


Using Information Systems to Improve Quality



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Outline

- Quality in health care
- How IT can improve quality
 - Clinical decision support
 - Knowledge-based CDS
- Quality on the ground
- Conclusions



Background

- Quality can be defined and measured precisely
 - Science of quality measurement is evolving
- Definition of quality is
 - degree to which health services are likely to achieve desired health outcomes and are consistent with current professional knowledge

IOM Roundtable on Health Care Quality JAMA 1998;280:1000-5



Background

- “Quality problems are extensive and serious”
- “Problems may be classified as underuse, overuse, or misuse”
- “Large numbers of Americans are harmed as a result”
- “Current approaches to quality improvement are inadequate”
- “...constraint to quality improvement is ...lack of information system infrastructure”

IOM Roundtable on Health Care Quality JAMA 1998;280:1000-5

Examples

- Underuse
- Inadequate management of AMI patient
 - 79% of elderly did not get b-blockers
- 45%-65% of women do not get scheduled mammograms

- Overuse
- 21% of antibiotic prescriptions for inappropriate indications
- 17% of angiographies, 32% of carotid endarterectomies, 17% of UGI endoscopies inappropriate



Problems managing lab results

- 4 days to adjust medications when creatinine rises; 3 days with e-mail alerts¹
- Only 50% of certain critical results treated appropriately²
- 4% of ADEs might be prevented with better communication of lab results³
- 27% of certain critical results not treated for > 5 hours⁴

1 – *Arch Int Med* 1994;154:1511-7, 2 - *MD Comput* 1990;7:296-301
3 – *JGIM* 1993;8:289-294, 4 – *JAMIA* 1998;5:112-119



Misuse of medical intervention

Preventable complications of treatment

- Adverse events due to negligence occurred in 1% of hospitalizations¹
- 6.5 adverse drug events per 100 admits
 - ADE associated w/ 2 day increase LOS
 - 28% of ADEs preventable; 43% serious²
- Recent data show preventable ADEs in outpatient settings and nursing homes^{3,4,5}
- Above studies have led to focus on safety

1-NEJM 1991 324;370-376, 2- JAMA 1995;274:29-43,
3-JAMA 2003 289:1107-1116, 4- NEJM 2003 348:1556-64,



Rand Quality of Care study

- 7000 patients, 12 metropolitan areas
- Phone survey/record review
- 30 conditions and preventive care
 - 439 indicators
- Patients received recommended care 55% of time
- Can't solve problem w/ current system

McGlynn NEJM 2003; 348:2635-2645

Examples of Quality: Underuse

Crossing the Quality Chasm

TABLE A-1 Examples of Quality of Health Care in the United States—Underuse: Did Patients Receive the Care They Should Have Received?

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
PREVENTIVE CARE				
Immunizations				
<i>Childhood Vaccines</i>				
Three Polio; four Diphtheria, Tetanus, Pertussis; one Measles, Mumps, Rubella; and three Haemophilus influenzae type b (Hib) by 18 months old. (Three to four doses of Hib are recommended, depending on formulation; three Hepatitis B virus vaccines [HBV] are also recommended but were not included in this particular study.) (American Academy of Pediatrics [AAP], 1994; Centers for Disease Control and Prevention [CDC], 1995a).	Children 19–35 months old in 31,997 households from a nationally representative sample of the United States (U.S.).	National Immunization Survey (NIS), 1995.	74% received all the vaccines. (If three doses of Hib are not included, the percentage is 76%.)	CDC, 1997
<i>Influenza Vaccine</i>				
Annual vaccination of all people ≥ 65 years old is recommended (U.S. Preventive Services Task Force [USPSTF], 1989). This recommendation has since been reiterated (USPSTF, 1996).	Approximately 8,000 adults ≥ 65 years old from a sample of people representative of the U.S. civilian, noninstitutionalized population.	National Health Interview Survey (NHIS), 1993.	52% received annual influenza vaccine.	CDC, 1995b
Same as above.	From a sample of 7,997 randomly selected patients ≥ 20 years old who had visited a clinic during the	Mailed surveys with phone follow-up of patients who visited one of 44 clinics from August 1, to	72% of people ≥ 65 years had an influenza vaccine in the prior year.	Kottke et al., 1997

Examples of Quality: Underuse

Crossing the Quality Chasm

TABLE A-1 Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
<p><i>Prenatal Care: Other Routine Prenatal Care</i> Includes first prenatal visit during first trimester, accurate determination of gestational age, screening for inherited disorders, measurement of symphysis-fundal height, and blood pressure measurement.</p>	Same as above.	Same as above.	Among six HMOs, women received 78%–87% (average 84%) of five processes of routine prenatal care.	Murata et al., 1994
<p><i>Prenatal Care: Pregnancy Complications</i> Includes diagnostic and treatment interventions after abnormal screening test results, and care to mitigate effects of pregnancy-induced hypertension and gestational diabetes.</p>	Same as above.	Same as above.	Among six HMOs, women received 54%–77% of care for complications of pregnancy.	Murata et al., 1994
<p><i>Prenatal Care: Proteinuria</i> Urine is checked for protein to evaluate for the presence of preeclampsia, a serious complication of pregnancy.</p>	Inpatient records for 2,336 women from a sample of 2,878 births in 1985; prenatal care records for 823 of these women.	Medical records for patients sampled from Medicaid claims files for women and children enrolled in Aid to Families with Dependent Children (AFDC) in two communities in California and two communities in Missouri, 1985.	Testing was provided at 75%–83% of visits. Follow-up was performed for 41%–65% of patients with proteinuria.	Carey et al., 1991

Examples of Quality: Underuse

Crossing the Quality Chasm

Childhood Asthma Care

Includes various components of asthma care consistent with prevailing standards of care.

Children < 18 years old in a group of 393 adults and children diagnosed with asthma, from a sample of 2,024 patients of 135 providers.

Same as above.

For each type of clinical setting, the study reports the average percentage of technical quality indicators for childhood asthma that were not met. Each of the averages was located in the 30%–40% range. Between 0% and 20% of care was inappropriate.

Starfield et al., 1994

Asthma Care

Includes various components of asthma care consistent with prevailing standards of care.

5,580 patients ≥ 14 years old who were prescribed asthma medications.

Survey of patients from multiple sites of a health maintenance organization in California, 1996.

72% of patients with severe asthma had a steroid inhaler, 26% of patients needing daily medications had a peak flow meter at home, and 42% were advised about self-management tools.

Legorreta et al., 1998

Diabetes Mellitus

Diabetes Mellitus: Dilated Eye Examination

Annual dilated eye examination to screen for retinopathy starting at time of diagnosis of non-insulin-dependent diabetes mellitus (NIDDM) and 5 years after diagnosis of insulin-dependent diabetes mellitus (IDDM).

2,392 adults ≥ 18 years old with IDDM (124 patients), NIDDM treated with insulin (922 patients), and NIDDM not treated with insulin (1,346 patients) from a sample of 84,572 people

NHIS, 1989.

49% had a dilated eye examination in the prior year; 66% had an examination in the prior 2 years; 61% and 57% of patients at high risk of vision loss because of a

Brechner et al., 1993

continues

Examples of Quality: Overuse

Crossing the Quality Chasm

TABLE A-2 Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
Carotid Arteries				
<i>Carotid Endarterectomy</i>				
Carotid endarterectomy is a procedure that opens up stenotic (blocked) carotid arteries (which supply blood to the brain).	Random sample of 1,302 cases of carotid endarterectomy.	Medicare physician claims data and medical records from three sites selected from thirteen sites in eight states (Arizona, California, Colorado, Iowa, Massachusetts, Montana, Pennsylvania, South Carolina), 1981.	32% of carotid endarterectomies were inappropriate, 32% were equivocal, and 35% were appropriate.	Chassin et al., 1987
Gastrointestinal Disease				
<i>Upper Gastrointestinal Tract Endoscopy</i>				
Endoscopy enables visualization of the gastrointestinal tract, and permits biopsy and brush cytologic examination.	Random sample of 1,585 cases of upper gastrointestinal tract endoscopy.	Same as above.	17% of upper gastrointestinal tract endoscopies were inappropriate, 11% were equivocal, and 72% were appropriate.	Chassin et al., 1987
Cataracts				
<i>Cataract Surgery</i>				
Cataract surgery is a commonly performed surgery in adults ≥ 65 years old. Cataract surgery should not be performed on people with certain conditions (e.g., macular degeneration or diabetic retinopathy).	1,020 patients who underwent a total of 1,139 cataract surgeries.	Medical records for patients from 10 academic medical centers, 1990.	2% of cataract surgeries were inappropriate, 7% were equivocal, and 91% were appropriate.	Tobacman et al. 1996

Examples of Quality: Misuse

Crossing the Quality Chasm

TABLE A-3 Continued

Health Care Service ^a	Sample Description	Data Source	Quality of Care	Reference ^b
Mental Health				
<i>Depression: Treatment</i>				
Includes treatment consistent with prevailing standards of care.	1,198 patients hospitalized with depression, representative of all Medicare elderly patients hospitalized in general medical hospitals with a discharge diagnosis of depression.	Medical records for Medicare patients from 297 hospitals in five states (California, Florida, Indiana, Pennsylvania, Texas), July 1, 1985, to June 30, 1986.	33% of patients discharged with antidepressants had doses below recommended level.	Wells et al., 1994b
Includes treatment consistent with prevailing standards of care.	64 patients with major depression from a sample of 2,592 consecutive primary care patients 18–65 years old who attended one of the study clinics.	Patient surveys and interviews, physician surveys, and computerized pharmacy records from 3 primary care clinics of Group Health Cooperative of Puget Sound in Washington.	Among patients with major depression who received antidepressant medications, 78% received dosages within the recommended ranges.	Simon and VonKorff, 1995

Crossing the Quality Chasm

Appendix

- Examples of underuse – 40 pages
- Examples of overuse – 10 pages
- Examples of misuse – 3 pages



“A Research Agenda for Bridging the Quality Chasm”

- Innovative health care organizations
- Effective professional training and continuing education
- Increasing the evidence base in health care
- Assuring that evidence is applied
- Aligning reimbursement with quality
- Implementing IT, including EHRs

Fernandopulle, Health Affairs, 2003;22:178-90



How EHRs can improve quality

- Fundamentally change how work is done
- Serve as a data source for organizations measuring their performance
- Knowledge-based clinical decision support to alter clinicians' decision making



How do EHRs change workflow?

- Clinical results management
- Order management
- Clinical encounter documentation
- Clinical communication
- Can provide clinical decision support



Clinical decision support

- Knowledge-based CDS
- Non-knowledge-based CDS

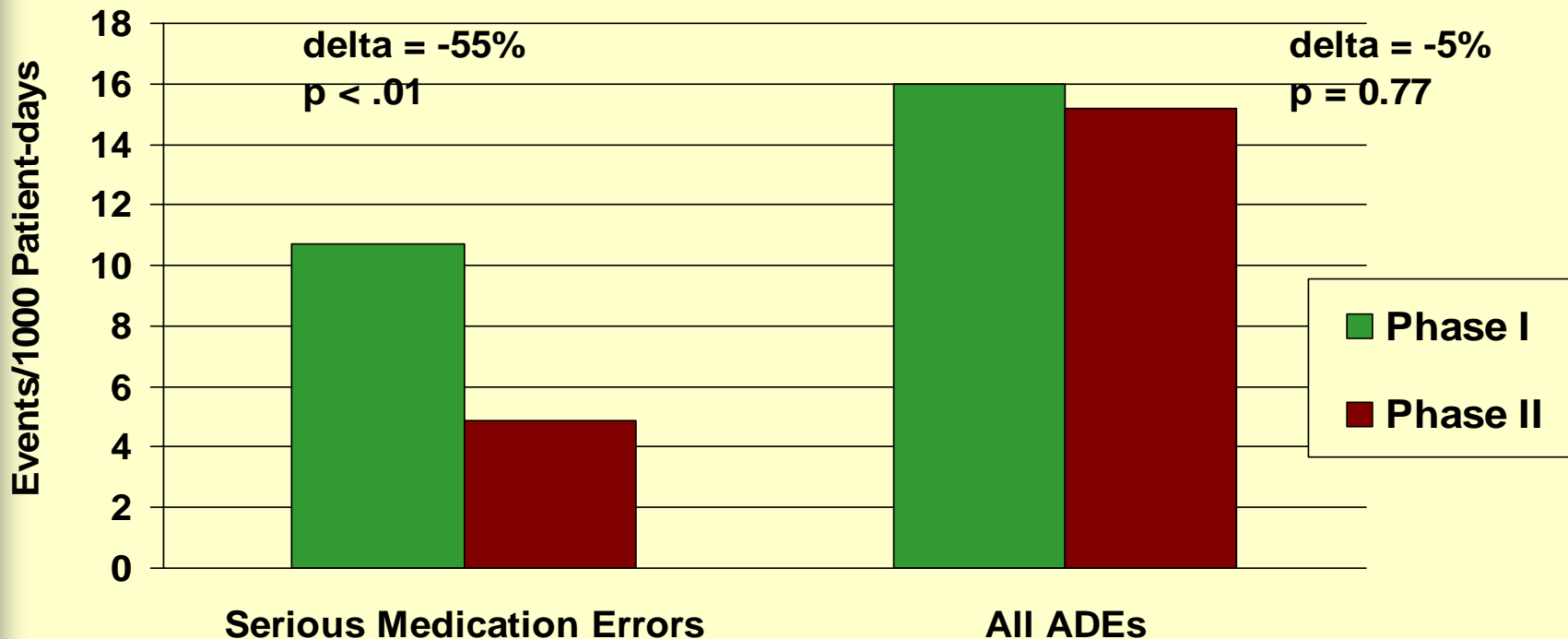


Drug safety features of CPOE

- Increased legibility
- Calculations
- More efficient communication to ancillary services
- Easy access to patient and reference data while ordering
- Order sets and dosing suggestions
- Reminders to use an appropriate drug
- Reminders to monitor levels
- Drug-drug and drug-allergy warnings

Kuperman JCJQI 2001;27:509-21

Impact of CPOE on Serious Medication Error and ADE Rates



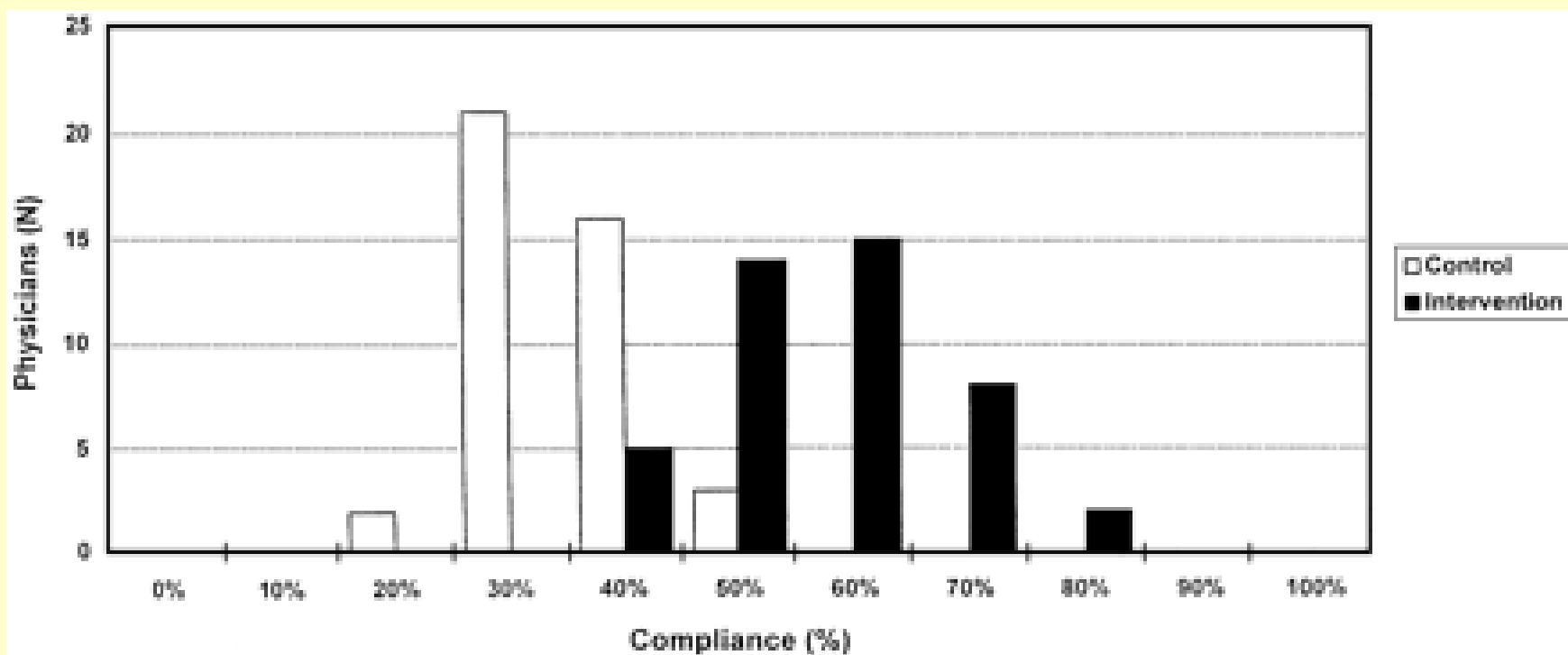


“Corollary” order reminders reduce errors of omission

- Target - corollary order pairs (n=87)
 - NSAID – creatinine level
 - Aminoglycoside – drug levels, creatinine
 - Warfarin – routine protimes
- Intervention -- display reminder at time of ordering

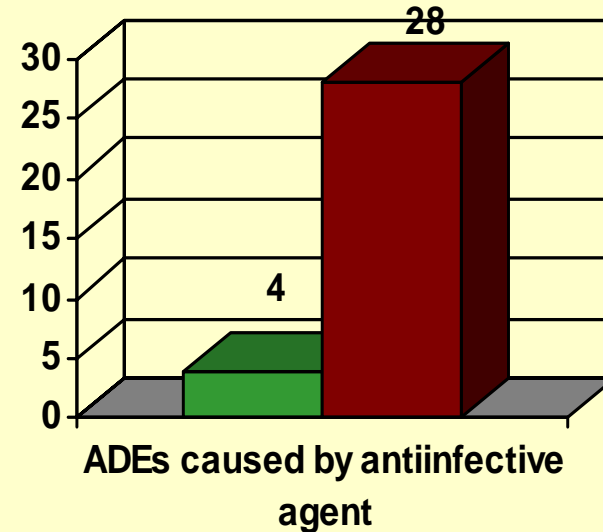
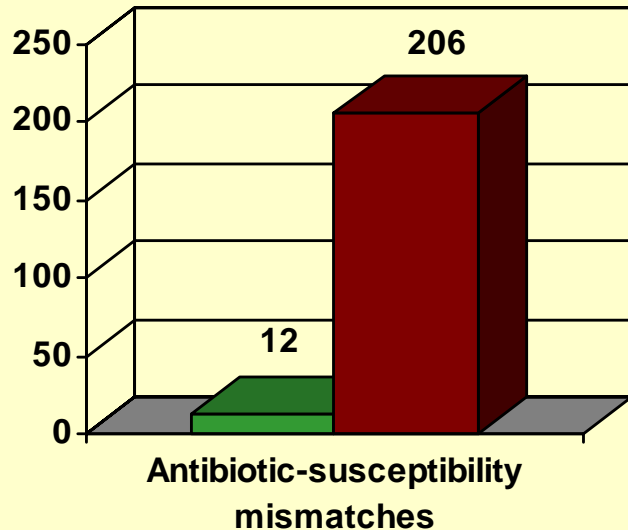
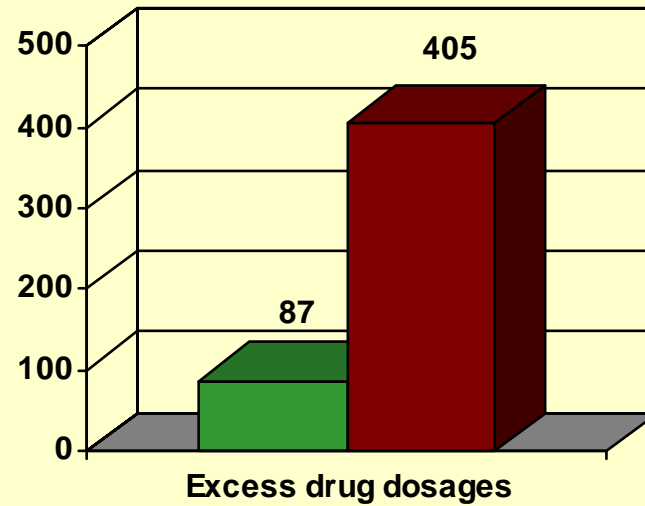
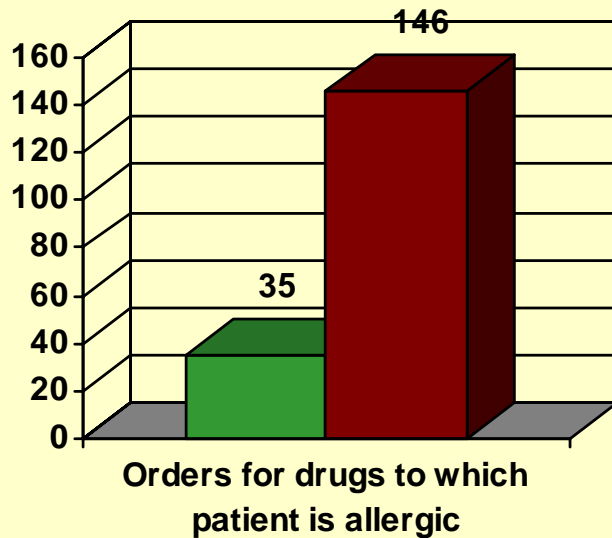
Overhage JAMIA 1997;4:364-375

Effect of alerts on compliance



Overhage *JAMIA* 1997;4:364-375

Effect of an antibiotic advisor



All results statistically significant
Costs, LOS also reduced
Evans NEJM 1998;338:232-238

■ Intervention ■ Control

Dose suggestions

BICS #1

8 x 12

ViewOrders PtLookup Feedback Help Goodbye

JTEST, JON 36F 11111111 Adm: 11/01/91 Room: 17A-117

(*)New Medication Name DOSE: DIGOXIN PO

Route

D Dose: [

F Frequency: [

T Start Time: [TODAY

U Duration: [] Days

P PRN [

H Hold if: [

I Instructions:

< dose List >

ALTERNATE DAYS

VARIABLE

0.0625 MG

0.125 MG

0.25 MG

0.375 MG

0.5 MG

OTHER

ALLERGIES: CEPHALOSPORINS, COUM

-----RECENT LABS-----

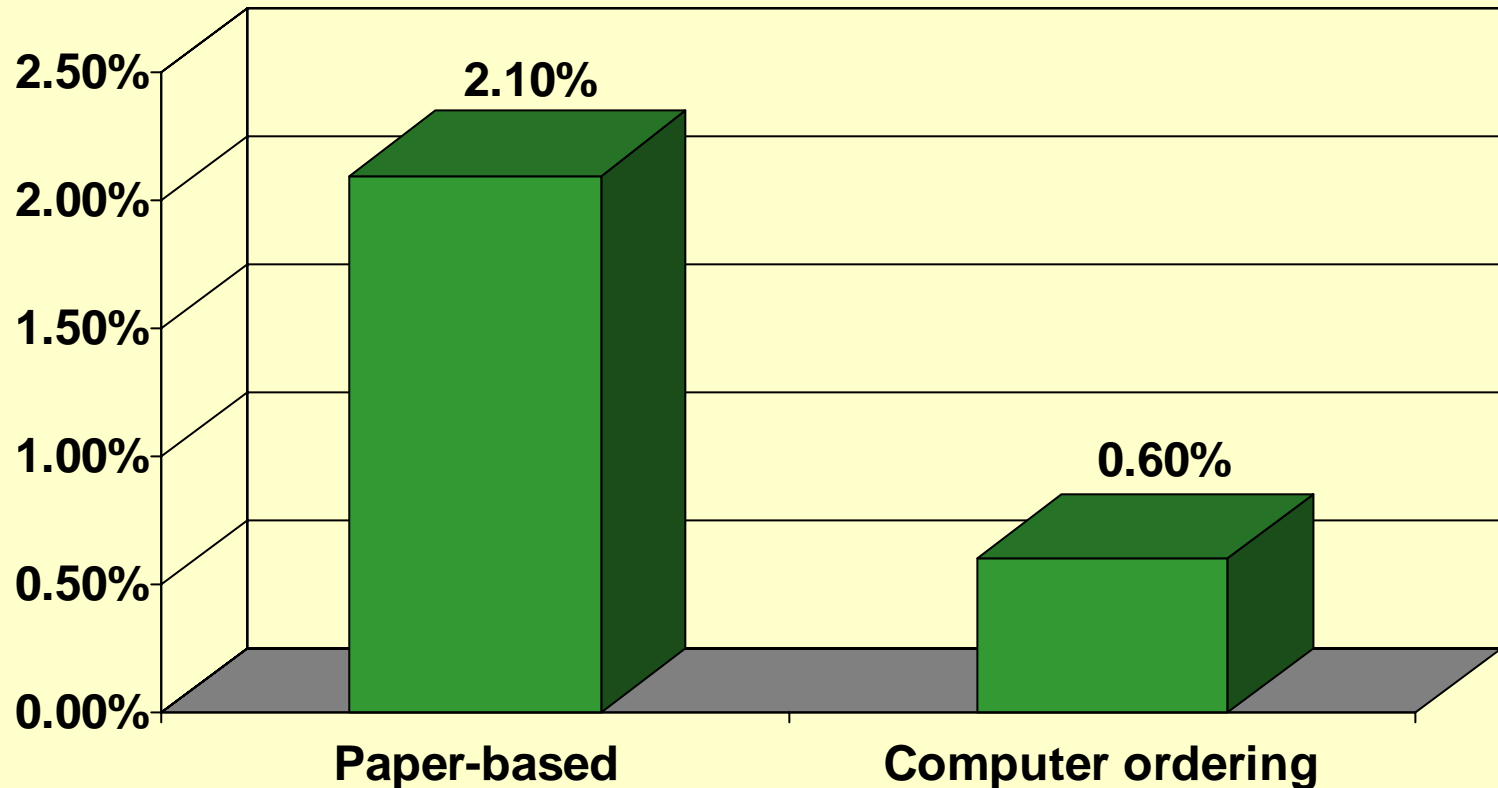
DIG: ---

K: 3.1*# 04/02/96

Move to desired choice with mo

Ok Cancel

Proportion of doses exceeding recommended maximum



Teich Archives Int Med 2000;160:2741

Dose suggestions in renal impairment

BICS #1

8 x 12

ViewOrders PtLookup Feedback Help Goodbye

OETEST,MCGEORGE 51M 11489952 Adm: 11/01/91 Room: 17A-112

(*)New Medication Name DOSE: DIGOXIN PO
Route List adjusted for renal function <Show data>

< dose List >

D	Dose:	[
F	Frequency:	[
T	Start Time:	[TODAY
U	Duration:	[] Days
P	PRN	[
H	Hold if:	[
I	Instructions:	

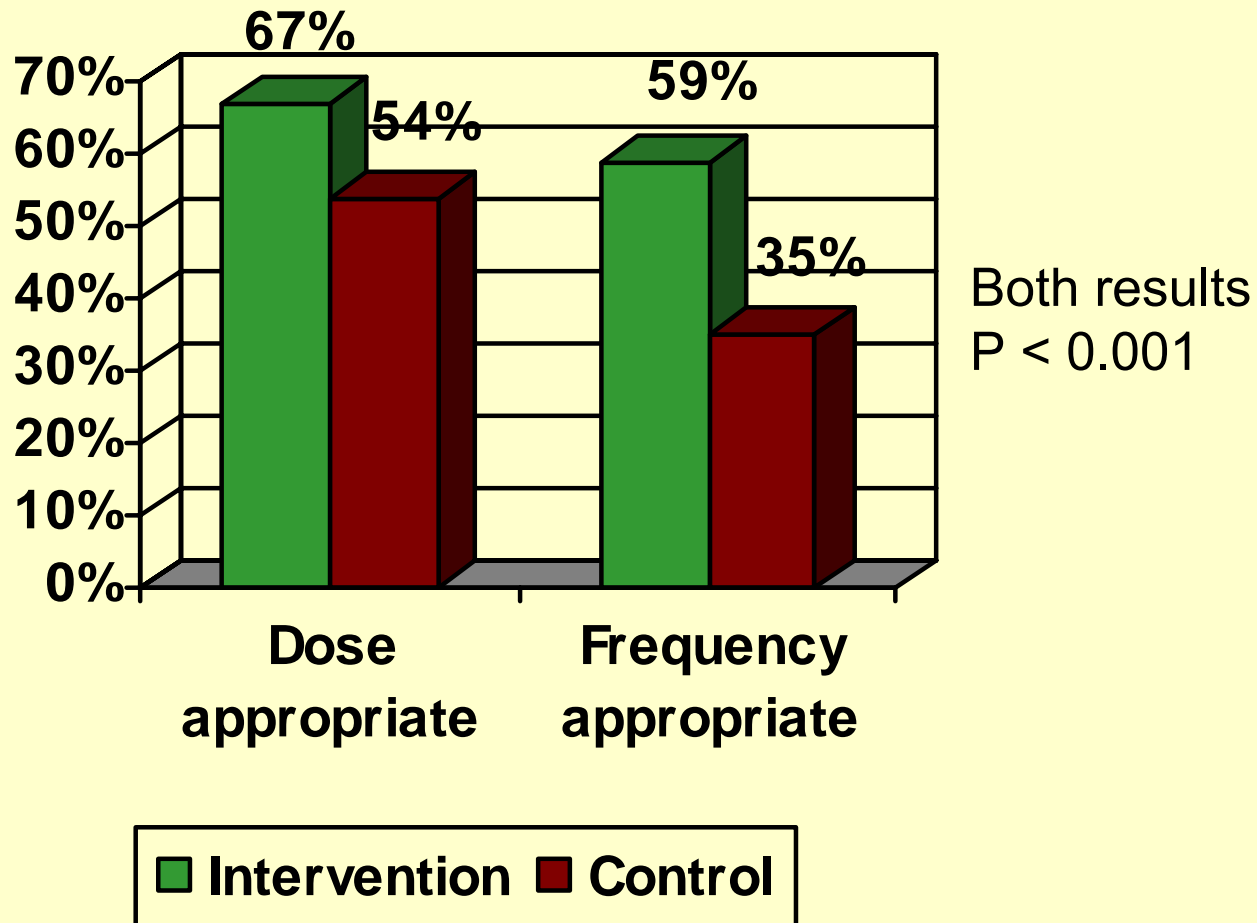
ALTERNATE DAYS
VARIABLE
0.0625 MG
0.125 MG
OTHER

ALLERGIES: PENICILLINS, TYLENOL
-----RECENT LABS-----
DIG: ---
K: 3.1 08/09/97

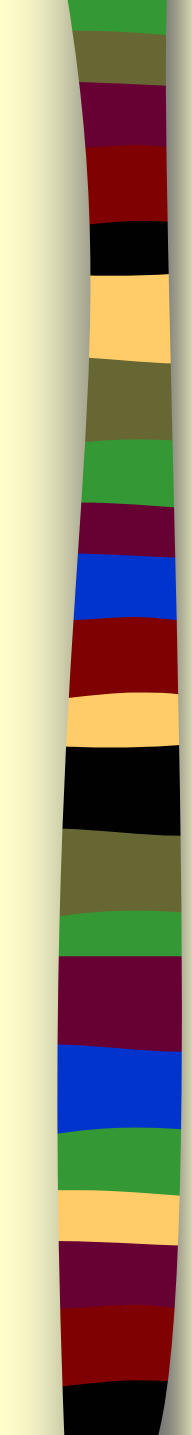
Move to desired choice with no

Ok Cancel

Dosing appropriateness in patients with renal impairment



Chertow JAMA 2001;286:2839-44



Outpatient reminders for preventive care management

- E.g., breast/cervical/colorectal cancer screening, cardiovascular and DM risk reduction, etc.
- Reminders delivered at time of visit
- Several studies done
- Meta-analysis showed adjusted odds ratio was 1.77
 - Varies by reminder
 - Still significant fractions of patients non-compliant

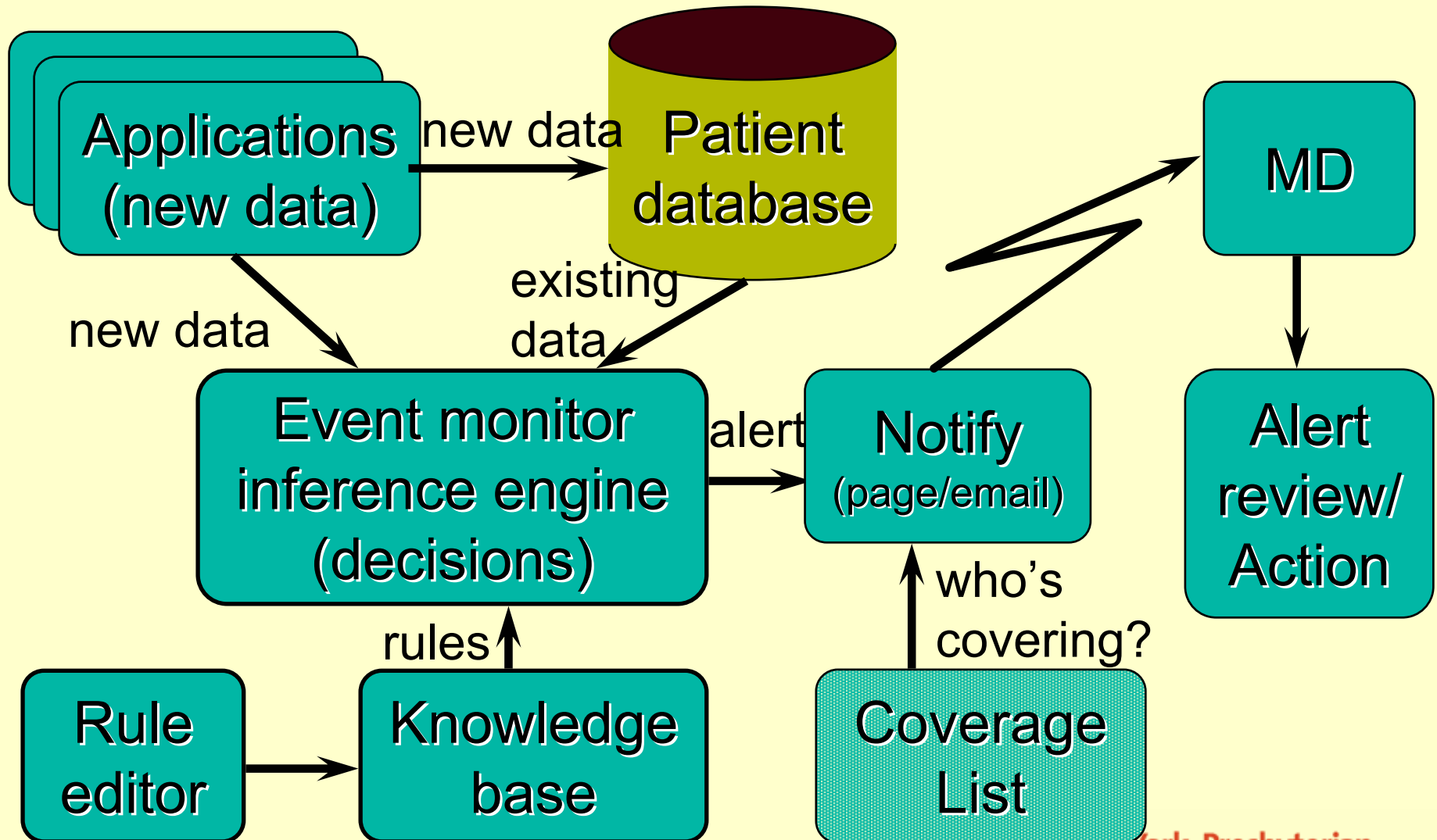
Shea JAMIA 1996;3:399-409



Why aren't reminders followed?

- Insufficient data
 - E.g., aspirin not on the medication list
- Incomplete logic
 - E.g., false if patient on warfarin
- Physicians ignore reminders
- Patients ignore suggestion
 - E.g., ophthalmology exam

Automatic alerting architecture



Time (hours) until:
Treatment **Condition**
ordered **resolved**

	N	median (25-75%)	mean (SD)	N	median (25-75%)	mean (SD)
Inter- vention	94	1.0 (0.2-2.6)	4.1 (12.1)	89	8.4 (4.0-14.5)	14.4 (18.7)
Control	98	1.6 (0.6-4.2)	4.6 (9.1)	95	8.9 (5.4-23.2)	20.2 (28.5)
p value		0.003*			0.11	0.11

Kuperman JAMIA 1999;6:512-519

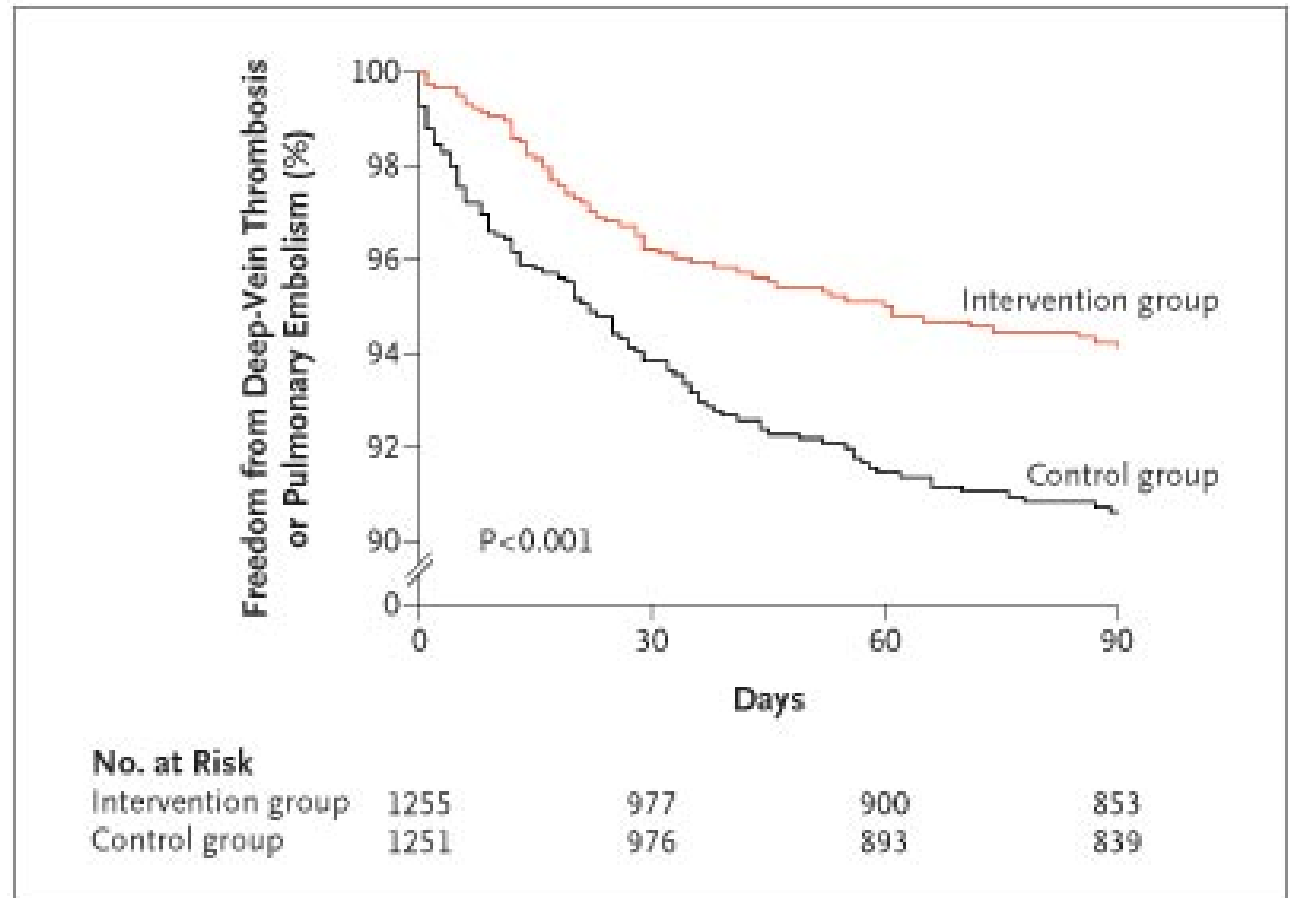
Impact of reminders to administer prophylaxis for venous thromboembolism on occurrence of deep vein thrombosis

Risk stratification algorithm including:

- Dx=cancer (3)
- Prior DVT (3)
- Hypercoagulable (3)
- Major surgery (2)
- Elderly (1)
- Obesity (1)
- Bedrest (1)
- OCs, HRT (1)

Score ≥ 4 defined as high risk

RCT; intervention group received alerts w/ option to order prophylaxis

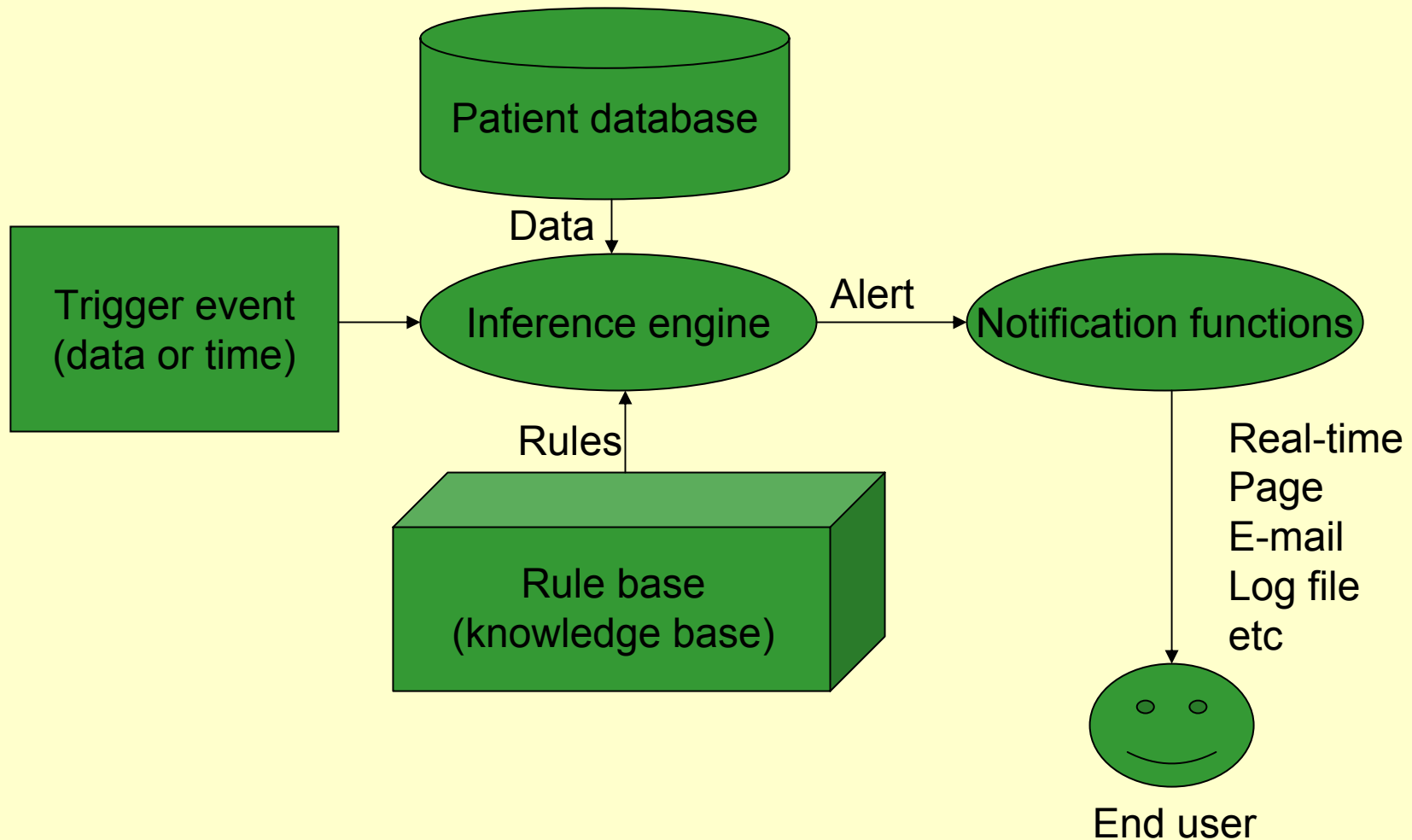


Kucher, N. et al. N Engl J Med 2005;352:969-977



The NEW ENGLAND
JOURNAL of MEDICINE

Model of knowledge-based CDS

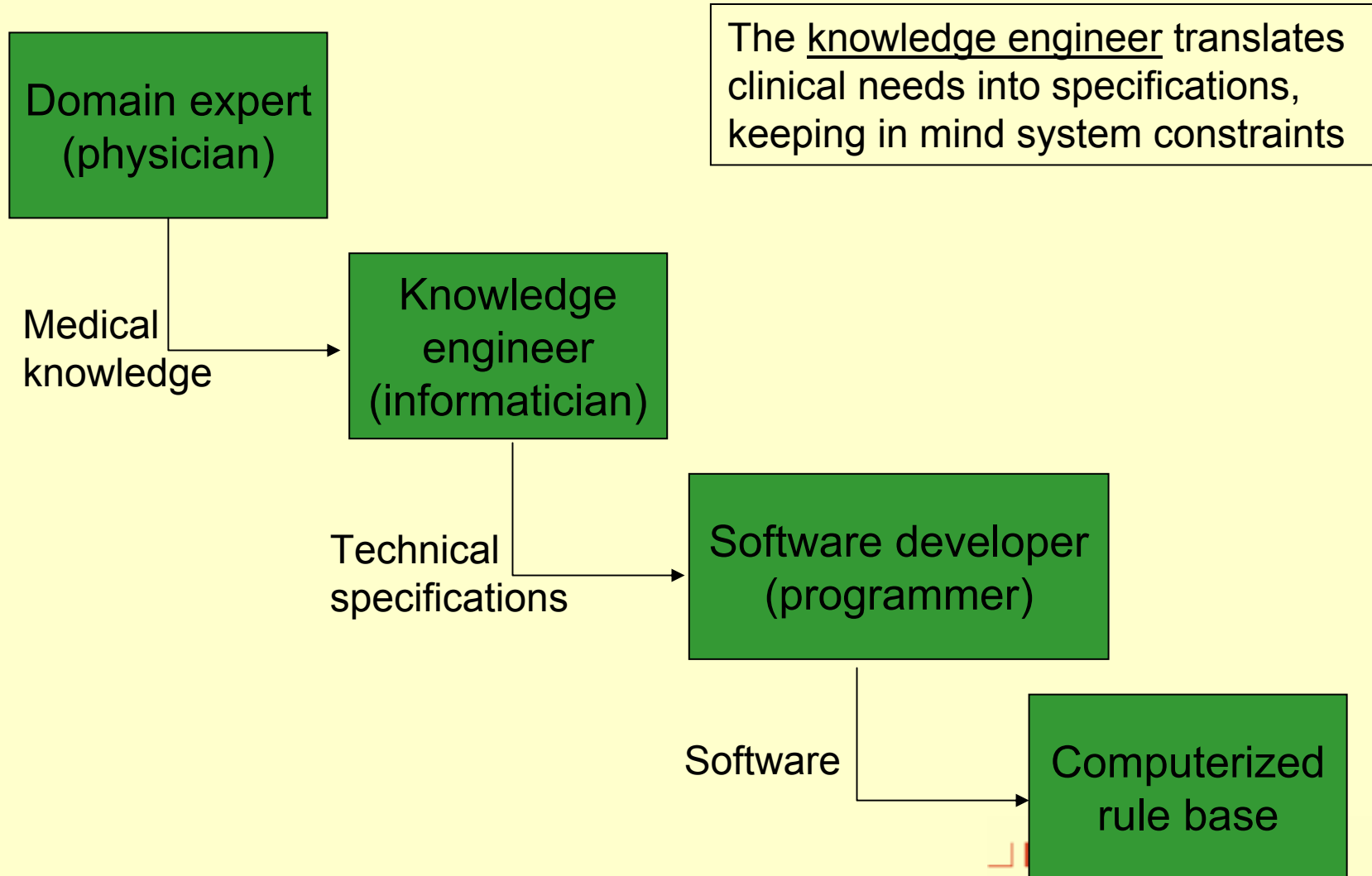




Prerequisites to knowledge-based clinical decision support

- Clinicians must be users of the system
 - E.g., prescribing for drug alerts
- Requisite data must already be present
 - “ask” infrequently
- Data must be structured and coded
- Need appropriate notification modalities
 - Tell the right person in the right way
- Must create and maintain knowledge-base
 - Knowledge engineering

Model for knowledge engineering



Knowledge engineering

- Hard, in and out of medicine ^{1 2 3}
- Must resolve ambiguities, vagueness, multiple opinions
- “Clashing” of rules
- Evolution of medication knowledge ⁴
 - Half-life of an AHRQ guideline is 5.8 years

1 Musen Comput Biomed Res 1992;25:435

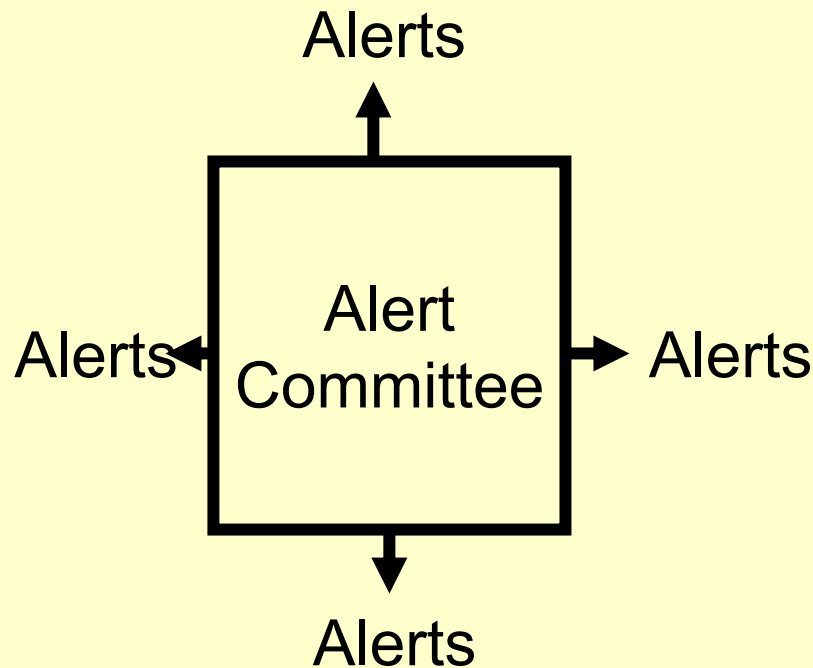
2 Hayes Roth, 1983

3 Lenat, 1990

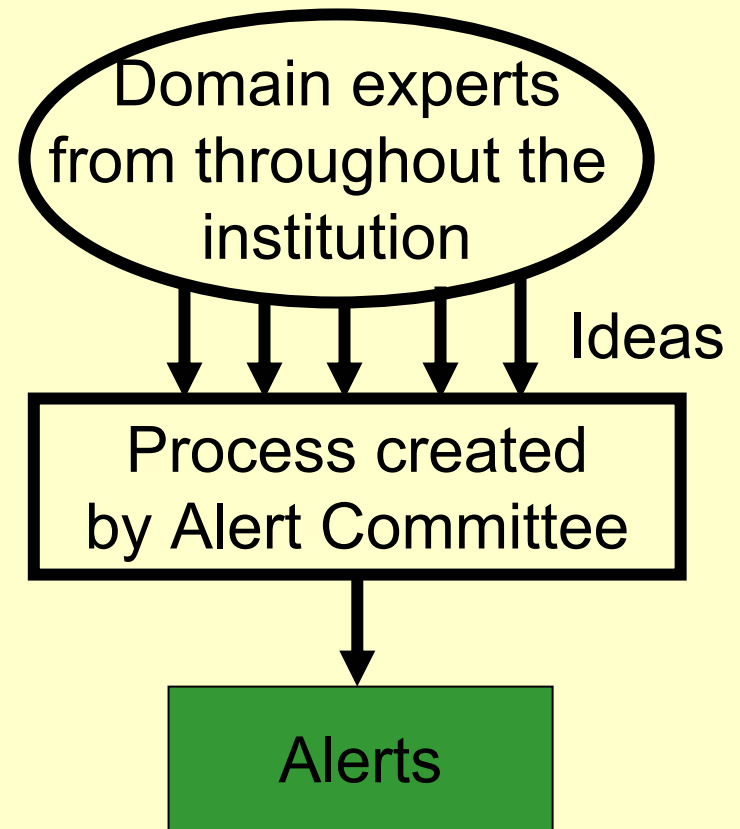
4 Shekelle, JAMA, 2001;286:1461

Knowledge engineering at NYPH

Old model



New model





NYPH alert request form

- Alert title
- Sponsoring dept or committee
- Requestor (contact person)
- Description of alert
- Rationale for alert
- Evaluation metric
- Applicable on all units or just some?



From request to software at NYPH

- 1 Sponsor completes request form
- 2 Alert Committee reviews form for completeness
- 3 Sends to technical team for estimate of work effort
 - May be complex; may require clarification of intent and negotiation of functionality
- 4 Prioritization of alert
- 5 Development begins

Maintenance of knowledge

- Review knowledge on a regular basis
 - Ostensibly, responsibility of sponsor
 - Retract the rule if not re-approved
- Easy in theory, hard in practice
 - People leave
 - People don't respond to e-mail
 - It's hard enough to do it once
 - The process requires resources
 - Need "teeth"
- Indiana does this well
 - Names and dates on the alerts

Quality on the ground

- What is quality informatics?
- Using IT to improve quality from the health care organization's perspective

Dimensions of Quality: NYPH view

***Clinical Excellence/
Safety, compliance
with guidelines***

***Efficiency/
Operational
Excellence***

***Service
Excellence***

- Patient/Family Is Focus
- Enhanced Care Experience
- Commitment to Patient

NYPH Quality Initiatives

– Regulatory Affairs

- JCAHO core measures
- NYSDOH cardiac measures
- JCAHO National patient safety goals

– Patient Safety

- Pyxis Overrides
- Incident reporting
- Ordering Alerts in Eclipsys

– Pay for Performance

- Oxford/UHC Contract (discharge/readmission)
- CMS Hospital Quality Measures

– Performance Excellence

- Length of Stay (Craniotomy, CAP)
- Radiology Wait Time
- Discharge Room TAT

– Research

- Perioperative beta blockers
- Heparin dosing algorithm
- Medications on the sterile field

– Health System Efforts

- Stroke Center Measures
- ED Indicators

Regulatory reporting requirements

Acronym	Full Agency Name
NQF	National Quality Forum's National Voluntary Consensus Standards for Hospital Care
CMS	Centers for Medicare and Medicaid Services Hospital Quality Alliance Data
JCAHO	Joint Commission on Accreditation of Healthcare Organizations Core Measures
NYSDOH	New York State Department of Health
NYSDOH-Surg	Cardiac Surgery/Society for Thoracic Surgery
NYSDOH-PCI	Percutaneous Coronary Interventions
AQHC	Agency for Quality Health Care
NNIS/CDC	National Nosocomial Infections Surveillance System / Centers for Disease Control
ACOS	American College of Surgeons Commission on Cancer Standard
NHCQR	National Healthcare Quality Report
NYODN	New York Organ Donor Network
UNOS	United Network for Organ Sharing
NSQIP	National Surgical Quality Improvement Program
NDNQI	National Database of Nursing Quality Indicators
PG	Patient Satisfaction Press Ganey for inpatient (PRC for ambulatory)
Comm Insurer	Various
Leap Frog	Leap Frog

Example: JCAHO core measures

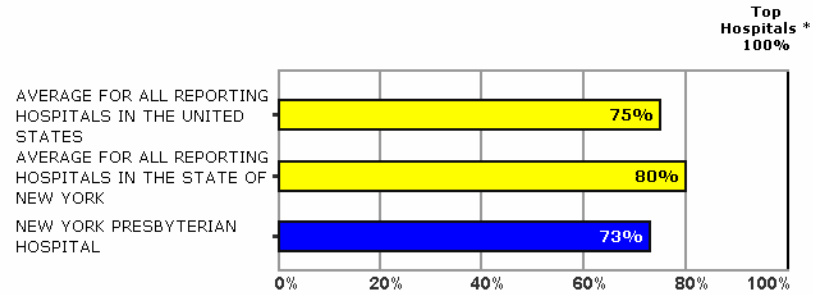
- Acute MI
 - ASA on admit and d/c, b-blocker on admit and d/c, ACEI for LV dysfunction
- CHF
 - Measurement of LV function
 - ACEI
- Community acquired pneumonia
 - Antibiotics with 4 hrs., oxygenation assessment, delivery of pneumovax
- Others suggested (and reported)
- If don't report, lose 0.4% of CMS update

Data collection form

Use of Thrombolytics and PCI Information		
Is there documentation of ST segment elevation or left bundle branch block (LBBB) on the electrocardiogram (ECG) performed closest to hospital arrival?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Was Thrombolytic Therapy received During Hospital Stay?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Thrombolytic Start Date (mm/dd/yyyy)	___/___/___	<input type="checkbox"/> Missing Date
Thrombolytic Start Time (HH:MM military)	___:___	<input type="checkbox"/> Missing Time
First PCI Date (mm/dd/yyyy)	___/___/___ Note : Must modify code and data from Administrative page	<input type="checkbox"/> Missing Date
First PCI Time (HH:MM Military)	___:___	<input type="checkbox"/> Missing Time
Left Ventricular Function Assessment Documentation		
LV Ejection Fraction Value From Report	_____ % Enter actual number rounded to a whole number. If a range is given, enter the mid-point value.	<input type="checkbox"/> Missing (If this data is missing, use the narrative LV function description field below)
Narrative LV Function Description	<input type="checkbox"/> Normal to Mild LVSD <input type="checkbox"/> Moderate to Severe LVSD <input type="checkbox"/> LVEF Unknown/UTD	Answer only if Ejection Fraction is unavailable or missing.
Is the left ventricular function documented as an ejection fraction less than 40% or a narrative description consistent with moderate or severe systolic dysfunction?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Use of ACEI and ARB Information		
Was the patient participating in a clinical trial testing alternatives to ACEIs as first-line heart failure therapy at DISCHARGE?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is a potential contraindication/reason for not prescribing an ACEI at Discharge documented?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is a potential contraindication/reason for not prescribing an ARB at Discharge documented?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Was an ACEI prescribed at DISCHARGE?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Was an ARB prescribed at DISCHARGE?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Smoking Cessation Advice and Counseling Documentation		
Did the patient smoke cigarettes anytime during the year prior to hospital arrival?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Was the patient given smoking cessation advice or counseling during this hospital stay?	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Graph 1 of 17

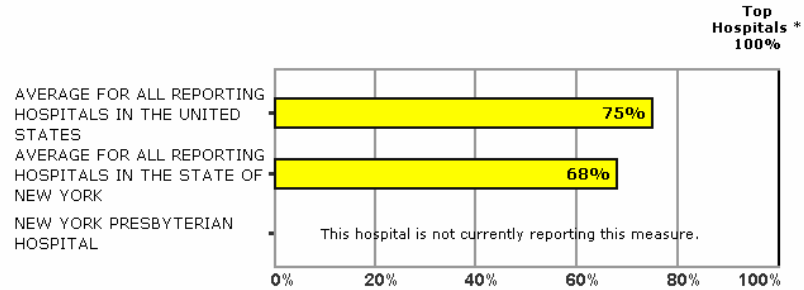
Percent of Heart Attack Patients Given ACE Inhibitor for LVSD



* Top Hospitals represents the top 10% of hospitals nationwide. Top

Graph 2 of 17

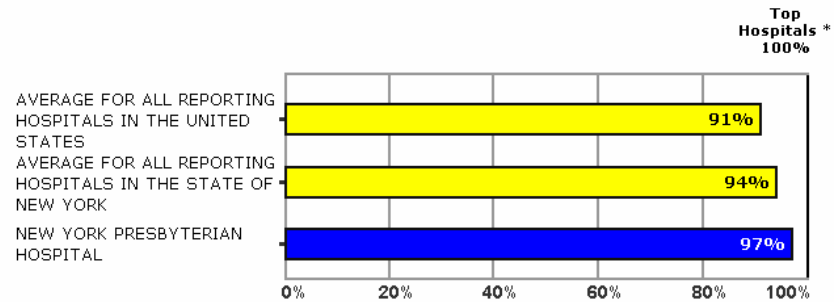
Percent of Heart Attack Patients Given Adult Smoking Cessation Advice/Counseling



* Top Hospitals represents the top 10% of hospitals nationwide. Top hospitals achieved a 100% rate or better.

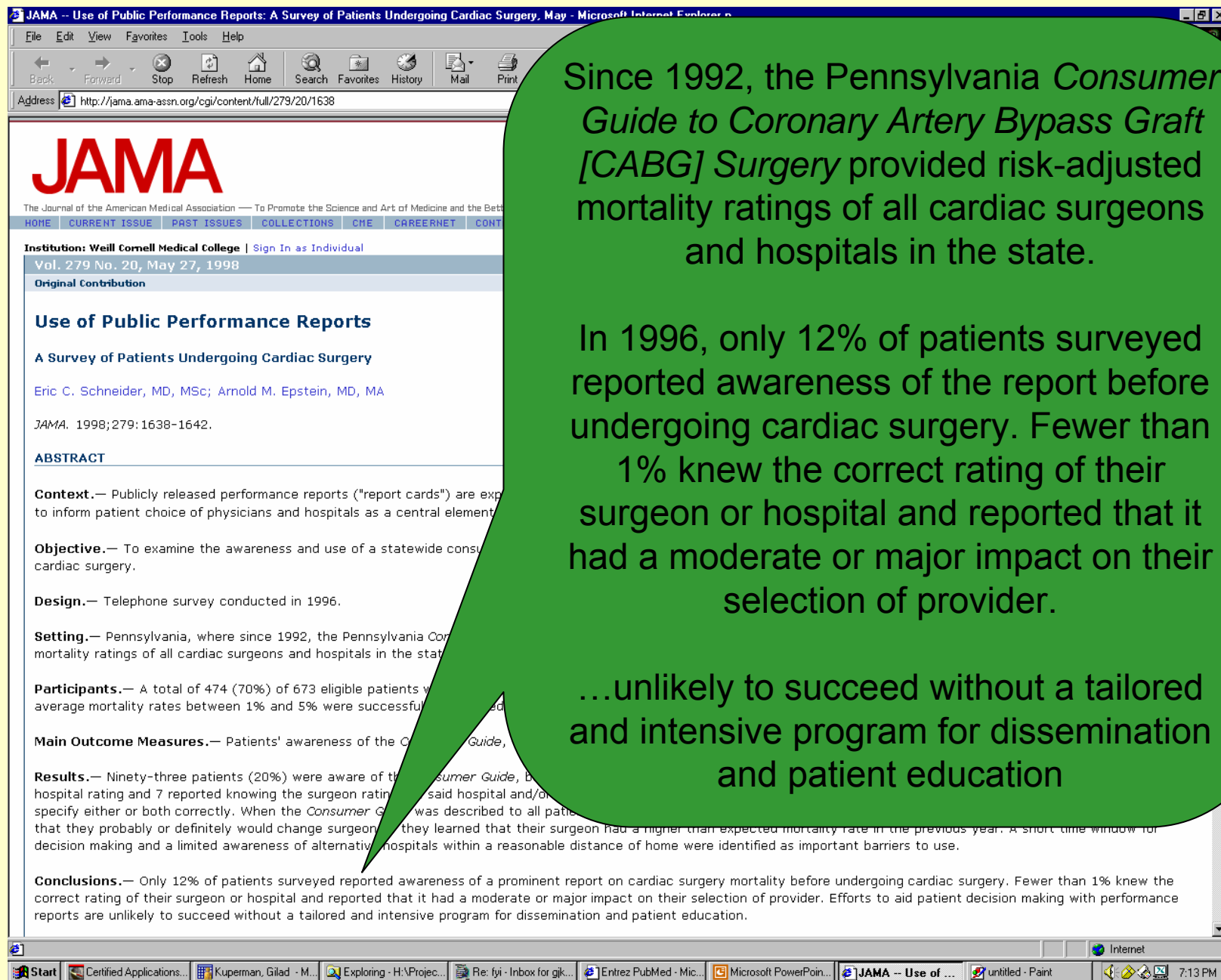
Graph 3 of 17

Percent of Heart Attack Patients Given Aspirin at Arrival



* Top Hospitals represents the top 10% of hospitals nationwide. Top hospitals achieved a 100% rate or better.

Impact of public reporting on patient decision making



JAMA
The Journal of the American Medical Association — To Promote the Science and Art of Medicine and the Betterment of the Human Condition

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Institution: Weill Cornell Medical College | Sign In as Individual
Vol. 279 No. 20, May 27, 1998

Original Contribution

Use of Public Performance Reports

A Survey of Patients Undergoing Cardiac Surgery

Eric C. Schneider, MD, MSc; Arnold M. Epstein, MD, MA

JAMA. 1998;279:1638-1642.

ABSTRACT

Context.— Publicly released performance reports ("report cards") are expected to inform patient choice of physicians and hospitals as a central element of patient decision making.

Objective.— To examine the awareness and use of a statewide consumer guide to cardiac surgery.

Design.— Telephone survey conducted in 1996.

Setting.— Pennsylvania, where since 1992, the Pennsylvania Consumer Guide to Coronary Artery Bypass Graft (CABG) Surgery provided risk-adjusted mortality ratings of all cardiac surgeons and hospitals in the state.

Participants.— A total of 474 (70%) of 673 eligible patients who had an average mortality rates between 1% and 5% were successfully interviewed.

Main Outcome Measures.— Patients' awareness of the Consumer Guide, their knowledge of their surgeon's and hospital's mortality ratings, and their reported impact on their selection of provider.

Results.— Ninety-three patients (20%) were aware of the Consumer Guide, but only 7 reported knowing the surgeon's and hospital's mortality ratings, and only 1 specified either or both correctly. When the Consumer Guide was described to all patients, 12% reported that they probably or definitely would change surgeons if they learned that their surgeon had a higher than expected mortality rate in the previous year. A short time window for decision making and a limited awareness of alternative hospitals within a reasonable distance of home were identified as important barriers to use.

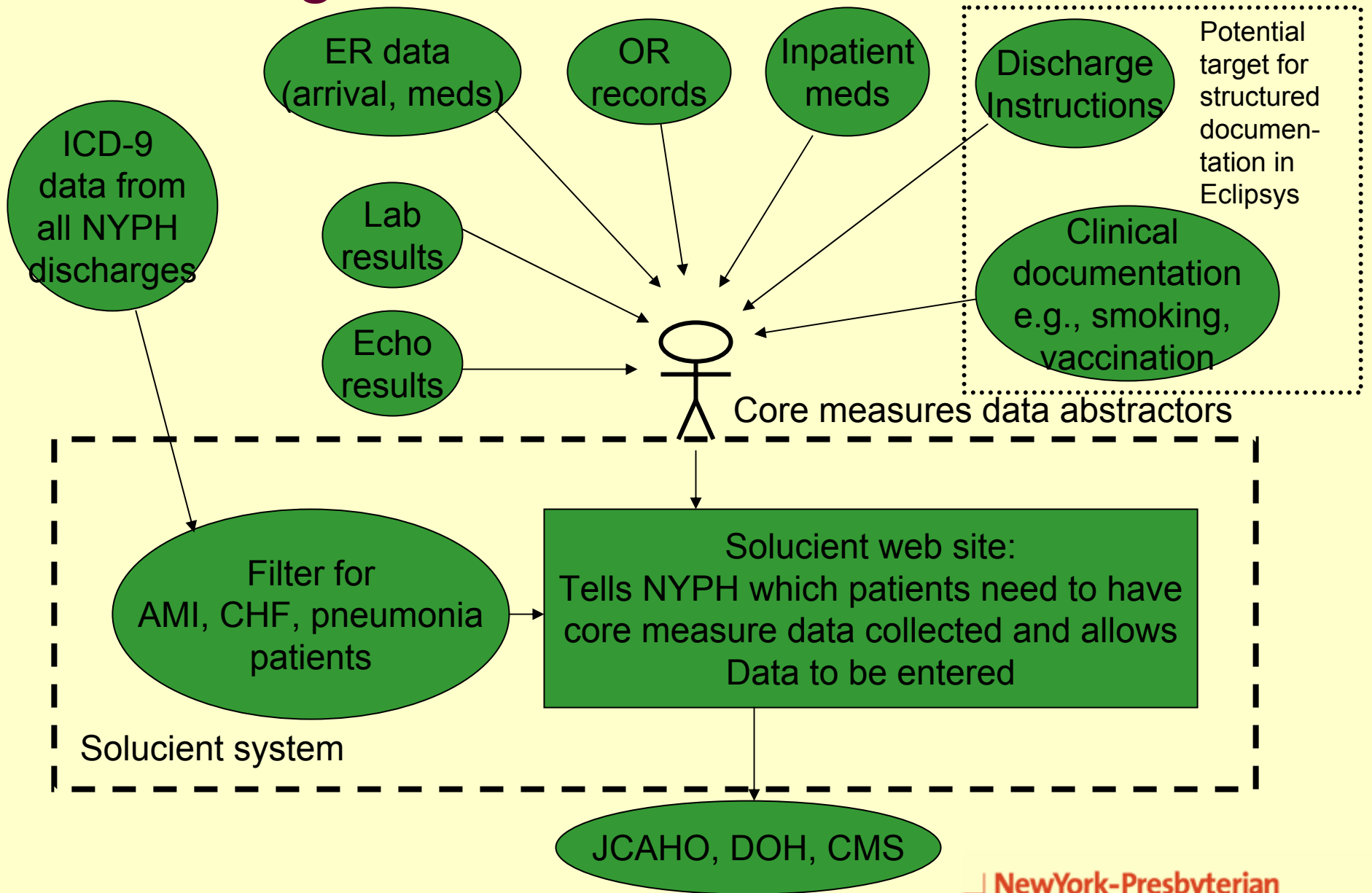
Conclusions.— Only 12% of patients surveyed reported awareness of a prominent report on cardiac surgery mortality before undergoing cardiac surgery. Fewer than 1% knew the correct rating of their surgeon or hospital and reported that it had a moderate or major impact on their selection of provider. Efforts to aid patient decision making with performance reports are unlikely to succeed without a tailored and intensive program for dissemination and patient education.

Since 1992, the Pennsylvania *Consumer Guide to Coronary Artery Bypass Graft [CABG] Surgery* provided risk-adjusted mortality ratings of all cardiac surgeons and hospitals in the state.

In 1996, only 12% of patients surveyed reported awareness of the report before undergoing cardiac surgery. Fewer than 1% knew the correct rating of their surgeon or hospital and reported that it had a moderate or major impact on their selection of provider.

...unlikely to succeed without a tailored and intensive program for dissemination and patient education

Management of core measures data



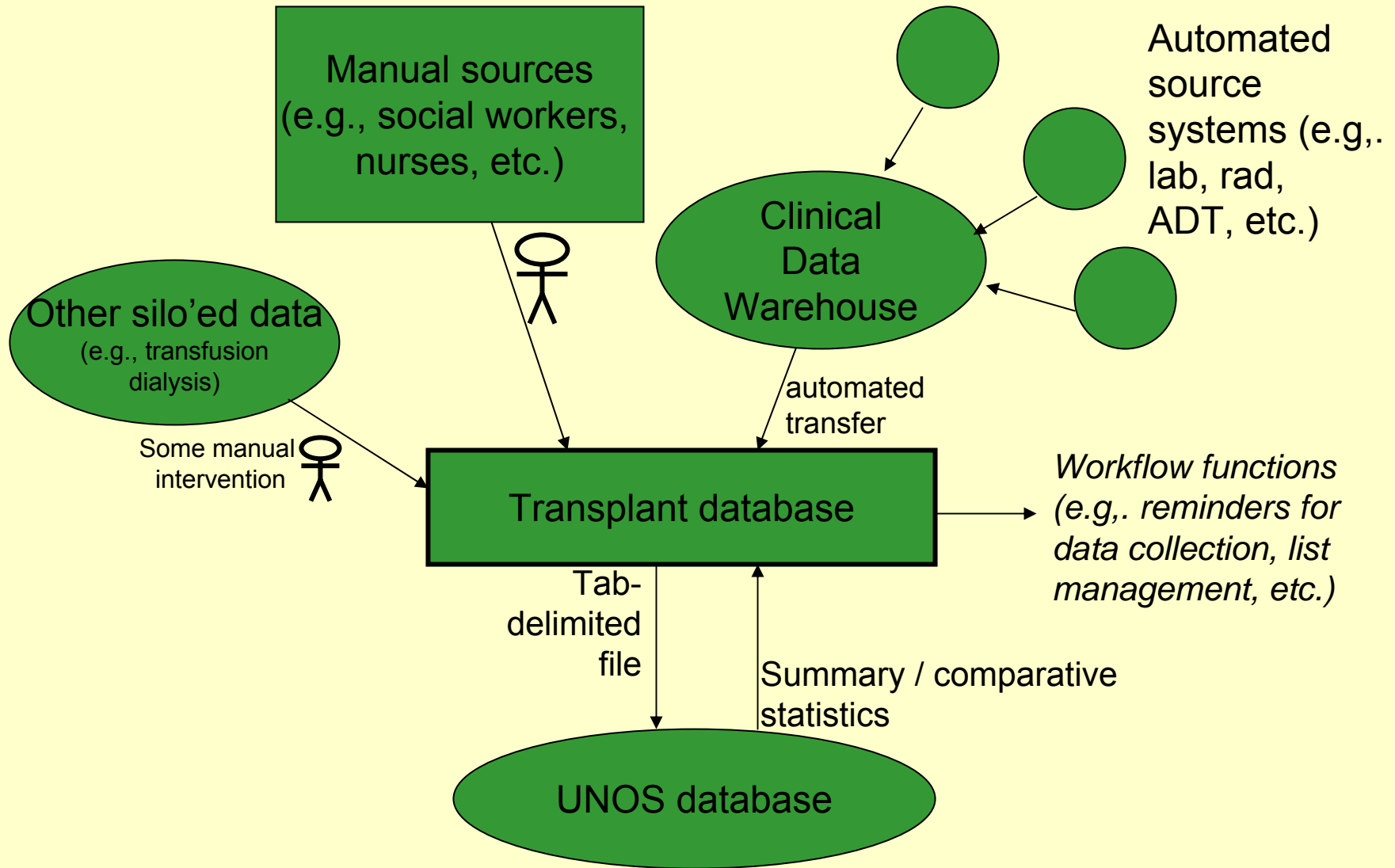
Transplant reporting requirements

- At wait list, at transplant and then at regular intervals
- Different kinds of patients
- Could be up to 100 elements for each patient at each point in time

Sample of transplant data

Between Listing & Transplant
Transfusions:
Pulmonary Embolism:
Infection Requiring IV Therapy within 2 wks prior to Tx:
Cerebrovascular Event:
Dialysis:
Implantable Defibrillator:
Prior Cardiac Surgery (non-transplant):
Prior Lung Surgery (non-transplant):
Episode of Ventilatory Support:
Tracheostomy:
Malignancies between listing and transplant:
Multiple Organ Recipient
Procedure Type:
Heart Procedure:
Was this a retransplant due to failure of a previous thoracic graft:
Total ischemia Time: Heart, Heart-Lung//Heart, Heart-Lung:
Incidental Tumor found at time of Transplant:
Graft Status:
Primary Cause of Graft Failure:
Post Txp Pre DC Events
Any Drug Treated Infection:
Stroke:
Dialysis:
Cardiac Re-Operation:

Management of transplant data



Cardiac surgery and PCI data

Cardiac Care - PCI Procedural Information NYState - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media

Address <https://cardiac.tspllc.com/CardiacCareNet/PCINYSTProcInfo04.aspx> Go Links >>

Cardiac Care Admin | Pat. Search | Pat. Summary | My Info | Help ? | Log Out

User: THEODORE, Vanitha **PCI NYState 2005** Pat. MRN: [] Go MRN: 1234568

Adm./Disch.	Proc info	Lesion Info	Acute MI Info	Pre-Inter Risk	Maj. Events	Validation	Reports
-------------	-----------	-------------	---------------	----------------	-------------	------------	---------

II. Procedural Information

Hosp. that perf. diag. cath: []

Primary physician perf. PCI: [] Date of PCI: [] (mm/dd/yyyy)

Time at start of procedure: [] (HH:mm in Military Time)

Diag. cath same lab visit: Yes No

Previous PCI this admission: Yes No Date of PCI: [] (mm/dd/yyyy)

PCI prior to this adm. & hospl: Yes No Date of PCI: [] (mm/dd/yyyy)

Procedure Related Medicines

Fractionated Heparin: Yes (Dalteparin): []
(Enoxaparin): []
(Nadroparin): []

Un-Frac Heparin: Yes (Unfractionate): []

Direct Thrombin Inhibitors: Yes (Argatroban): []
(Bivalirudin): []
(Lepirudin): []

If IV GPIIb/IIIa Platelet Inhibitors

Abciximab: Yes (Abciximab): []

All Others: Yes (Eptifibatide): []
(Tirofiban): []

Use of IV GPIIb/IIIa Plat. Inhib.: [] Timing: []

Thrombolytics

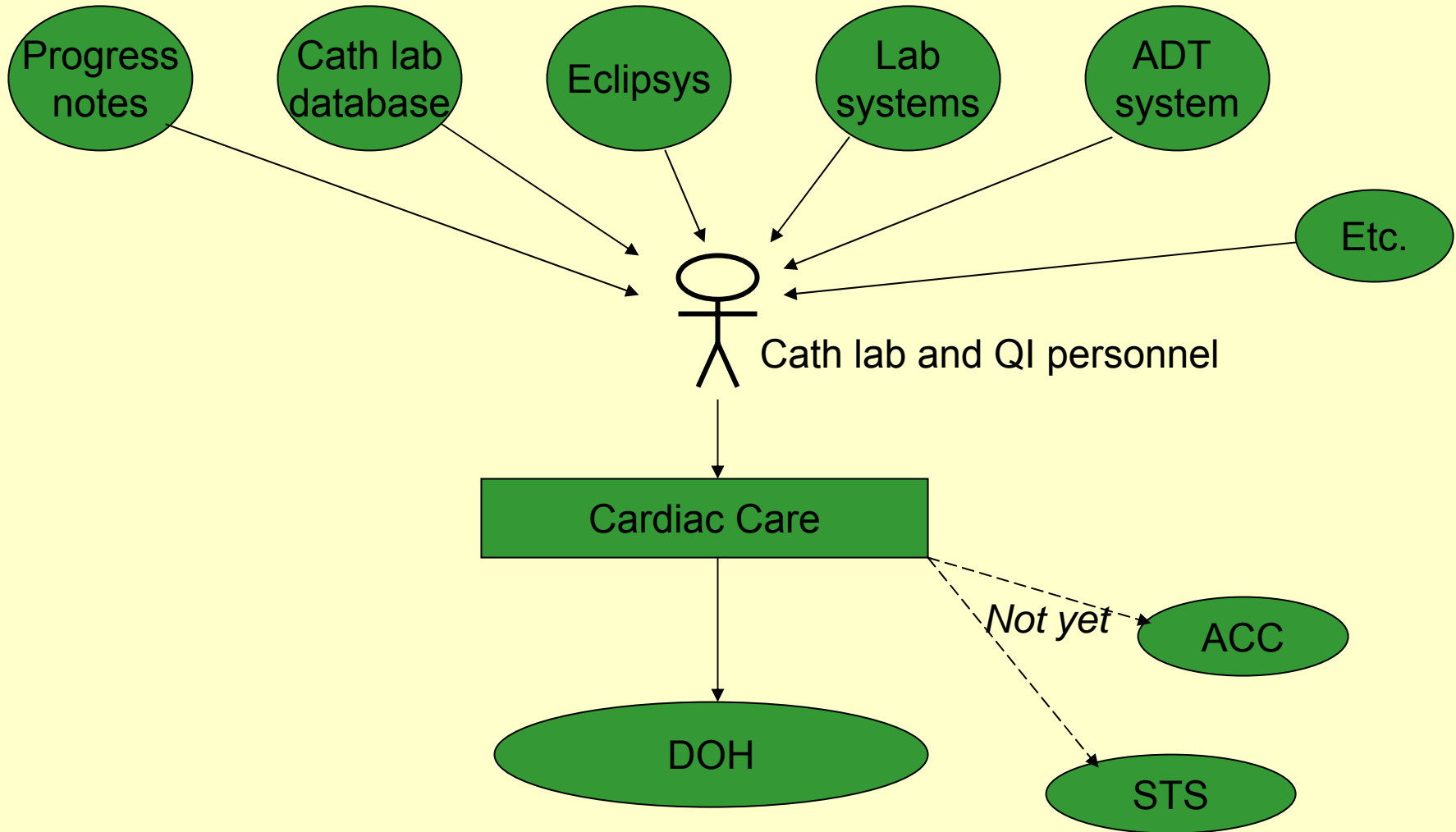
Thrombolytics: [] Contraindicated: Yes

Save Save Next Save & Exit Reset

Adm./Disch. Proc Info Lesion Info Acute MI Info Pre-InterRisk Maj Events Validation Reports

Management of cardiac data

Source systems



Is structured documentation going to help us?

Previous Open Heart Operations

- 1 One
- 2 Two
- 3 Three or more

Previous MI (most recent)

- 4 <6 hours
- 5 6-23 hours
- 6 days
(use 21 for 21 or more)
- 7 Check here if Transmural MI

- 9 Cerebrovascular Disease
- 10 Peripheral Vascular Disease

Hemodynamic Instability at time of procedure

- 12 Unstable
- 13 Shock

18 Congestive Heart Failure, Current

19 Congestive Heart Failure, Past

20 Malignant Ventricular Arrhythmia

21 Chronic Obstructive Pulmonary Disease

23 Extensive Aortic Atherosclerosis

24 Diabetes requiring medication

25 Hepatic Failure

27 Renal Failure, dialysis

28 Immune System Deficiency

30 Emergency Transfer to OR after Dx Cath

31 Emergency Transfer to OR after PCI

32 Previous PCI, this admission

33 PCI before this admission

38 Stent Thrombosis

39 Any Previous Organ Transplant

40 Heart Transplant Candidate

61 Cardiomegaly

62 Active Endocarditis

IV. Major Events Following Operation (answer *all* that apply)

0 None

1 Stroke (new neurological deficit) Intra-Op to 24 hrs

1A Stroke (new neurological deficit) over 24 hrs

2 Transmural MI (new Q waves)

4 Deep Sternal Wound Infection (bone-related)

5 Bleeding Requiring Reoperation

8 Sepsis or Endocarditis

9 G-I Bleeding, Perforation or Infarction

10 Renal Failure

13 Respiratory Failure

14 Unplanned Cardiac Reoperation or interventional procedure

Definition of CHF, current

- Within 2 weeks prior to procedure
 - Paroxysmal nocturnal dyspnea
 - Dyspnea on exertion due to CHF
 - CXR w/ pulmonary congestion
 - Lung exam positive for rales, treated w/ Lasix

Summary – regulatory reporting requirements

- Understand what data is needed for regulatory reporting requirements
- Which systems would make most sense to interface to CDW?
- What opportunity does automated clinical documentation offer?
 - Can documentation templates be created?
 - Can they be maintained over time?

JCAHO National Patient Safety Goals

- Improve the accuracy of patient identification
 - Use at least two patient identifiers (neither to be the patient's room number) whenever administering medications or blood products;
- Improve the effectiveness of communication among caregivers
 - For verbal or telephone orders or for telephonic reporting of critical test results, verify the complete order or test result by having the person receiving the order or test result "read-back" the complete order or test result.
 - Standardize a list of abbreviations, acronyms and symbols that are not to be used throughout the organization.
 - Measure, assess and, if appropriate, take action to improve the timeliness of reporting, and the timeliness of receipt by the responsible licensed caregiver, of critical test results and values.
- ★ Improve the safety of using medications
 - Remove concentrated electrolytes (including, but not limited to, potassium chloride, potassium phosphate, sodium chloride >0.9%) from patient care units.
 - Standardize and limit the number of drug concentrations available in the organization.
 - Identify and, at a minimum, annually review a list of look-alike/sound-alike drugs used in the organization, and take action to prevent errors involving the interchange of these drugs.
- ★ = may involve use of IT
- Improve the safety of using infusion pumps
 - Ensure free-flow protection on all general-use and PCA (patient controlled analgesia) intravenous infusion pumps used in the organization.
- Reduce the risk of health care-associated infections.
 - Comply with current Centers for Disease Control and Prevention (CDC) hand hygiene guidelines.
 - Manage as sentinel events all identified cases of unanticipated death or major permanent loss of function associated with a health care-associated infection.
- Accurately and completely reconcile medications across the continuum of care.
 - During 2005, for full implementation by January 2006, develop a process for obtaining and documenting a complete list of the patient's current medications upon the patient's admission to the organization and with the involvement of the patient. This process includes a comparison of the medications the organization provides to those on the list.
 - A complete list of the patient's medications is communicated to the next provider of service when it refers or transfers a patient to another setting, service, practitioner or level of care within or outside the organization.
- Reduce the risk of patient harm resulting from falls.
 - Assess and periodically reassess each patient's risk for falling, including the potential risk associated with the patient's medication regimen, and take action to address any identified risks.



“Pay for performance”

- Payers (employers) are instigating
- Several early examples
 - Outpatient and inpatient
- Differences in
 - Amount remunerated
 - Reward for structure/process/outcome
 - Fraction of patients affected
 - Can be competitive or not

CMS web site

Epstein NEJM 2004;350:406-410

Rosenthal Health Affairs 2004;23:127-141



CMS / Premier P4P pilot

- Started 2003; inpatient
- AMI, CHF, Pneumonia, CABG, hip/knee replacements
- Process and outcome measures
- Top 10% of hospitals get 2% bonus
- Will cost \$21 million over 3 years



P4P – outpatient examples

GE Bridges to Excellence (MA, etc.)

- \$55/year/diabetic patient if have registries, care coordination programs, EHRs and decision support
- Additional \$100/y/pt if MD is ADA-recognized
 - Requires large fraction of patient in compliance

Integrated Healthcare Association (CA)

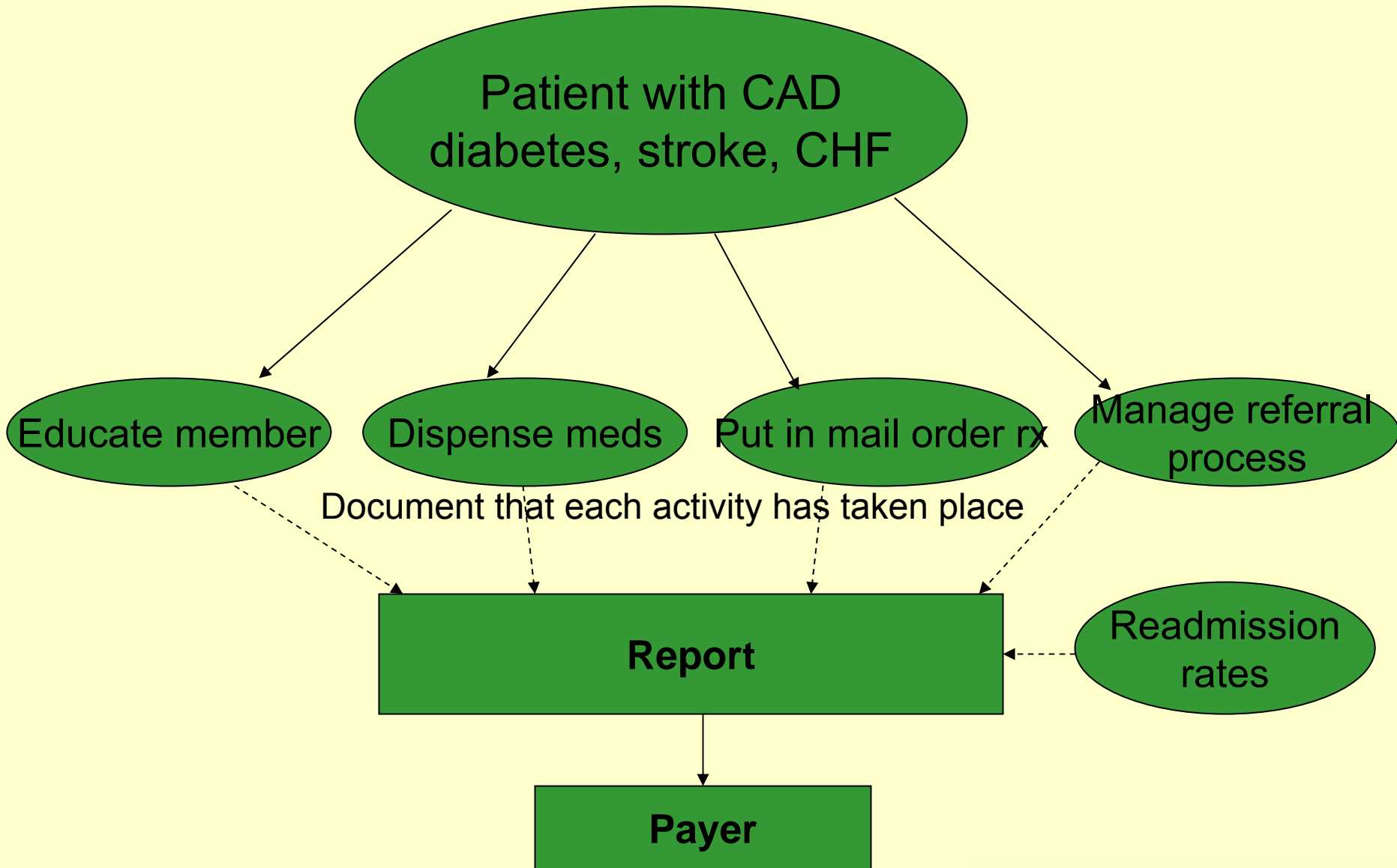
- Scorecard: 50% preventive and chronic disease measures, 40% patient satisfaction, 10% use of IT



An inpatient example

- Insurer – hospital system
- Patients w/ CAD, stroke, CHF, diabetes
- Hospital obligations
 - Pre-discharge education
 - Dispense take home medications and arrange for mail-order prescriptions
 - Arrange for visit to specialist
 - Document and report on each of the above
- Small graded increase in payment for each
 - Also benefit for reduced re-admission rate

Example P4P obligations



Issues in implementing P4P

- Ideally, would use IT to
 - Remind you to carry out the obligation
 - Assist in carrying out the obligation
 - Documenting the activity
 - Reporting
- Must create processes for each obligation
 - Determine who “effectors” will be
 - E.g., nursing, pharmacy, case management
 - Understand the workflow of each effector
 - Use IT effectively
 - Otherwise, will have manual processes
- Must work hard to fit IT into the process

Issues with P4P

- Mostly a mix of structure and process
 - Reward for outcomes uncommon
- Reward for performance, not improvement
 - Disincentive to those who may need help
- Take resource away from other activities
 - Pay for quality, or what we can measure?
- Targeting sub-processes may stifle more global innovations
- Providers needs sufficient numbers of patients
- A single provider may have many arrangements



The future of P4P

- No evidence yet of its efficacy
- Much to be learned
- Will probably increase over time
- Need to figure out how to turn “micro-improvements” into broad improvements
- Probably not sufficient in and of itself; should be combined w/ other approaches
 - IT, CDS
- Provides a stimulus for use of IT

What is Six Sigma?

- *Measurement*-based quality improvement strategy that focuses on process improvement and variation reduction
- Fixed sequence
 - Define
 - Measure
 - Analyze
 - Improve
 - Control
- Quantitatively rigorous
 - Means data is needed

Six Sigma

- Started by Motorola
- Popularized by GE
- Claim: can reliably improve quality and reduce costs of the enterprise
- Beginning to be used increasingly in health care
 - Extra challenge in health care: physicians as key decision makers

Six sigma at NYPH

- Adopted in a big way
- Currently, 40 “black belts”
 - Full time devoted to leading projects and implementing 6 sigma techniques
- 200 “green belts” – 20 days of training
- Huge culture change
- Many health care workers not used to using data-driven analytic techniques (!)
- Projects aligned with strategic goals

NYP 6 Sigma Projects

- **Cath/EP Room Turnaround Time**
- **Patient Wait Times in Radiology**
- **CT OR Room Turnaround Time**
- **Hip Fracture LOS**
- **Housekeeping Turnaround Time**
- **Non-Invasive Cancellation Reduction**
- **PACU Criteria Met to PACU Exit**
- **Billing Compliance for Screening Mammograms**
- **ED Throughput**
- **Craniotomy LOS**
- **Radiology Report Turnaround Time**
- **Transport Response Time for Patient Care Units**
- **Outpatient Lab Charge Capture**
- **Hem/Onc Infusion Center Cycle Time**
- **Outpatient Transplant Room Utilization**
- **Medical Records to Ambulatory Care**
- **Attending of Record Accuracy**
- **Antibiotic Utilization**
- **Psych ED LOS**
- **Accuracy & Timeliness of Pharmacy Charge Posting**
- **Medication Delivery Turnaround Time**
- **Radiology Turnaround Time in ED**
- **Timeliness of Cancer Registry TNM Staging**
- **Ambulatory Surgery Turnaround Time**
- **Antibiotic Delivery in Cardiothoracic ORs**
- **Scheduled Induction Wait Time in L&D**
- **Blood Delivery Turnaround Time**
- **Pyxis Overrides**
- **Smoking Cessation Counseling**
- **Nursing Communication Patient Satisfaction**
- **Ambulatory Surgery Wait Time**
- **ICU Throughput**
- **Intradisciplinary Plan of Communication**
- **Isolation Room Throughput**
- **Use of Abbreviations in Medical Records**
- **Information Transfer for Antenatal to L & D**
- **Improve AOB Process in Radiology**
- **Inpatient Tray Accuracy**
- **Call Bell Response Time**
- **Discharge Instruction Process**

An example:

**Children's Hospital of New York-Presbyterian
February 2004 – October 2004
PICU Stay Reduction for Post-operative
Cardiac Patients**

Project Mission:
Improve the quality of care for postoperative cardiac patients at Children's Hospital of New York-Presbyterian by reducing PICU length of stay to target values, and reduce inpatient costs .



Project Successes:

- Reduce ICU length of stay to targets (4 diagnoses)
- Save roughly \$327K (annual)

PICU Stay Reduction for Post-operative Cardiac Patients

MICHIGAN SEP 2002 - AUG 2003 DATA (Source: UHC)

	TOF Repair 35.91		FONTAN 35.94		GLENN 39.21		AV CANAL 35.63,54,73	
	Total	* ICU	Total	ICU	Total	ICU	Total	ICU
Mean	14.2	9.1	14.31	3.60	11.75	4.10	11.1	5.7
Standard Error	2.7		2.22		2.04		1.4	
Median	9.0		10.0		7.5		7.5	
Mode	5		9		7		6	
Standard Deviation	17.7		16.3		12.9		8.4	
Sample Variance	311.6		265.62		167.27		71.2	
Kurtosis	26.9		36.04		23.05		(0.2)	
Skewness	4.8		5.66		4.44		1.1	
Range	111		115		78		29	
Minimum	4		6		4		2	
Maximum	115		121		82		31	
Sum	598	381	773	192	470	164	421	215
Count	42	42	54	54	40	40	38	38

* Team questioned the calculation of this benchmark:

- May include neonates
- May include more complex pts, e.g. pulmonary atresia
- May include pre-op PICU stay

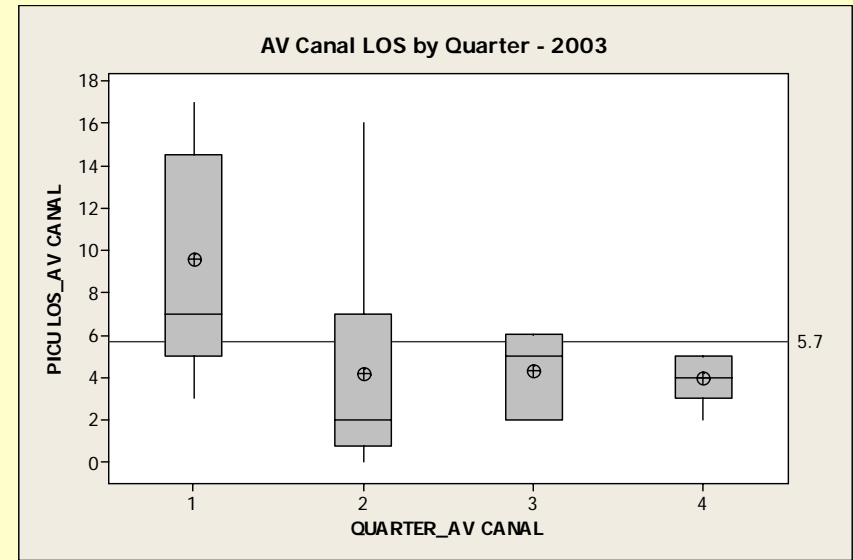
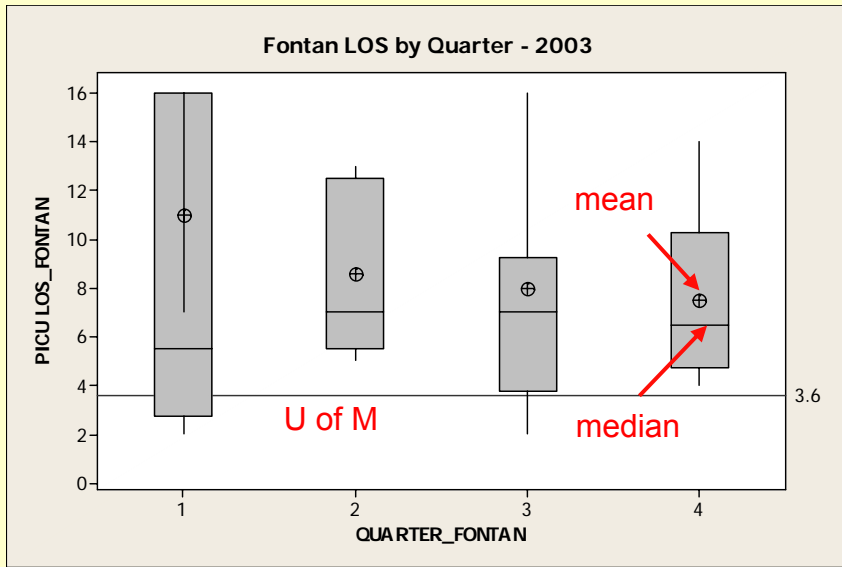
No other benchmark data available at start of project

Dx/Proc	CHONY 2003 Baseline				U of M Benchmark
	2003 Cases	Mean	Std Dev	Median	Mean
TOF	43	8.21	17.27	4	9.1
Fontan	31	8.58	8.03	7	3.6
Glenn	50	9.86	15.3	5	4.1
AV Canal	23	6.26	5.14	5	5.7
	147				

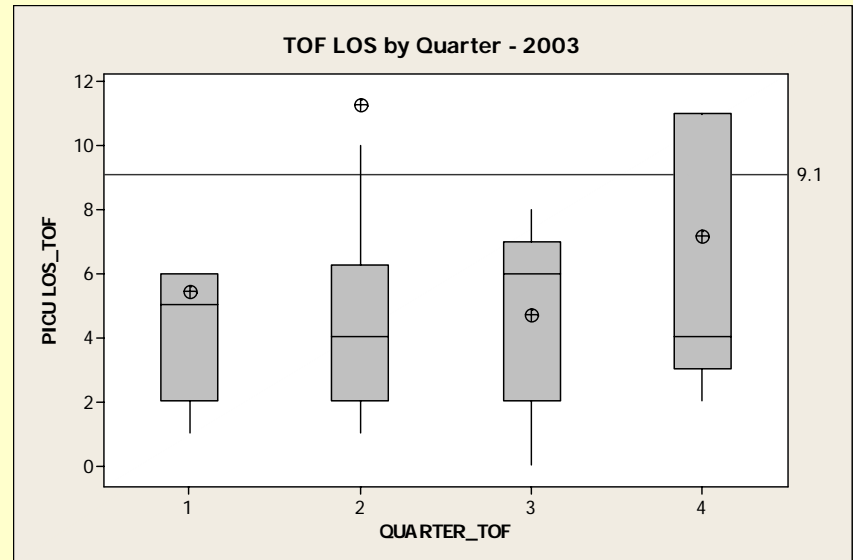
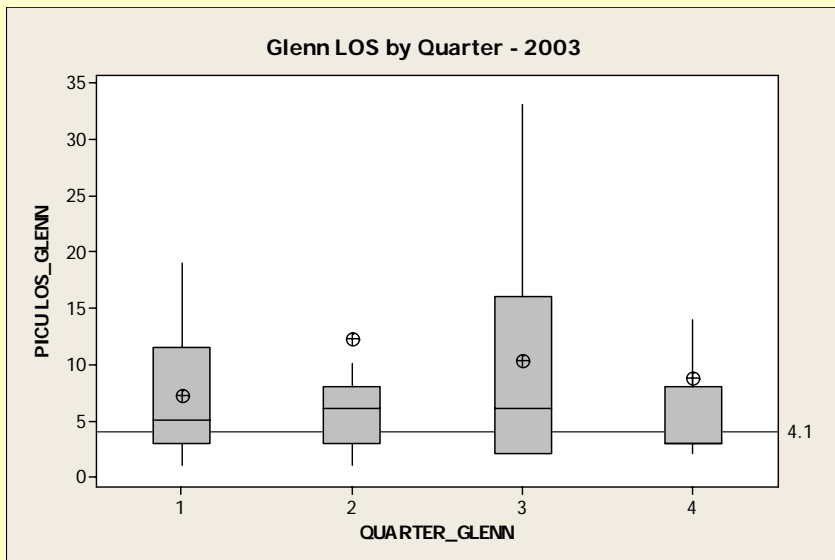
The team compared CHONY baseline to University of Michigan benchmarks to select Operative Procedures for project focus

PICU Stay Reduction for Post-operative Cardiac Patients

Baseline
Data



Boxes represent interquartile range



PICU Stay Reduction for Post-operative Cardiac Patients

Predictors

23 variables were studied.

3 Variables found to be significant:

- 1) Postop day of extubation***
- 2) Postop day of pressor wean***
- 3) Preop RSV infection***

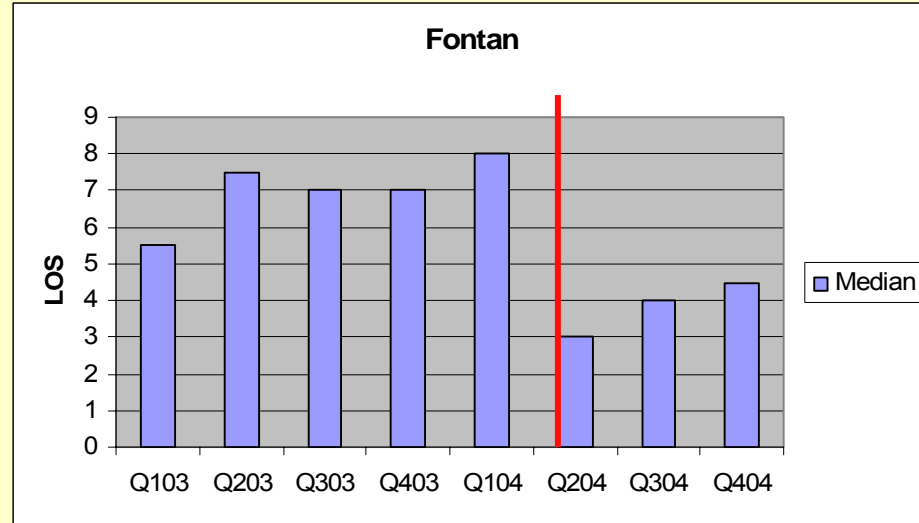
Data Element	Source
PICU LOS	TSI
Procedure	TSI
RSV + Y/N	chart
Fenestration Y/N	chart
JET Y/N	chart
CPAP Y/N	chart
Pre Op stay Y/N	TSI
PreOp LOS	TSI
Pleural Effusion Y/N	chart
Discharge Day of Week	TSI
Temp Pacemaker Y/N	chart
Permanent Pacemaker Y/N	chart
Post Op Sepsis Y/N	chart
Age of Pt at Surgery	TSI
Previous Cardiac Surgery Y/N	TSI
Age of Pt at previous surgery	TSI
PICU Discharge Time of Day	TSI
POD Extubation	chart
POD Chest Tube D/C	chart
POD Pressor D/C	chart
POD IV Lasix Push	chart
POD IV Lasix Drip	chart
POD Central Line D/C	chart
Surgeon	TSI

After multivariate analysis of clinical parameters expected to affect LOS, the team proposed several interventions:

<p>Factors Correlated with Long Stay</p>	<p>Interventions</p>
<p><i>Postop day of Vasopressor weaning</i></p>	<ul style="list-style-type: none"> • Rapid weaning from inotropes, consistent with nursing guidelines for BP, HR and perfusion • Consider switching to oral agents (afterload reducers and digoxin) within 48 hours of surgery
<p><i>RSV +</i></p>	<p>Preoperative RSV screening to include:</p> <ul style="list-style-type: none"> • nasal washings for symptomatic patients • CXR and CBC with differential • Parents instructed to call with any change in clinical status • Symptomatic patients with negative tests are discussed case by case with CT surgery • Use of Synergis prophylaxis

Fontan – Pre and Post Improvement

Quarter	N	Mean	StDev	Median
Q103	6	11	15.81	5.5
Q203	6	8.5	3.27	7.5
Q303	13	8	6.57	7
Q403	7	10.29	8.08	7
Q104	3	11	7.94	8
Q204	7	6.86	9.77	3
Q304	10	6.8	9.987	4
Q404	10	5.4	4.326	4.5



First three quarter's results (n= 27) show reduced median and mean LOS

Six sigma -- summary

- Data driven
- Puts demands on IT
- Challenge: Projects are ad hoc
 - Could be any kind of data that is required
- As with regulatory, trying to understand the kinds of data that are required to prioritize our warehousing strategy
- Structured documentation will help somewhat

IT and Quality: Summary

- Quality problems exist in health care
- IT in general, EHRs, and CDS can help
- Getting a solid EHR platform is important
- Warehousing architecture is important
- Structured documentation can be a source of data, but still will leave gaps
- Regulatory requirements are rampant
 - Some cannot be addressed by IT
- Quality requirements and IT capabilities currently are not well aligned
 - Each need to shift
- There are hard problems out there
 - Leadership and innovation is important