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

John S. Rumsfeld, MD PhD
Clinical Director, CART-CL
Staff Cardiologist, Denver VAMC
Broad Background

- **Congressional mandate**: VA to provide care ‘at least equivalent’ to non-VA sector
  - Explicit comparison required
- **Problem**: 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
- **Concern**: Veterans have more comorbidities, worse health status, lower SES than non-Veterans

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_
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 all VA cath labs, as part of a national QI program.
Other key collaborators / communications: OQP, VISN Directors/CMO’s/ISO’s, Clinical Procedures, DSS, FDA, ACC, Individual Facilities (administration, clinical, technical, ISO), PBM, CICSP, ViSTA Imaging, etc.
Highest Quality Health Care

- Effective
- Equitable
- Patient-Centered
- Safe
- Timely
- Efficient
Project Requirements

- Software must be clinically useful
  - No duplicate data entry
  - Used as part of regular clinical care
    - Pre-Procedural, 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

- July-Dec, 2004: ‘Beta testing’ (6 sites)
- Jan, 2005: Data repository ‘live’
- Jan, 2005-present: 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
In Progress

Uncompleted

3/22/2007 - Assessment
11/16/2006 - PCI
11/16/2006 - Procedure
11/16/2006 - Assessment
9/26/2006 - Assessment

Completed

CART-CL Database
log updated

ZTIU TEST, PATIENT SON
000000460 4/4/1960 47

New Report
### Prior Cardiac History

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### Comorbid Conditions

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### Cardiac Risk Factors

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Catheterization Report

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

Procedure Date: 4/16/2007
Attending: RASSER, JOHN C
Operators: GARCIA, JOEL A

Procedures: Left Heart Catheterization, LV Angiography, Coronary Angiography,
Bypass Graft Angiography, Right Heart Catheterization, Angiography
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 Syndromes, Valvular Heart Disease

ACCESS
Primary Arterial: Right Femoral, SF sheath, Seal closure

CATHETERS
Right coronary artery: JR 5, 5 Fr

LEFT HEART CATHETERIZATION

Pressures (mm Hg)
Arteries: 80/120, mean 100
Mild Aortic Valve Stenosis
Mild Mitral Valve Stenosis

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

CORONARY ANGIOGRAPHY

Native Vessels

Summary: 2 vessel CAD
Dominance: Right dominant

Stenosis Details

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<thead>
<tr>
<th>Segment</th>
<th>Stenosis %</th>
<th>Characteristics and Comments</th>
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<td>90</td>
<td>Calcified, Thrombus</td>
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<tr>
<td>Left PDA</td>
<td>Diffusely Dissected</td>
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<tr>
<td>RCA (overall)</td>
<td>Luminal irregularities</td>
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<td>Mid RCA</td>
<td>30</td>
<td>In-Stent Restenosis</td>
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</table>

Highest % Stenosis Within Segment

BYPASS GRAFTS

<table>
<thead>
<tr>
<th># Graft Type</th>
<th>Insertion Segment</th>
<th>% Stenosis Location</th>
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<tbody>
<tr>
<td>1 SVG</td>
<td>1ST Diagonal</td>
<td>75 Arterio/Arterial</td>
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<tr>
<td></td>
<td></td>
<td>In-Stent Restenosis</td>
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</table>
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

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
“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
    - 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
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)**
Attributes of Clinical Task
(cath reports, data repository, QI, etc.)

Attributes of Users
(clinicians)

Attributes of Technology
(CART-CL application)

System

fit
facilitators/barriers

fit
facilitators/barriers

ADOPTION

facilitators/barriers

Adapted from: Ammenwerth et al. BMC Medical Informatics and Decision Making 2006; 6(3)
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

Clinician leaders

Administrative support

Data

Benchmarking
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

John.Rumsfeld@va.gov