The VA Cardiovascular Assessment, Reporting, and Tracking System for Cath Labs

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Broad Background

- <u>Congressional mandate</u>: VA to provide care 'at least equivalent' to non-VA sector
  - Explicit comparison required
- <u>Problem</u>: No direct VA and non-VA clinical data available on representative scale
  - Internal quality improvement programs
  - Electronic medical record, but significant clinical data in narrative text
  - Administrative and pharmacy databases
- <u>Concern</u>: Veterans have more comorbidities, worse health status, lower SES than non-Veterans

Grover FL et al. Ann Thorac Surg 1994; Selim AJ et al. JAGS 2004; Rogers WH et al. J Ambl Care Manage 2004

On a positive note…..

- Previous comparative studies support equivalent VA cardiac care
  - No difference in post-MI mortality
  - VA patients at least as likely as Fee-For-Service patients to receive guideline indicated medical therapy for MI

↓

Acute MI

Petersen LA et al. NEJM 2000;343:1934
Peterson LA et al. Circulation 2001;104:2898
Fihn SD NEJM 2000;343:1963

The Harvard Report

- Comparison of matched VA and Medicare AMI patients 1997-1999 (n=13,129 in each group)
- Main Results:
  - VA patients traveled further to hospital with MI
  - VA patients much less likely to be admitted to hospital with onsite cardiac cath facilities
  - One year mortality: VA 34.5% versus Medicare 30.9%
  - 30-day revascularization: VA 22.0% vs. Medicare 44.9%
- Limitations: Veterans more comorbidities & lower estimated SES, administrative data, missing key clinical data

Landrum et al. Health Serv Res 2004;39:1773-1792
Heidenreich PA, Health Serv Res 2004;39:1793-1798

As if that weren't enough…

- New England Journal of Medicine, 2003
  - 1,665 VA patients; 19,305 Medicare patients
  - VA patients less likely to undergo cardiac cath when indicated by guidelines at time of AMI
    - 44% versus 51%
    - Odds Ratio for cath (VA vs Medicare) = 0.75 (95% CI 0.57-0.96)
  - 'There is underuse of needed angiography after AMI in both the VA and Medicare systems, but the rate of underuse is significantly higher in the VA'

Petersen LA et al. NEJM 2003;348:2209

VA Response

- Cardiac Care Initiative
  - Regional cardiac care plans (hub/spoke model) and local ACS care pathways
  - New cath labs
  - National VA performance measures
  - Chart review of all AMI and unstable angina patients
 - **Focus on cardiac procedures – How many, In whom? Results? Safety?**

Black Hole

- Number of cath labs in VA
  - 70, 72, 75 ?
- Number of cath labs in VA using different log / reporting / database systems
  - 70, 72, 75 ?
- VA administrative data compared to individual cath lab logs
  - Average discrepancy 40%
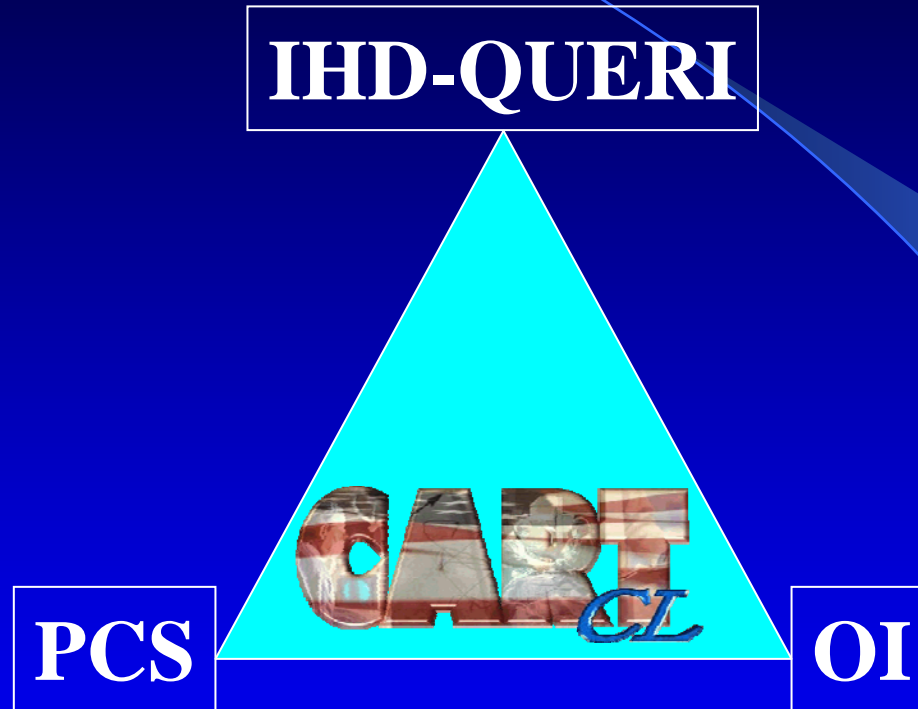- No QI program for cardiac care/procedures

The CART-CL Project

Cardiovascular Assessment Reporting and Tracking System for Cath Labs

Create a national VA cath lab data repository, including software for data entry and report generation for <u>all</u> VA cath labs, as part of a national QI program
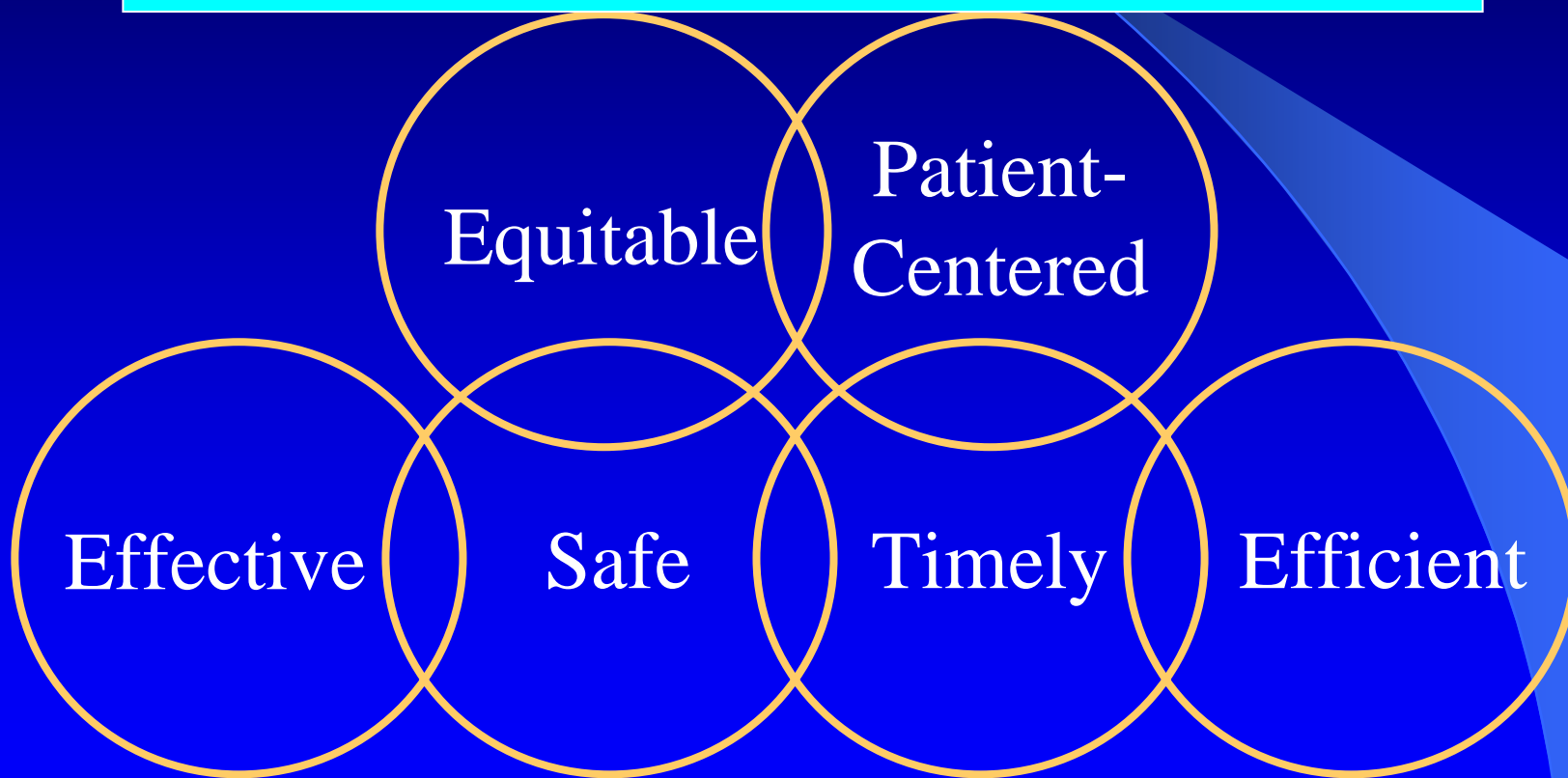
Who?

IHD-QUERI

PCS

OI
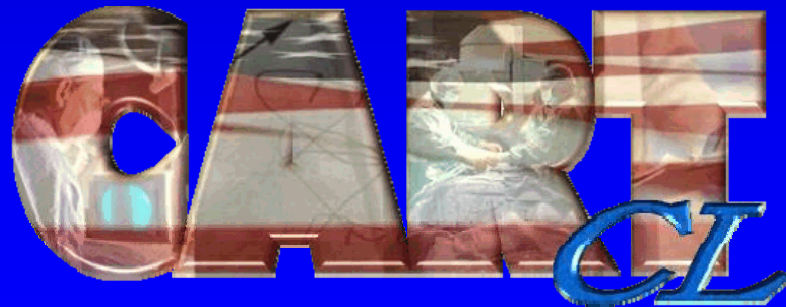
- <u>Other key collaborators / communications</u>: OQP, VISN Directors/CMO's/ISO's, Clinical Procedures, DSS, FDA, ACC, Individual Facilities (administration, clinical, technical, ISO), PBM, CICSP, ViSTA Imaging, etc.

What?

Highest Quality Health Care

Equitable

Patient-Centered

Effective

Safe

Timely

Efficient

Project Requirements

➤ Software must be clinically useful
  - No duplicate data entry
  - Used as part of <u>regular</u> clinical care
    - Pre-Procedure, Diagnostic Procedure, & PCI report generation for CPRS, while automatically capturing key data
    - No new personnel
  - Flexible graphical user interface combining categorical data entry and 'free' text
  - Core of American College of Cardiology data elements/standards

More Requirements

- Integrated with CPRS
  - Launch within CPRS; Flow of data to and from CPRS
- Easy to modify/update/expand
  - New/evolving clinical, administrative, regulatory needs
- Centralized national data repository
  - Not '75 databases for 75 cath labs'
  - National workload capture for VA (link to DSS/PCE/billing)
  - Support local QA for sites (access to their own data)
  - National QI program – feedback to sites with benchmarking, both within VA and VA / non-VA

Timeline

- June 2003: 'Seed' funding from Patient Care Services

- August 2003-present: Software development
  - Small group of clinicians (3) working directly with small group of technical folks (programmer, database architect)

- Feb 2004: Prototype demo to VA National Leadership Board

- May 2004: Project funding

- June 2004: Software deployment, Denver VAMC

Timeline, *con't*

- <u>July-Dec, 2004</u>: 'Beta testing' (6 sites)
- <u>Jan, 2005</u>: Data repository 'live'
- <u>Jan, 2005-present</u>: Incremental national installation with ongoing clinical testing / feedback / modification / expansion
- As of today, all 75 sites installed or in process

More Technical (slightly)

- Model-driven application
  - Extensible database
  - Extensible application
  - Over 95% of application is not directly coded
- Data repository = Microsoft SQL server
- Software developed in Delphi
- Integration with CPRS via RPC's

VistA CPRS in use by: Gethofer,Hans (vista.denver.med.va.gov)

File   Edit   View   Tools   Help

ZZTIU T
000-00-04

Primary Care Team Unassigned

Flag   Remote Data*   Postings   WAD

Tools menu (open):
ECHCS Home Page
VISTA IMAGING (ECGs,ETTs,Mammos)
iMedConsent + Pt Edu
  Electronic Consent FAQs
VISTAWEB (remote VA data)
View Vitals
Vitals Entry
IMAGING PACSWeb
*** What is New in CPRS? ***
Surgery: On-Call Schedules
VISTA
Education
Patient Education Handouts
GFR Calculator
Patient Safety Report
DENTAL RECORD MANAGER PLUS
EventCapture
MH ASI-MV
MH Testing
ROES3
FIM
AudiogramDisplay
AudiogramEdit
CART EL.
My Health-e-Vet
VISN19 DOCUMENTS
CAIRO Hand-off
VIC Issuer
Lab Provider Notices
Graphing...   Ctrl+G
Lab Test Information...
Options...

Active Problems
Hepatitis C Car
Pulmonary Emb
Hyperlipidemia
Diabetes Mellit
Benign Essenti
Hepatitis C Car
Chronic Obstru
Otitis Media, Su
Copd (ICD-9-CI
Schizophrenia
Adjustment Dis
Congestive He
Postsurgical Ac
Postsurgical Pe
Atrophy Of Ede
Diabetic Retinc
Disc Drusen
Glaucoma-Low
Benign Hyperte
*Subjective Tin
Neck Pain (ICD
Pain In Joint In
Background Di

Allergies / Adverse Reactions
Tuberculin Purified Protein Derivative (manto
Animal Hair
Sulfa Drugs
Fluoroquinolones

Postings
Allergies
Clinical Warning   Mar 20,2006
Pain Opiate Agreement   Sep 09,2005
Outside Medications   Jan 02,2002
Outside Medications   Jan 02,2002
Advance Directive Social Work Note
Advance Directive Social Work Note
Advance Directive Social Work Note
Advance Directive Scb   Jul 18,2000

Active Medications
Non-VA Multivitan
Non-VA Aspirin 32
Non-VA Aspirin Ta
Non-VA Zz Evenin
Non-VA Ginkgo E

Clinical Reminders   **Due Date**
ECH ALCOHOL USE SCREEN   Mar 24,05
ECH CHF WEIGHT INSTRUCTIONS   DUE NOW
ECH DIABETIC A1C   Jul 08,04
ECH DIABETIC FOOT EXAM   DUE NOW
ECH DEPRESSION SCREEN   DUE NOW
ECH FLU INJECTION   DUE NOW
ECH SCREEN FOR PTSD   DUE NOW
ECH TOBACCO USE SCREEN   Dec 02,03

Recent Lab Result
No Orders Found.

May 23,2006 15:28   (37.0 C)
Jul 19,2006 09:37   APICAL,LYING,LEFT,AT REST
Jul 19,2006 09:37   LYING,AT REST
BP   130/80   Jul 24,2006 13:58
HT   69 in   May 29,2003 08:18   (175.3 cm)
WT   350 lb   Nov 17,2004 08:42   (158.8 kg)   ACTUAL,S
PN   0   Feb 06,2006 10:52
POX 90   Jul 19,2006 09:37   1.0 l/min 80%
BMI 51.79   Nov 17,2004 08:42

Appointments/Visits/Admissions
May 01,2007 13:00 Ms Multiple Scler

Cover Sheet | Problems | Meds | Orders | Notes | Consults | Surgery | D/C Summ | Labs | Reports

CART-CL (Beta 2.3.3) in use by: GETHOFER,HANS

File   Edit   Report   Help

ZZTIU TEST,PATIENT SON
000000460   4/4/1960   47   [New Report]

| Presentation | History | Tests | Physical Exam | Medications | Labs | Sedation/Consent | Summary |

Prior Cardiac History >

CHF
[Yes ▼]

MI   Most recent
[Yes ▼]   [2001 ▼]

PCI   Most recent
[Yes ▼]   [▼]

CABG   Most recent
[Yes ▼]   [▼]

Valve Surgery   Most recent
[No ▼]   [▼]

Cardiac Transplant   Most recent
[No ▼]   [▼]

Cardiac Cath   Most recent   Result
[▼]   [▼]   [▼]

[...] Comments
[   ]

Comorbid Conditions

Peripheral Vascular Disease   Cerebrovascular Disease   Chronic Lung Disease
[No ▼]   [Yes ▼]   [Yes ▼]

Depression   Sleep Apnea
[▼]   [▼]

PTSD   Renal Insufficiency   On Dialysis
[▼]   [▼]   [▼]

[...] Comments
[   ]

Cardiac Risk Factors

Hypercholesterolemia   Hypertension   Diabetes
[Yes ▼]   [Yes ▼]   [Yes ▼]

Family History of CAD   Tobacco Use History
[▼]   [Current ▼]

[...] Comments
[   ]

| Reports | Pre-Procedure Assessment | Cath/Other | PCI |

New   Assessment report

File　Edit　Report　Help

ZZTIU TEST,PATIENT SON
000000460　　4/4/1960　　47　　| New Report |

| Presentation | History | Tests | Physical Exam | Medications | Labs | Sedation/Consent | Summary |

*	Name	Value	Date	Comment	Alert	Range	Source
*	Potassium	4.2	05/14/2006 16:08			3.5 - 5.1	VistA
	Potassium	4.2	05/14/2006 16:08			3.5 - 5.1	VistA
*	CK	258	11/03/2005 08:18		High	21 - 150	VistA
	CK	258	11/03/2005 08:18		High	21 - 150	VistA
*	Hematocrit		10/05/2005 15:04			42 - 54	VistA
*	Platelets		10/05/2005 15:04			150-400	VistA
*	INR	1	12/23/2005 13:31			.91 - 1.08	VistA
	INR	1	12/23/2005 13:31			.91 - 1.08	VistA
*	Cholesterol total	254	11/04/2005 13:14		High	135 - 200	VistA
	Cholesterol total	254	11/04/2005 13:14		High	135 - 200	VistA
*	LDL (direct)	68	11/29/2005 09:49			0 - 100	VistA
	LDL (direct)	68	11/29/2005 09:49			0 - 100	VistA
	LDL (calculated)	148	11/04/2005 13:14		High	0 - 100	VistA
	LDL (calculated)	148	11/04/2005 13:14		High	0 - 100	VistA
*	HDL Cholesterol	50	11/04/2005 13:14			40 - 60	VistA
	HDL Cholesterol	50	11/04/2005 13:14			40 - 60	VistA
*	Triglycerides	149	04/03/2007 14:51			0 - 150	VistA
	Triglycerides	862	11/29/2005 09:49		High	150	VistA
	Triglycerides	862	11/29/2005 09:49		High	150	VistA

	Name	Value	Date	Comment			
*						New	Delete

(*) Lab selected for report

___ Lab Comments

| Reports | Pre-Procedure Assessment | Cath/Other | PCI |

New　　　　　　　　　　　　　Assessment report

```
Generated by the VA Cardiac Assessment, Reporting, and Tracking (CART) system

Patient: ZZTIU TEST,PATIENT SON   SSN:  000000460   DOB:   4/4/1960   AGE: 47
Procedure Date:  4/16/2007
Attending: MESSENGER,JOHN C
Operators: GARCIA, JOEL A

Procedures: Left Heart Catheterization, LV Angiography, Coronary Angiography,
  Bypass Graft Angiography, Right Heart Catheterization, Aortography
  Intra-Aortic Balloon Pump

 Status: Elective
 This was an inpatient procedure.
 Type of procedure, site, and patient ID were verified with the patient.

Indications: Acute Coronary Syndrome, Valvular Heart Disease

ACCESS
 Primary Arterial:   Right Femoral, 5F sheath, Seal closure

CATHETERS
 Right coronary artery: JR 5, 5 fr

LEFT HEART CATHETERIZATION

Pressures (mm Hg)
 Aorta:        80/120, mean 100

 Mild Aortic Valve Stenosis
 Mild Mitral Valve Stenosis

LV-ANGIOGRAPHY
 EF = 46%  Abnormal - Global wall motion

CORONARY ANGIOGRAPHY

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Native Vessels
--------------
Summary:   2 vessel CAD
Dominance: Right dominant

Stenoses Details
----------------------------------------------------------------------------------
Segment                Stenosis*  Characteristics and Comments
----------------------------------------------------------------------------------
Mid LAD                   90       Calcified, Thrombus
Left PDA                           Diffusely Diseased
RCA (overall)                      Luminal irregularities
  Mid RCA                 80       In-Stent Restenosis
----------------------------------------------------------------------------------
  * Highest % Stenosis Within Segment


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BYPASS GRAFTS
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 # Graft Type    Insertion Segment   % Stenosis Location
----------------------------------------------------------------------------------
 1 SVG           1st Diagonal              75      Aortic/Ostial
                 In-Stent Restenosis
----------------------------------------------------------------------------------
```
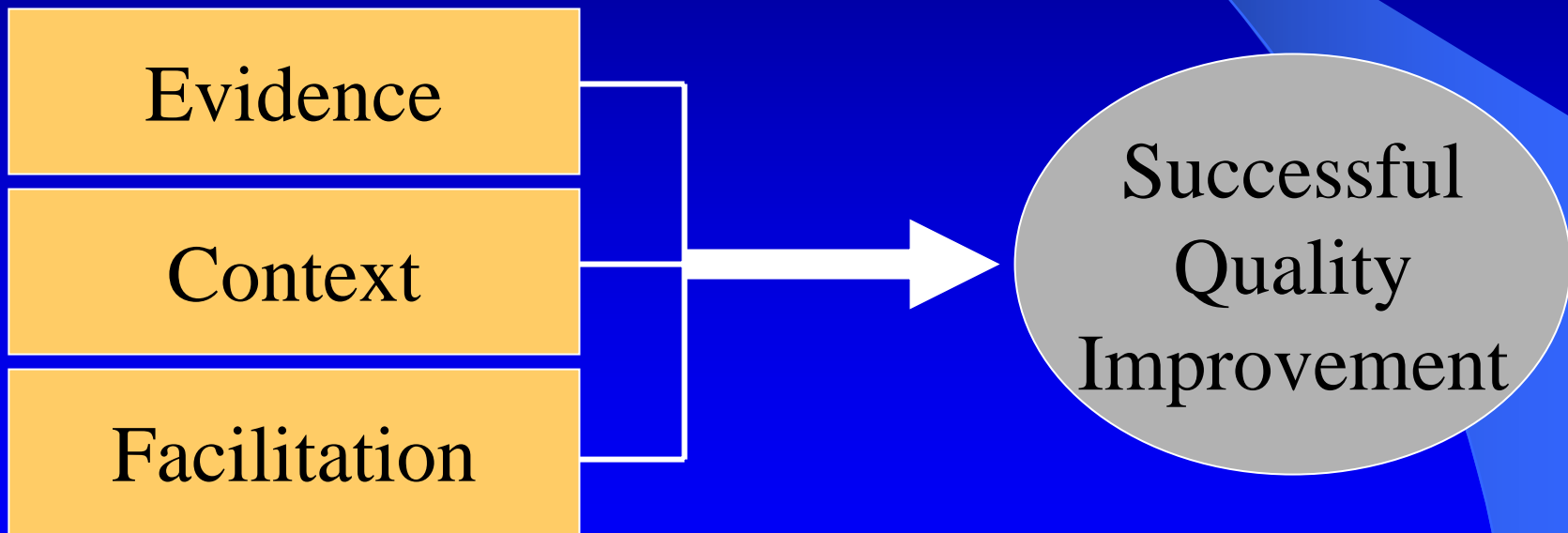
http://vhaechcartweb/

Implementation Process

1) Clinical site contact(s)
   - Cath lab director
2) Technical contact via clinical contact
3) Web demo if requested
4) CART-CL technical team works with local technical folks to set up (install)
   - Remote permissions
   - Remote set up / modest work for local IRMS
5) Once set up, in-service with clinical champion
   - Remote, 1.5 hour in-service
   - Local champion teaches others at site

Implementation Conceptual Model: Macro and Micro

VA

Site

Evidence

Context

Facilitation

Successful Quality Improvement

Adapted from Kitson, Harvey, and McCormack. Qual Health Care 1998

Clinical Acceptance

- As of 4/15/07:
  - Use by 837 VA clinicians
  - >48,000 reports generated on >27,000 patients
- Implementation process has worked well
  - Rapid clinical adoption at most sites
- Positive clinician feedback
  - Ease of use
  - Time-saving over previous methods
  - Integration with CPRS / format of notes
  - Commitment to contribute to a single national VA data repository and QI program (including promise of participation in ACC-NCDR)
  - Local QA, Workload capture, JCAHO help

Sample Email Comment
from Ed Toggart, MD, Cath Lab Director, West LA VAMC

"With CART-CL- the fellow and attending pull up CPRS and CART-CL, and enter angio and hemodynamic data together as a "team" generating the cath report IMMEDIATELY after the case, which as you know appears directly in CPRS as a completed report. We-fellows and attendings are very pleased because of the immense time saving- only one report is necessary- no administrative headache of tracking is necessary, etc.…"

Improve Clinical Care

- Documentation
  - ✓ Data entry based on ACC standards
  - ✓ Reinforces information already in CPRS
  - ✓ Improves review of data within cardiology teams
  - ✓ Carry forward of data in CART-CL to next procedure
- Communication / Continuity of Care
  - ✓ Cardiology procedure results now part of CPRS
  - ✓ Standardized reports improve communication within and between VA centers

Quality Improvement

- National data now available to evaluate the care we provide
- Sites have access to their own data for local QI
- VA participation in ACC-NCDR
  - Participation in ACC-NCDR quality improvement programs
    - Obviates need for full VA-only program
- National VA Cath Lab 'Community'

Patient Safety

➢ In lab complications

➢ Follow-up module

➢ Link to other VA data sources to monitor longer-term patient outcomes
  • Example: stent thrombosis following DES

➢ Unexpected problems with devices
  • Working with FDA
    o CART-CL as national patient safety network

Research

- ➢ Clinical and health services research related to cardiac procedures
  - CART-CL data in and of itself
  - Link CART-CL data to other VA data sources
    - ✓ Mortality, hospitalization, pharmacy, cost
  - Use CART-CL within broader clinical research projects
- ➢ Quality Improvement Research
  - Care delivery interventions
  - Assess impact of QI, policy, clinical care changes

Administration

➢ Program Evaluation

- Workload capture of cardiac procedures built into the CART application

- Link to billing, administrative databases

- Inform planning for future cardiac care (procedure capacity, cost, etc.)

- Quality oversight (Dr. Jesse)

Platform for Expansion

- CART-ACS
- CART-Peripheral
- CART-ICD
- CART-CPR
- Other diseases / procedures?

Variation in Implementation

- Project Delays
  - 'Scope creep' (e.g. workload capture, JCAHO)
  - VA data security crisis
  - Technical challenges (e.g. C&A, labs, note upload)
- Site-specific delays
  - Technical (e.g. remote permissions)
  - Clinical (e.g. alternative local solution)
- Formal study of variation in CART-CL implementation, including identification of key facilitators and barriers (QUERI RRP)

Health IT Adoption
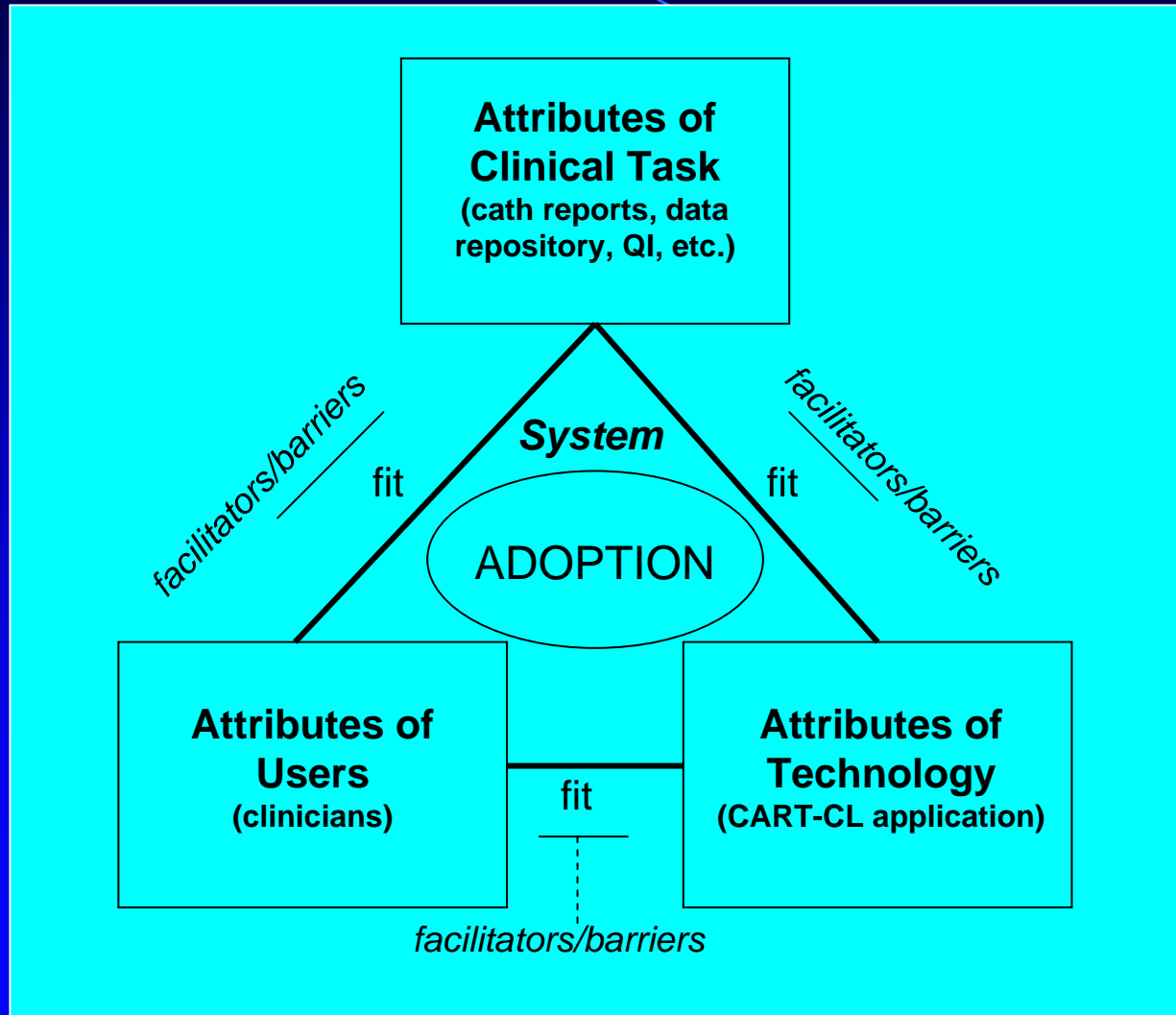
Sample Barriers

- Lack of clear local clinical champion
- Competing local solutions
- Clinical inertia / noise to signal
- Failure to engage local IRMS
- Unexpected security and technical delays (national and site-specific)
- Challenge of 'production version' software while still 'testing/modifying'

Sample Facilitators

- National administrative backing
  - Email from Dr. Jesse to Chiefs of Cardiology, letter from Dr. Kolodner to IRMS, National Directive
- Engagement of local clinical champions
- 'One site at a time' engagement, testing, feedback, participation
- Flexible software application (ease of use, time saving)
- Integration with CPRS
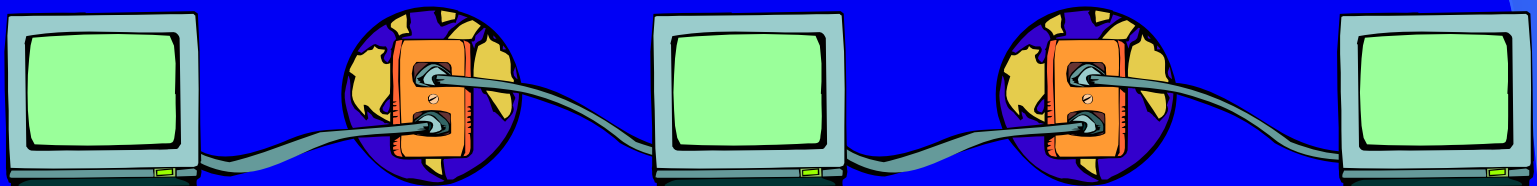- Desire to contribute to national data repository, VA + ACC-NCDR

Other Lessons Learned - Technical

- ➢ Value of clinician-driven software development
  - Software as a 'clinical tool'
- ➢ Core of data standards
- ➢ Extensible database architecture
- ➢ Stay 'within' CPRS
- ➢ Don't wait on possible national technical 'solutions' / changes (but talk with everyone)
- ➢ Small, effective project group
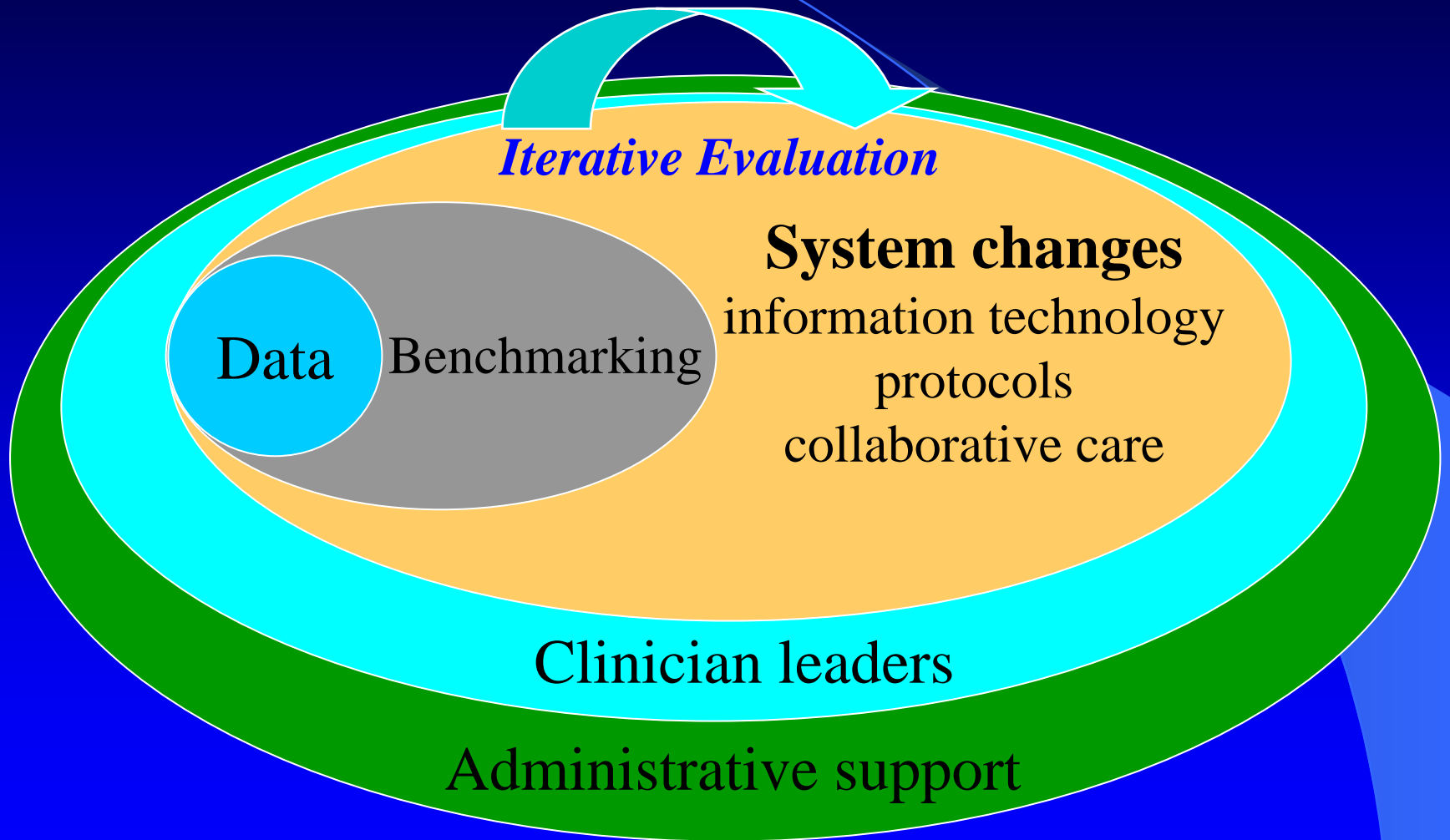 - Importance of Hans Gethoffer
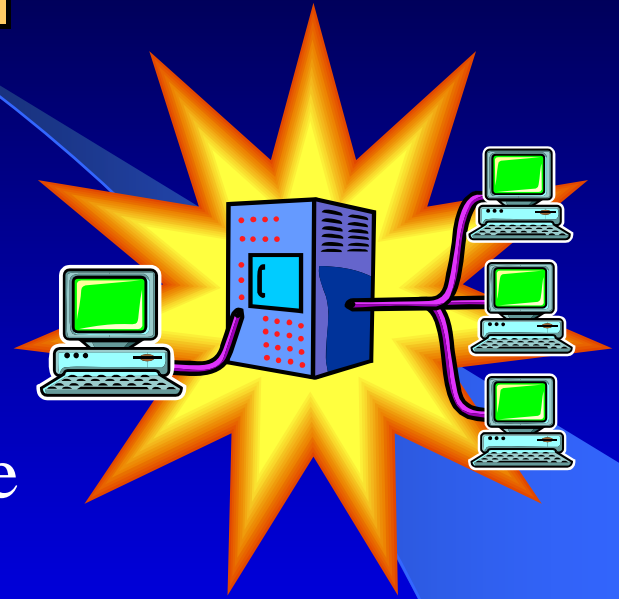
Final Lessons Learned

- Importance of 'clinical champions' cannot be overstated

- Yet…the backbone of success is technical

- Integration into broader system of care / QI efforts

- Engagement of administration / fit with administrative goals

Quality Improvement

Iterative Evaluation

System changes
information technology
protocols
collaborative care

Data

Benchmarking

Clinician leaders

Administrative support

CART-CL Program

- ➢ Leadership / Oversight
  - Steve Fihn (IHD-QUERI)
  - Bob Jesse/Mahdu Aggarwal/Mike Kussman (Patient Care Services)
  - Hank Rappaport/Rob Kolodner (Office of Information)
  - Jon Perlin (Former Acting Undersecretary for Health)
- ➢ CART Project Team
  - Clinical Director (JR)
  - Technical Director (Hans Gethoffer)
  - Technical/Analytic Team (Brian Gillespie, Greg Noonan, Tami Box, Meg Plomondon)
  - Administrative Coordinators (M. McDonnel/J. Nance)

Thank You

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