FINDING WISDOM IN THE INFORMATION:
The VA Clinical Assessment, Reporting, and Tracking (CART) Program Approach

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Lead, Health IT
CART Program
June 21, 2011
Monday, November 30, 2009

51 year old male with history of Hodgkin’s lymphoma
Partially paralyzed diaphragm, reduced lung function

Outpatient diagnosis of bronchitis

Wednesday, December 2, 2009

Outpatient diagnosis of double pneumonia

Friday, December 4, 2009

Admitted to ICU

Sunday, December 6, 2009

Placed on mechanical ventilation
Acute renal failure and respiratory failure
In late 2009, what knowledge existed?

Data based on CDC estimates of 2009 H1N1 Deaths using statistical modeling [http://www.cdc.gov/h1n1flu/estimates_2009_h1n1.htm](http://www.cdc.gov/h1n1flu/estimates_2009_h1n1.htm)
Moving from Information to Wisdom

History and Presentation

X

X

X

YES

Treat as bronchitis

Treat as pneumonia

Treat as H1N1
Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?

-T.S. Eliot
INFORMATION
IN THE SERVICE OF
DOCUMENTATION
VA Clinical Assessment, Reporting, and Tracking Program

CART was not designed as a documentation tool or a data registry, but as a framework by which INFORMATION could be harnessed to create KNOWLEDGE and generate WISDOM to make operations more efficient, improve quality and safety, and provide better and more targeted care for our Veterans.
CART Program Mission

To develop and implement a single national VA data repository, reporting system, and quality improvement program for procedures performed in VA cardiac catheterization laboratories.
BUILDING A
CLINICAL INFORMATION SYSTEM
The Clinical Model

**REQUIREMENTS:**
- Designed by the users
- Standards-based
- Integrated in CPRS
- Faster than dictation
- Improves efficiency
- Part of workflow
NCDR uses ACC/AHA data standards plus NCDR-developed standards, harmonized with other organizations like Society for Thoracic Surgeons.

ACC worked with the Office of the National Coordinator on these cardiovascular data standards.

Additional harmonization with other standards, such as SNOMED, LOINC, ICD-10, where possible.

Submitted to CDISC/HL7 June 2011.
The Technical Model

We were Agile when Agile wasn’t cool.
Traditional Model
The CART Technical Model

METAMODEL
dynamic construction of forms through meta objects
The CART Technical Model

**Traditional Object-Oriented Programming**

```
class Provider
  string Name
  string SSN

class Patient
  string Name
  string SSN
```

Direct coding in a common object-oriented language will result in hundreds of objects and thousands of properties and methods that are all conceptually similar.

**META MODEL APPROACH**

```
Object <type><name>
  Property <type><name>
```

Access any property in any object by a single meta-property function:

```Object('Patient').Property('SSN')```

coded as

```getObjectProperty('Patient', 'SSN')```

- dynamically extensible
- we do not need any code changes in the meta system to define and access new objects and properties.

3 MAJOR VERSIONS, 20+ Minor Iterations Yearly
(that’s more agile than the iPhone)
CART Utilization
(as of June 20, 2011)

3,312 Providers

206,601 Patients

231,079 Procedural Reports
THE HEALTH INFORMATICIST’S PRAYER

Oh, Health IT Infrastructure,
Grant me the data sources to collect valid, discrete data,
The knowledge to make some kind of sense out of all of that data
And the wisdom to know how much caffeine is required in order for me to apply that knowledge to improve care.
CREATING
KNOWLEDGE AT THE POINT OF CARE
Improving Quality of Care: The Current Model

Point of Care

Data stored in medical record

Data stored in repository

YEARS

$\$

Patient Safety

Quality Improvement

Clinical Research

Routine Care

Clinical Assessment, Reporting, and Tracking Program
ABSTRACTION OF DATA TO IMPROVE QUALITY IS AFTER THE FACT.

This is necessary because data collection is not integrated into the *process* of clinical care.
TRANSACTIONAL QUALITY AND MANAGEMENT

“If specific data are needed for patient care, to improve quality and increase patient safety, these data should be available and accessible at the point of care and not abstracted after the fact.”

Robert Jesse, VA Principal Deputy Undersecretary for Health
Informatics in the Service of Quality

- Routine Care
- Patient Safety
- Quality Improvement
- Clinical Research
Informatics in the Service of Quality Improvement

- Major Adverse Event Alerts
- Device Surveillance
- Decision Support and Beyond
The Problems of Device Surveillance

- Underreporting
- Voluntary = Passive
- Numerators, not denominators

http://www.fda.gov/cdrh/postsurv/medsunappendixa.html
www.fda.gov/cdrh/postsurv/medsun.pdf

J Gen Intern Med. 2006;21(9):942-948.
CART-FDA Surveillance

UNEXPECTED PROBLEM with DEVICE
Entered in CART

Automatic Alert

LEVEL I
Not Specific to the Medical Device
(deidentified – no PHI)

LEVEL II
Potentially Device-Related
(details for novel events – no PHI)

LEVEL III
Potentially Device-Related
Patient Complications
(FDA reportable MedWatch 3500A)
CART Major Adverse Event Review

Automatic Notification
Emergent CABG
Stroke
Death

Committee Review

Recommended Action

Resolution

24-72 hours

30 days
Ok, I have the information and harnessed that to gain knowledge... But where is the wisdom?

Use The Force, you must.
Informatics in the Service of Quality Improvement

- Reporting and Benchmarks
- Local quality improvement
- Health Services Evaluation
- Targeted Interventions
CART Quality: Reports

• Monthly Site QA Reports
• National Reports (VACO, CART-QM Committee)
  – Monthly Reports:
    • Procedure counts (including fiscal year to date)
    • Major adverse event counts (including fiscal year to date)
  – Bi-Annual Reports
    • Detailed site and ‘roll-up’ data; quality metrics
• Quarterly VISN-level Reports
  – VISN CMO’s
Direct Integration with ACC-NCDR

- Contract, data specifications and mapping and certification are complete
- Based on ACC-NCDR v4
- Begin submitting VA data this quarter
How do I get CART data?

• The CART Program is currently under the Office of Patient Care Services

• Re-organization will move CART to the new Office of Informatics and Analytics, and specifically the Office of Analytics and Business Intelligence

<table>
<thead>
<tr>
<th>Local Data</th>
<th>Local Performance Metrics</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex: “I would like to know the total radiation time per patient.”</td>
<td>Ex: “We would like to explore our complication rates for X, compared to the national VA average.”</td>
<td>Ex: “I want to examine the quality of care for Veterans undergoing saphenous vein grafts.”</td>
</tr>
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</table>
How do I get CART data?

LOCAL DATA
• Clarify the type of information your need (not an application process)
• Over 40 requests have been made and filled
• Some take 45 minutes to complete, others weeks

RESEARCH or WORK-PREPARATORY TO RESEARCH
• Proposal to the CART Research and Publications Committee (10 members)
  • Once the transition is complete to OIA, we will merge our research oversight with theirs
• Proposals evaluated based on
  • Clinically important questions, scientific validity
  • Feasibility of answering the question with existing data
  • Strategic priorities

Email our National Site Manager, Alec Arney at alec.arney@va.gov
Patient-Centered Wisdom

Pre-procedural Care
- Upstream care and testing
- Decision support
- Informed consent

Procedural Care
- Radial, SVG Interventions; Radiation exposure
- Device surveillance
- Procedural Complications

Longitudinal Care and Outcomes
- Medication adherence
- Risk factor management
- Value (outcome / cost)
Pre-Procedural Care: Collaborations

**Pre-Procedural Care**

- **Upstream care and testing**

- **Decision support**
  - Appropriateness of cath procedures [Maddox]
    Using Interactive Voice Response (IVR) to administer the Seattle Angina Questionnaire

- **Informed consent**
  - Radiation Exposure [Tsai]
    Characterize radiation exposure with the goal of developing decision support tools

  - Contrast-induced Nephropathy [Matheny]
    Automated risk characterization for patients undergoing procedures and prompts for dosing
Procedural Care: Collaborations

Procedural Care

- Stent Selection [Brilakis]
  Drug-eluting vs bare metal stents

- Future:
  Real Time Locator Services
  Bleeding risk assessment
Post-Procedural Care: Collaborations

Longitudinal Care & Outcomes

- Clopidogrel (Plavix) Adherence [Ho]
  Improving adherence to Plavix after placement of drug-eluting stent, using automated processes through CART and interactive voice response follow-up.

- Blood pressure and lipid control [Maddox]
  Improving control among coronary artery disease patients in the year following cath.

Medication adherence
Risk factor management
Value (outcome / cost)
WHAT ELSE?
YOU TELL US.
CART Program Expansion

• CART-Peripheral
  – Thomas.Tsai@va.gov
  – Lower extremity intervention, then carotid stenting

• CART-EP
  – Paul.Varosy@va.gov
  – ICD, then pacemakers, then ablation procedures

• CART-CPR
  – Steve.Bradley@va.gov
  – In-hospital cardiac arrest documentation
CART-Peripheral: Procedure Details

Segment/Location: Left Common Iliac
Highest % Stenosis: 90

Characteristics: Calcium (mild)

Comment (narrative):

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<td>mild calcium</td>
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CART-EP: Encounter Information
CART-EP: Device Data

![Screen capture of CART-EP device data interface]

- **Patient Test**: 12345-760
- **Visit not selected**: [add visit information]

### Existing Hardware

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<th>Manufacturer</th>
<th>Model Name</th>
<th>Model Number</th>
<th>S/N</th>
<th>Date of Implant</th>
<th>Disposition</th>
</tr>
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<tr>
<td>Pulse Generator</td>
<td>Medtronic</td>
<td>224135K</td>
<td>PUD44441H</td>
<td>5/1/2010</td>
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<tr>
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<td>Medtronic</td>
<td>5076-92</td>
<td>P0N222222V</td>
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<tr>
<td>RV Lead</td>
<td>Guidant</td>
<td>0144-85</td>
<td>P0N221334A</td>
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<td>BAA3333333</td>
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### New Hardware

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### Measurements

- **Battery Voltage**: [value]
- **Charge Time**: [value]
- **Capture Threshold**: [value]  [Amplitude (V)]  [Pulse Width (ms)]  [Sensing (mV)]  [Impedance (Ohm)]  [Shock (Ohm)]
Collaborations and **Future** Directions

**Within VA**

- OIA/OABI – Web Solutions Group (MDWS)
- Corporate Data Warehouse (CDW)
- Veterans Implant Tracking and Alert System (VITAS)
- Transformational Initiatives
  - (T15) Health Care Efficiencies (RTLS)
  - (T16) Health Informatics Initiative (AViVA)
- Blue Button

**External**

- FDA, NCDR, DELTA, Microsoft
THE HEALTH INFORMATICIST’S PRAYER

Oh, Health IT Infrastructure,
Grant me the data sources to collect valid, discrete data,
The knowledge to understand the data
And the wisdom to apply that knowledge to improve care.
“What we call the beginning is often the end. And to make an end is to make a beginning. The end is where we start from.”

-T.S. Eliot
Thank You

With special thanks to the entire CART Program staff:

John S. Rumsfeld, MD, PhD, Program Director and VA Director of Cardiology
Thomas M. Maddox, MD, MSc
Paul Varosy, MD
Tom Tsai, MD, MSc
Hans Gethoffer, Dr. Ing
Gary Grunwald, PhD
Meg Plomondon, PhD, MSPH
Gregory Noonan
Alec Arney, RN, MA
Colin O’Donnell, MS
Brian Gillespie
Maggie Stanislawski, MS
Blake Wood
Josie Nance
Mary McDonell, MS

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