Home Care
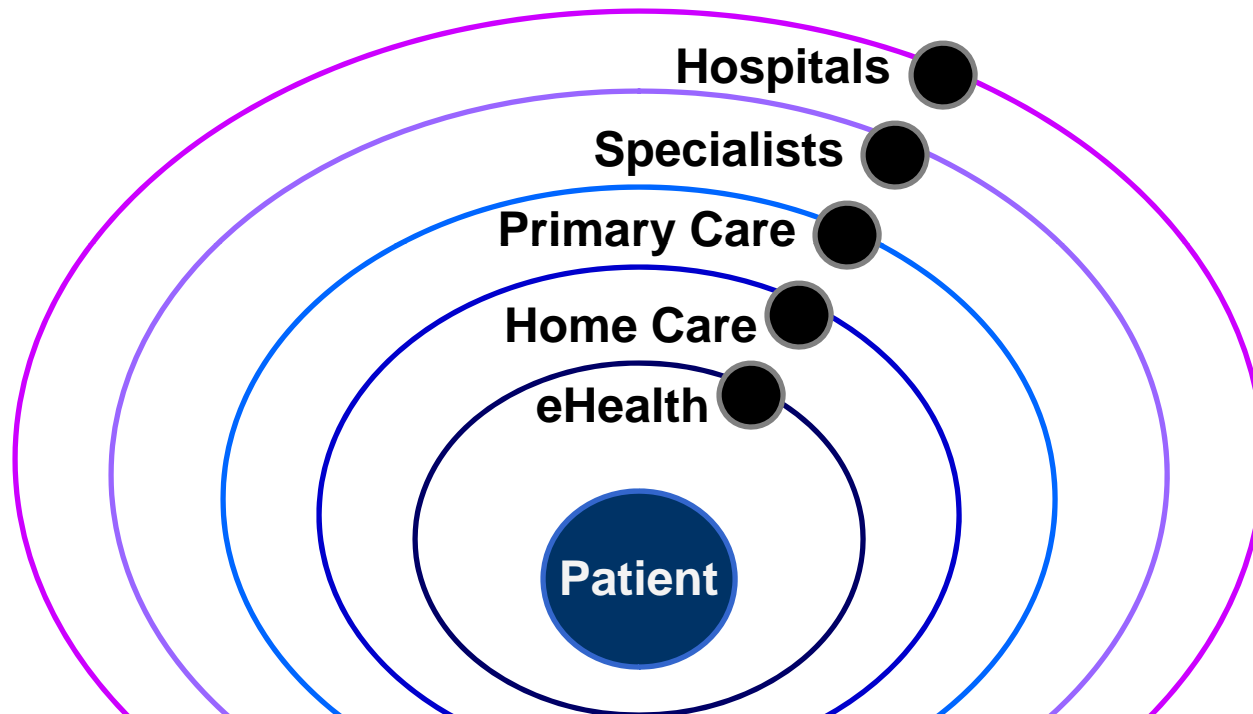
eHealth

Patient

Murphy, J. "The Center of the Universe: A Closer Look at a Patient-Centric Care Model". Nursing Informatics Commentary, Journal of Healthcare Information Management, 6-7 (Spring 2008).

2008 年台灣國際醫學資訊聯合研討會
Joint Conference on Medical Informatics in Taiwan
MIST 2008、NIST 2008、MISAT 2008、The 7th Asia-Pacific HL7 Conference

The ONC-Coordinated Federal Health Information Technology Strategic Plan: 2008 - 2012

Improving the health, safety and well-being of America

http://www.hhs.gov/healthit/resources/HITStrategicPlanSummary.pdf

The Plan has two goals, Patient-focused Health Care and Population Health.

Each goal has four objectives and the themes of *privacy and security, interoperability, adoption, and collaborative governance.*
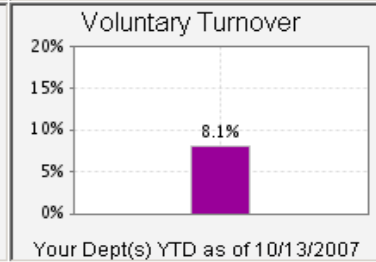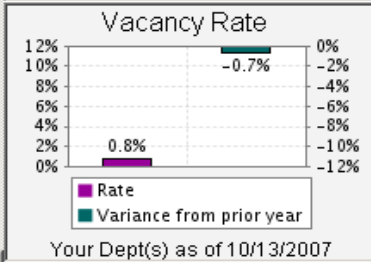
(Published June 3, 2008)
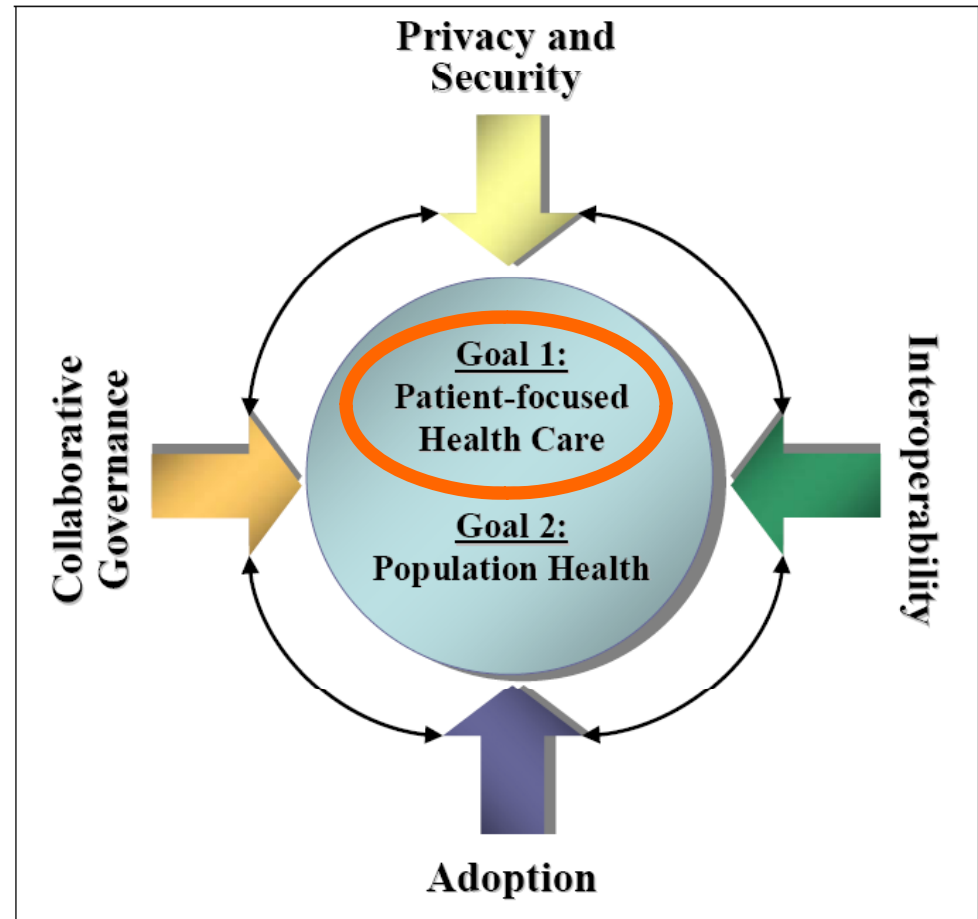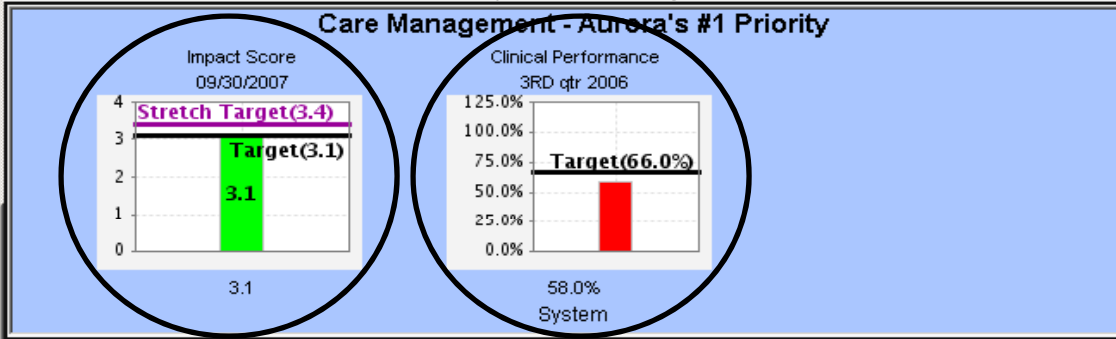
Aurora's key indicators of performance

User Access [default ▼]

Having access to up-to-date data is the first key step in achieving Aurora's strategic goals.
Click here to learn more about Aurora's Leadership Dashboard and your role in its use.

Preferences   [Print]

Care Management - Aurora's #1 Priority

Impact Score
09/30/2007

Stretch Target(3.4)
Target(3.1)
3.1

3.1

Clinical Performance
3RD qtr 2006

125.0%
100.0%
75.0%   Target(66.0%)
50.0%
25.0%
0.0%

58.0%
System

Patient Loyalty

Would Recommend
YTD as of 08/31/2007

64.0%
Target(62.3%)
62.0%
BaseLine(61.8%)
60.0%
58.0%
56.0%

60.3%

Coordination of Care
YTD as of 08/31/2007

56.0%
54.0%
52.0%
50.0%   Target(49.0%)
48.0%
BaseLine(48.2%)
46.0%

46.9%
System

Budget Variance

$199,657

Your Dept(s) YTD as of 05/31/2007

Employee Engagement

5
4   **2007 Target(3.70)**
3
2   3.63
1
0

Org 05 as of 12/2006

Productivity

Target 100%

0%   100%   150%

Your Dept(s) YTD as of 09/29/2007

Length Of Stay

Target 12
4

System YTD as of 08/2007

Supply Costs

-$664
budget varian

Your Dept(s) YTD as of 05/31/2007

Vacancy Rate

12%   0%
10%   -0.7%   -2%
8%   -4%
6%   -6%
4%   -8%
2%   0.8%   -10%
0%   -12%

■ Rate
■ Variance from prior year

Your Dept(s) as of 10/13/2007

Voluntary Turnover

20%
15%
10%   8.1%
5%
0%

Your Dept(s) YTD as of 10/13/2007

Revenue Cycle

Gross Dollars Lost Due to Lack of ABN
$4,000,000   **$3,162,122**
$3,000,000
$2,000,000
$1,000,000
$0

System YTD as of 07/31/2007

Clinical Performance Measures
(Premier)

	AMI	CABG	PNEUMONIA (CAP)	CHF	HIP-KNEE	PREG	NECK	LUMBAR	STROKE
ASLMC	1	2	1	1	2	N/A	3	2	1
ASLSS	1	N/A	1	1 ↑	3 ↑	N/A	N/A	N/A	2 ↑
ASMC	1	3 ↓	1	1 *	1	1	N/A	N/A	3
WAMH	1	N/A	1	1 ↑	2	2	3 ↓	3 ↑	1
AMCWC	N/A	N/A	2	3 ↓	1	1	N/A	N/A	2
MHB	+ 1	N/A	1	+ 1	2	1	N/A	N/A	1 ↑
AMC-KEN	2 ↓	N/A	1	1	1	+ 1	N/A	N/A	1 ↑
ALMC	3 ↓	N/A	+ 1	1	4	1 *	N/A	N/A	3
ABMC	1 ↑	1	1	+ 1	1	2	2	2 ↑	1 ↑
AMCMC	1 ↑	N/A	2 ↓	1	1	1 ↑	N/A	N/A	2 ↑
ASMMC	1	N/A	1	+ 1	+ 1 *	+ 1	N/A	1	1
AMCO	1	N/A	1	1	2	1 ↑	N/A	N/A	2 ↓

* Peer group best performer
+ Premier Award for Quality Winners

Aurora Health Care®
Updated 09//11/2007

Quartile Performance
1 = Top Performer
4 = Bottom Performer

87% in Upper Median
66% in Top Quartile
Based on 2nd Q 2006 -
1st Q 2007 Data
Arrows indicate movement
from prior quarter

Clinical IT Strategy

Electronic Health Record

Right Information

Right Decisions

Care Management Vision

Right Care

Right Time

Right Place

Right Price
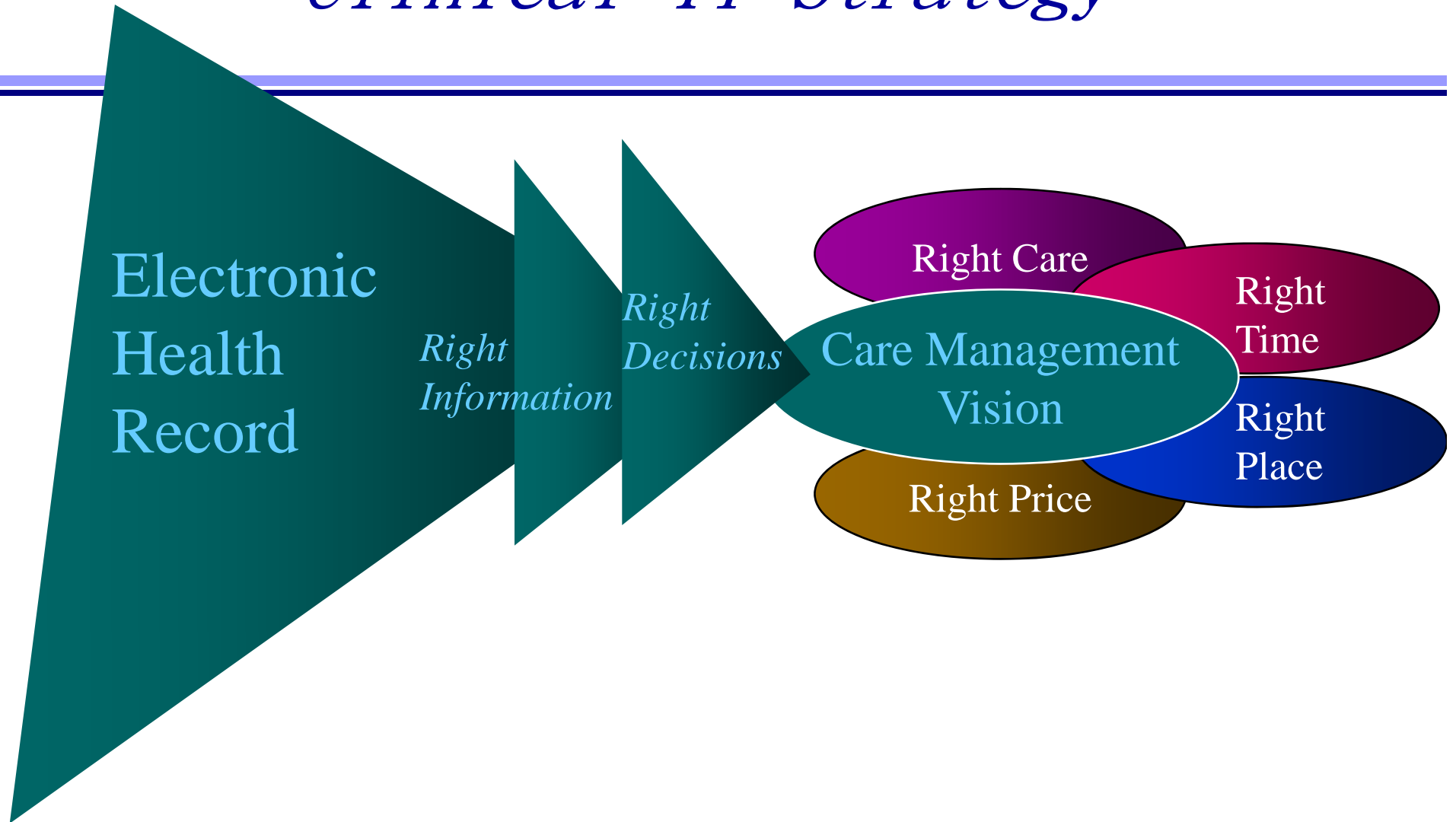
Key Strategic Technologies

- Electronic Health Record (EHR)
  - Clinical information integrated into a single, across-the-continuum patient record
  - Best practices incorporated to support care management
  - Personal Health Record included
- Mobile Technology
  - Access to the EHR with mobile/wireless devices
- Digital Imaging
  - Cardiology, Radiology, Mammography
- Web Technology
  - Patient, physician, workforce integration
  - eHealth/Personal Health Record

Electronic Health Record

- *Patient-focused* electronic record
  - Enterprise Master Patient Index
  - Anytime, anywhere access

- Integrated Architecture for Core Systems
  - Allows different applications to interact with common patient data

- "Best of Breed" software for select systems
  - Interfaces from "feeder" systems
  - Examples: Lab, Dictation, Transcription, Coding, Billing

Flow of Information

Old

Visits to Internist
1983 - 2008

ED Visit for Chest
Pain - 2001

Admission to
Hospital - 2007

2008 年台灣國際醫學資訊聯合研討會
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Flow of Information

New

Visits to Internist
1983-2008

Visit to ED
2001

Admission to
Hospital 2007

Clinic

ED

Hospital

Data
Repository
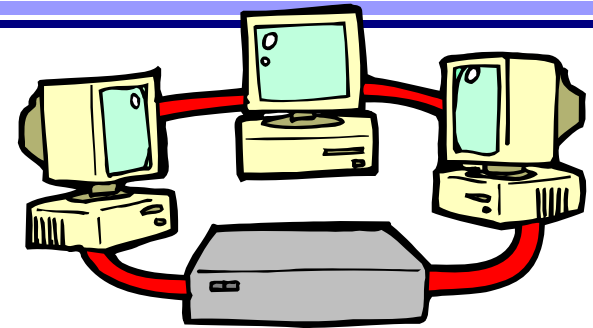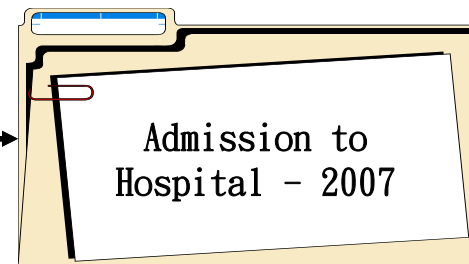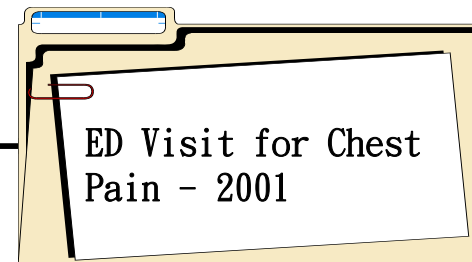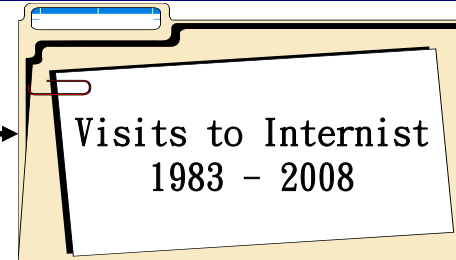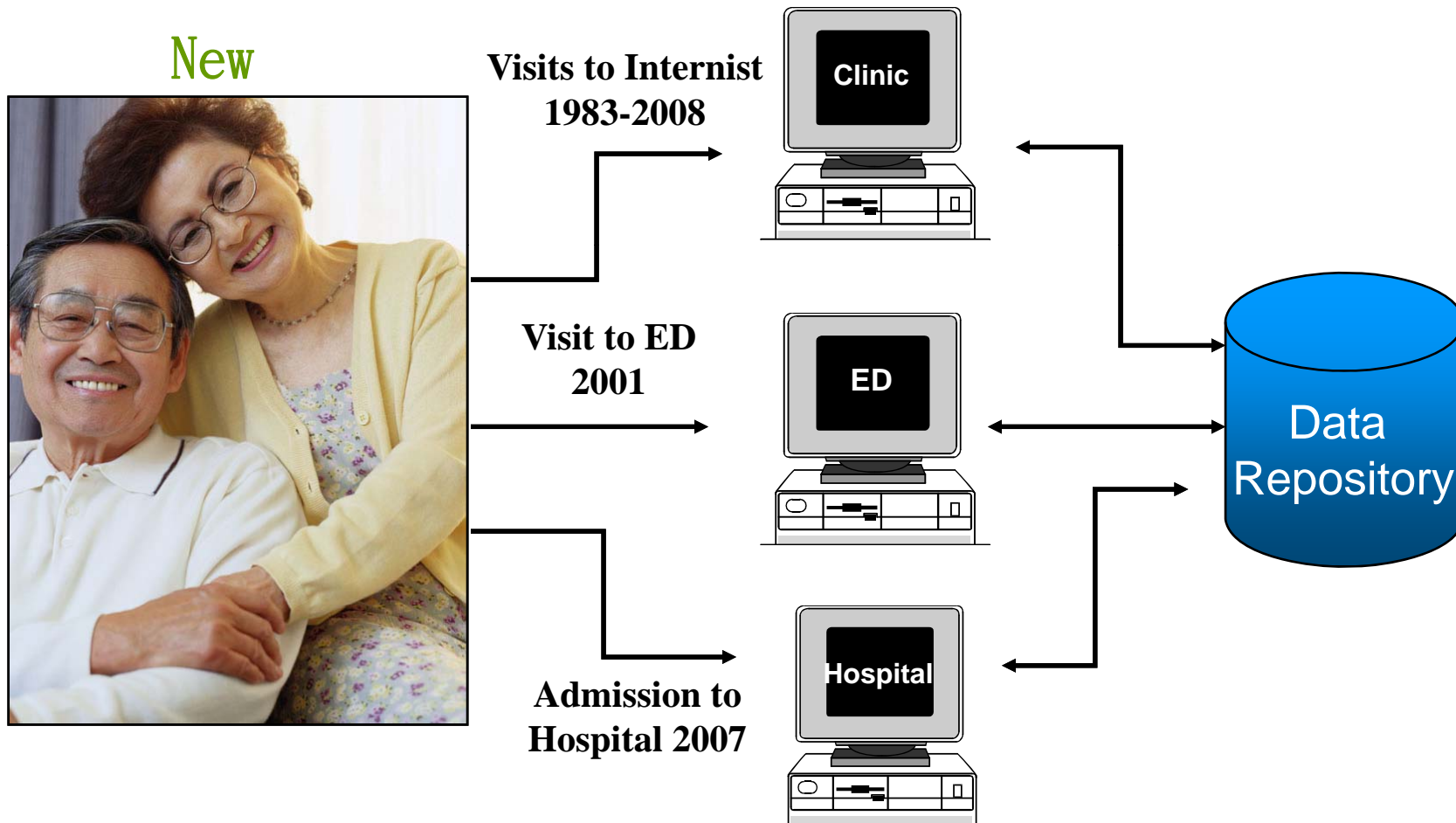
EHR Repository as of Aug 2008

Patients   3.6 m

Documents   30 m

Laboratory Results   290 m

Pharmacy Orders   7 m
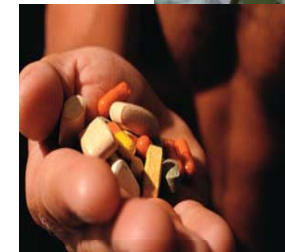
Medication Profile

File   View   Go   Problem   Chart   Help

As Of 1:18 PM

Name: ████████████████   DOB: 1/5/1895   Age: 105 Years   Sex: Female   Chart Number: 1076202 (Enc Chartnum)

Allergy Profile

		Substance	Reaction Status	Severity	Onset Date	Created By	
		NO KNOWN DRUG ALLERGIES	Active		10/7/1996	Contributor_syst...	

Medication Profile

Medication View

See Rx View

Name	SIG			C.	Provider	Date	Status
Current Medications							
aspirin (ASPIRIN TAB 81MG)	-- 1 active prescription						
└ Rx aspirin (ASPIRIN TAB 81MG)		01	qd	##0	NO Refills	Pfotenhauer, Joseph	03/17/1998 ... Active
levothyroxine (Synthroid)	-- 1 active prescription						
└ Rx levothyroxine (Synthroid)	0.05mg	1 tab(s)	qd	#30	0 Refills	Pfotenhauer, Joseph	06/01/1999 ... Active
ranitidine (ZANTAC TAB 150MG)	-- 1 active prescription						
└ Rx ranitidine (ZANTAC TAB 150MG)		01	bid	#000	00 Refills	Pfotenhauer, Joseph	10/07/1996 ... Discontinued
└ Rx ranitidine (ZANTAC TAB 75MG)		01	bid	##0	NO Refills	Pfotenhauer, Joseph	03/02/1998 ... Active
Past Medications							
Rx acetaminophen-propoxyphene (Darvocet N)	650 mg-...		q4-6h prn	#0	0 Refills	Pfotenhauer, Joseph	12/14/1999 ... Discontinued
Rx amlodipine (Norvasc)	2.5mg	1 tab(s)	qd	#0	0 Refills	Pfotenhauer, Joseph	12/06/1999 ... Discontinued
Rx cephalexin (Keflex)	250mg	1 tab(s)	qid	#40	0 Refills	Zablotney, David	01/14/1999 ... Discontinued
furosemide (FUROSEMIDE TAB 20MG)	-- 3 past prescriptions						
└ Rx furosemide (FUROSEMIDE TAB 20MG)		01	qd	##60	1 Y Refills	Pfotenhauer, Joseph	03/02/1998 ... Discontinued
└ Rx furosemide (FUROSEMIDE TAB 20MG)		01	qd	#050	06 Refills	Pfotenhauer, Joseph	08/14/1997 ... Discontinued
└ Rx furosemide (FUROSEMIDE TAB 20MG)		01	qd	#000	00 Refills	Pfotenhauer, Joseph	10/07/1996 ... Discontinued
Rx hydrochlorothiazide-losartan (Hyzaar)	12.5 mg-...	1 tab(s)	qd	#30	PRN Re...	Pfotenhauer, Joseph	06/01/1999 ... Discontinued
Rx Misc Medication (MISCELLANEOUS DRUG)		01	qd	##60	PRN Re...	Pfotenhauer, Joseph	05/26/1998 ... Discontinued
Rx nitroglycerin (NITRO-DUR PATCH .2MG)		01	qd	##0	NO Refills	Pfotenhauer, Joseph	03/17/1998 ... Discontinued
Rx potassium chloride (POTASSIUM TAB 20MEQ)		01	qd	##60	1 Y Refills	Pfotenhauer, Joseph	03/02/1998 ... Discontinued
Rx trimetrexate (Neutrexin)	25mg	30	tid			Zablotney, David	01/14/1999 ... Discontinued

Problem List

		Name of Problem	Life Cycle Status	Co...	Onset Date	Responsible Provider	Recorded By	
		UNSPECIFIED ESSENTIAL HYPERTENSION	Active		5/7/1998		Contributor_system, HNA01M	

Abnormal value highlighting

Specialty Event Sets

Graphing

Reference data access

CPOE

Decision Support in CPOE (1): Enterprise-wide Order Sets

Careset - Uncomplicated-Community Acquired Pneumonia-CPOE

	Component	Order Detail
	Nursing:	
☑		T;N, Intake and output Q8hrs while on IV's, Q8H
☑	Weigh	T;N, Daily wieghts while on IV's, qAM
☑		T;N, Encourage fluids 660-800cc/shift while awake
☑	Bathroom Privileges (BRP)	T;N, BRP and advance per clinical pathway
	Laboratory:	
☑	Carbon Dioxide (CO2)	Routine, T;N, Lab Collect, Venous
☐	Blood Culture	Routine, T;N, Lab Collect, Q5MIN 2 TIME/DOSE
☐	Respiratory Culture & Smear (Sputum Culture)	Routine, T;N, Nurse Collect, Sputum, Sputum, Do not delay antibiotic if unable to obtain
	If from Nursing home:	
☐	Urinalysis Screen (Urine Screen)	Routine, T;N, Nurse Collect
	Pulmonary Consults:	
☑	Oxygen Request	ASAP, T;N, Oxygen request _____ LPM/NC titrate to keep Sat>92%
	Consults:	
☐	Nutrition Consult/Instruction (Dietitian Consult)	T;N
☐	Social Services Consult	Today, T;N
☐	Physical Therapy*	Today, T;N, Physical Therapy Consult
	Medications:	

Order Details

Detail Values

Order Comments

Details

Decision Support in CPOE (2): Discern Alerts

Decision Support in CPOE (3): Drug Alerts

Name: TEST, ONLY   DOB: 1/1/1901   Age: 100 Years   Sex: Male   Chart Number: <No Data>

My List | Search | Order Catalog

Select -->

Search | amox

( ) Generic   ( ) Product   ( ) Category

Name
amoxapine
amoxicillin
amoxicillin-clavulanate
amoxicillin/clarithromycin/lansoprazole
Amoxil 125 mg/5 mL Suspension (amoxicillin)
Amoxil 200 mg/5mL Suspension (amoxicillin)
Amoxil 250 mg/5mL Suspension (amoxicillin)
Amoxil 400 mg/5mL Suspension (amoxicillin)
Amoxil 50mg/mL Liquid (amoxicillin)
Amoxil Capsule (amoxicillin)
Amoxil Chewable Tab (amoxicillin)
Amoxil Pediatric Drops (amoxicillin)
Amoxil Tablet (amoxicillin)

Typical Orders/Prescriptions   Select -->

Amoxil Capsule : 250 mg Cap, 30, PO, tid, 0
Amoxil Capsule : 500 mg Cap, 30, PO, tid, 0

● All   ● Allergy   ▲ Drug   Food   ○ Dup. Therapy   ○ Reference

Amoxil Capsule   ☑ Quick sig

Sig: 250 MG PO tid   <Duration>   ☑ Short lists

Dispense: 30   Refill: 0   Rx date: 12/03/2001   Stop date: <None>   ☐ Auto stop

Samples: <0>   Add'l refill: 0   Refill date: 12/03/2001

PRN: <None>

Instructions: <None>

Indications: <None>

Comment: <None>   Order Details ▼

Prescriber: Manne, Sridevi   Leaflet: No leaflet   ☐ DAW

Address: Aurora Health Center 8348 Washington Avenue Racine, (7358)WI-2 53406   ☐ Print DEA

Routing: Print Rx   Other   ☐ Historical

Action	Name	SIG	C.	L...	I...	Provider	Date
Rx Order	Amoxil Caps...	250 MG PO tid #30 0 Refills				Manne, Sridevi	12/3/01 9:20:15 AM

Drug-Drug interaction checking
Drug-Allergy checking
Dose-Range checking

Med Profile | Allergies

Display: Current Allergies (only) ▼   Perform Rever Allergy Check

D/A	Substance	Category	Reactions	Severity	Type	C...	Est. Onset	Reaction S...	Updated
✓	**Advil**	Drug	RASH		Allerg...			Active	10/2/01
✓	**amoxicillin**	Drug			Allerg...			Active	10/1/01
✓	**amoxicillin-clavulanate**	Drug	rash	Mild	Allerg...	📎	About 7/18...	Active	10/1/01
	bandaid							Active	11/20/0

Links to Evidence on internet from patient chart

Registration

Patient Registers;
bar-coded
wristband created

1

Patient comm[unicates]
allergies, curr[ent]

Clin Doc

2

PowerOrders

Physician orders
medication via CPOE

3

Integrated Products

In[tegrated Medicati]on
Ad[ministration Proc]ess

7

Patient Billing

[C]harge
[pa]tient bill

Pharmacy

4

Pharmacy
fills order;
checks for
interactions

eMAR

Electronic
Medication
Administration
[(eMAR)]

6

5

Medication with bar code
administered to patient
[with patient ID]
[barcode] checking

Clin Doc

Specs • Patient Profile

Key Successes

- Decision Support – Evidence-Based Medicine (easy to do the right thing)
- Inbox, Result Review, Electronic signature
- Timeliness of result availability
- Completeness of record - longitudinal, cross site
- Medication Profile
- Remote access to data (75% of physicians have access from home or office)
- Access to data without chart pull - for returning phone calls or prescription refills
- Ease of concurrent reminders and retrospective reporting for drug recalls or care management data retrieval
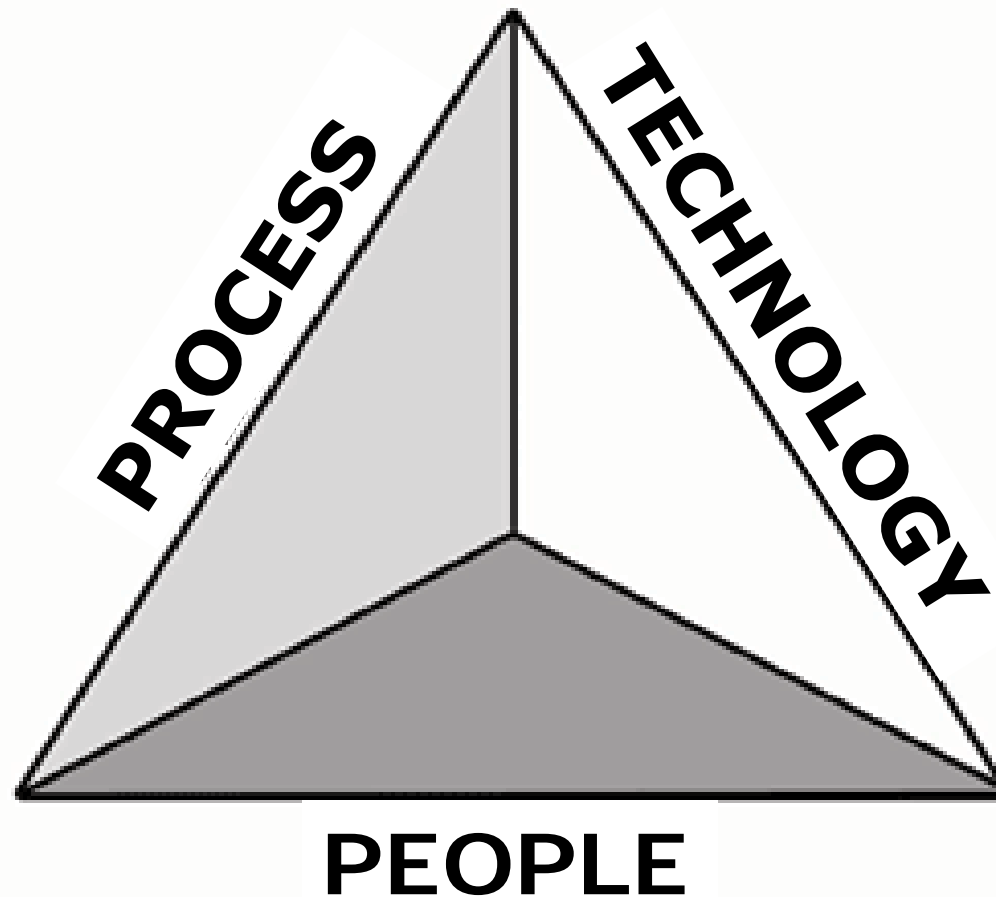
Key Challenges

- Care Team Workflow Redesign and how computer is used at POC (mobile computing devices)

- Training and Support

- Availability of System - aka, NO DOWNTIME (back-up data access strategy)

- Response Time

> Response Time

> > Response Time

- Support … maintaining the gains ...

The "Triple Constraint" to Manage in IT Implementations with Clinicians

Electronic Health Record Adoption

EMR Adoption Model[SM]

Stage	Cumulative Capabilities	2007 Final	Q 2 2008
Stage 7	Medical record fully electronic; HCO able to contribute CCD as byproduct of EMR; Data warehousing in use	0.0%	0.0%
Stage 6	Physician documentation (structured templates), full CDSS (variance & compliance), full R-PACS	0.8%	0.9%
Stage 5	Closed loop medication administration	1.4%	1.0%
Stage 4	CPOE, CDSS (clinical protocols)	2.2%	1.8%
Stage 3	Clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology	25.1%	32.0%
Stage 2	Clinical Data Repository, Controlled Medical Vocabulary, Clinical Decision Support, may have Document Imaging	37.2%	33.9%
Stage 1	Ancillaries – Lab, Rad, Pharmacy – All Installed	14.0%	12.6%
Stage 0	All Three Ancillaries Not Installed	19.3%	17.7%

Data from HIMSS Analytics[TM] Database N = 5073/5071 ©2008 HIMSS Analytics

Ubiquitous Computerization in Healthcare?

"That it will ever come into general use, notwithstanding its value, is extremely doubtful because its beneficial application requires much time and gives a good bit of trouble, both to the patient and to the practitioner because its hue and character are foreign and opposed to all our habits and associations."

- The London Times, 1834
Commenting on the "stethoscope"

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Thank You, Judy

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