Data Centered Health

Presentation to Armed Forces Communications and Electronics Association (AFCEA) Health Information Technology (IT) Day

Theresa A. Cullen, MD, MS
Chief Medical Information Officer
Director, Health Informatics
Office of Informatics and Analytics
Veterans Health Administration

NOVEMBER 13, 2013
Agenda

• Overview of the Department of Veterans Affairs (VA)

• Big Data

• Evolution of Electronic Health Record (EHR)
Patient and Provider
Patient, Provider, and Patient Family
Community
Population
Overview of VA
In 1996, VA began the creation of Veterans Integrated Service Networks (VISNs) to transform VA Health Care from a “Hospital System” to a “Health System.” Veterans Health Administration (VHA) currently has 21 VISNs.

- **152** Medical Centers
- **990** Outpatient Clinics
  - **821** Community-Based
  - **152** Hospital-Based
  - **11** Mobile
  - **6** Independent
- **300** Vet Centers
- **70** Mobile Vet Centers
- **102** Domiciliary Residential Rehabilitation Programs
- **134** Community Living Centers

Source: FY 2012 End-of-Year Pocket Card
VA’s Health Care Delivery Model

- Personalized, Proactive and Patient-Driven
- Team Care
- Continuous Improvement
- Data-Driven, Evidence-Based
- Value
- Prevention / Population Health

⇒ Coordinated Care
CPRS / VistA
Through the creation of the Electronic Health Record (EHR), the VA propelled the health care field into the 21st century, establishing an environment of efficiency and effectiveness for VA patients.
VA Mobile Health - Today

**For Clinicians**
- Apps currently in various stages of development and testing make critical information from a patient’s EHR available in real-time and on-the-go

**Clinician-Facing Apps:**
- Successfully provide mobile access to patient information
- Improve accessibility, productivity and workflow for pilot participants
- Extensively tested for security-related issues associated with mobile devices
- Being actively used on VA networks

**For Veterans and Caregivers**
- Currently available Apps assist Veterans with managing PTSD, quitting smoking, sleeping and more.
  - PTSD Coach, PE Coach, CBT-i Coach, PFA Mobile, Stay Quit Coach

**Family Caregiver Pilot:**
- VA loaned iPads to 1,000 Family Caregivers of seriously injured post-9/11 Veterans. The iPads were pre-loaded with VA Mobile Health Apps created to support Caregivers’ needs and the needs of the Veterans they assist. The Apps support Veterans with the following functionalities:
  - VA EHR clinical information
  - Disease Management Support and Electronic Coaching
  - Caregiver Support
  - Management and Coordination of Care
Big Data
Collect and Blend the Big Data
Secondary Data Use: Research and Predictive Analytics Capabilities

Broad range of clinical programs designed to improve care for Veterans with complex chronic illness

- Home-based primary care
- Case-management
- Specialty clinics, e.g., heart failure
- Telehealth
- Palliative care

- Providers can’t accurately predict Veterans at highest risk of deterioration
- Patient Aligned Care Team Registered Nurse (RN) Care Managers charged to coordinate care
- No systematic way to identify Veterans who might benefit most → predictive analytics using data from Electronic Health Record (EHR)
Whats Wrong: Data-Domain Centric

- Building blocks of EHR are data domains
  - Meds, Labs, Rad, Notes, Diagnoses, etc.

- Results in bad thought-flow and workflow

Zheng et al., Analysis of User Interactions with EHR System
Moving From What’s Wrong

Data Silos

Data Juxtaposition

Data + Workflow Integration
Implications of Conceptual Approach

• Want to construct a few user-interface components that naturally facilitate clinical reasoning and work.
• Because they address basic cognitive needs, they can be reused or reconfigured for most healthcare processes.
• Avoid “an app for that,” while allowing for extensibility.
## Standard Orders

<table>
<thead>
<tr>
<th><strong>Routine Tests</strong></th>
<th><strong>Tests by Specialty</strong></th>
<th><strong>Hematology</strong></th>
<th><strong>Microbiology</strong></th>
<th><strong>Urine Chemistry</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>CBC</td>
<td>HTN Panel #1</td>
<td>Apoly Cnt/CBC</td>
<td>C-Reactive Protein</td>
<td>ANA Reflexive Panel</td>
</tr>
<tr>
<td>Chem 7</td>
<td>HTN Panel #2</td>
<td>APTT</td>
<td>HIV Antibody Screen</td>
<td>C-Reactive Protein</td>
</tr>
<tr>
<td>Lipid Panel,Fasting</td>
<td>Diabetes Labs</td>
<td>Diff w/CBC</td>
<td>Rheumatoid Factor</td>
<td>C-Reactive Protein</td>
</tr>
<tr>
<td>Lipid Panel,Non-Fasting</td>
<td>Intake Clinic Labs</td>
<td>ESR w/CBC</td>
<td>Treponemal Ab</td>
<td>C-Reactive Protein</td>
</tr>
<tr>
<td>SGOT Today</td>
<td></td>
<td>Iron Group w/Ferr</td>
<td></td>
<td>Semen Analysis, Fertility W/U</td>
</tr>
<tr>
<td>SGPT Today</td>
<td></td>
<td>Retic w/CBC</td>
<td></td>
<td>Semen Analysis, Post Vasectomy</td>
</tr>
<tr>
<td>Alkaline Phosphatase</td>
<td></td>
<td>Vitamin B12</td>
<td><strong>Microbiology</strong></td>
<td><strong>Microbiology</strong></td>
</tr>
<tr>
<td>Total Bilirubin</td>
<td></td>
<td>Cortisol</td>
<td>Orders...</td>
<td>Orders...</td>
</tr>
<tr>
<td>Albumin</td>
<td></td>
<td>Folic Acid</td>
<td>C. diff culture/Tox B PCR Stool</td>
<td>Orders...</td>
</tr>
<tr>
<td>HBA1C</td>
<td>Creatinine EGFR Calc.</td>
<td>Clozapine Panel (CBC/APoly/NI)</td>
<td>Orders...</td>
<td>Orders...</td>
</tr>
<tr>
<td>Microalbumin</td>
<td>Direct Bilirubin</td>
<td><strong>Miscellaneous</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occult Blood (Colorectal Screen)</td>
<td>Protein, Total</td>
<td>Hep B Profile</td>
<td>UA-Culture if indicated</td>
<td>UA-Culture if indicated</td>
</tr>
<tr>
<td>Occult Blood (Random) STAT</td>
<td>Triglycerides</td>
<td>Hep C Antibodies</td>
<td>Copper (urine 24hr)</td>
<td>Copper (urine 24hr)</td>
</tr>
<tr>
<td>(Random card occult blood)</td>
<td>Uric Acid</td>
<td>T-3</td>
<td>Creatinine,24Hr</td>
<td>Creatinine,24Hr</td>
</tr>
<tr>
<td>DOES NOT satisfy CRC remind</td>
<td><strong>Enzymes</strong></td>
<td>T4/T4 Uptake</td>
<td>Creatinine Clearance/SCr-EGFF</td>
<td>Creatinine Clearance/SCr-EGFF</td>
</tr>
<tr>
<td>Calcium</td>
<td>Acid Phosphatase</td>
<td>TSH</td>
<td>Spot Urine Creatinine</td>
<td>Spot Urine Creatinine</td>
</tr>
<tr>
<td>Magnesium</td>
<td>CPK</td>
<td>Cosyntropin Not Available (8/16)</td>
<td>Protein, Urine 24hr</td>
<td>Protein, Urine 24hr</td>
</tr>
<tr>
<td>PO4</td>
<td>LDH Total</td>
<td>25-OH Vitamin D</td>
<td>Uric Acid Excretion Panel/SCr-E</td>
<td>Uric Acid Excretion Panel/SCr-E</td>
</tr>
<tr>
<td>Nutrition Panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT/INR Stat Plasma</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT/INR Routine Plasma</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other Lab Tests**
Developing Context-Sensitive Orders

- 30 million records – 20 years of data mined to identify relationships between
  - Problems
  - Laboratory results
  - Prescriptions
  - Procedures
  - Orders
  - Location
  - Provider
  - Patient
- 15,000 conditions and 10,000 orders
Common Test and Drug Orders

- Epigastric pain
  - CBC with diff
  - Chemistry panel
  - Helicobacter pylori
  - Lipase
  - Amylase
  - Upper GI endoscopy
  - Abdominal ultrasound
  - CT abdomen w/o contrast

- Omeprazole
- Ranitidine
- Amphogel
- Rabeprazole
- Promethazine
- Sucralfate
- Metronidazole
- Metoclopramide
- Docusate
Characteristics of VHA Analytic Approach

- Treat corporate data as strategic resource, available to entire organization
- Maximize understanding of organizational processes and outcomes to promote learning and improvement
- Invest in relevant, role-base training in analytics so tools are available widely and not just to a few
Products

• For clinicians
  – Real-time, structured data collection
  – Population and panel management tools

• For leadership
  – Understanding organizational performance and vulnerabilities

• For public/consumers
  – Unparalleled transparency and public reporting
Care Assessment Need (CAN) Report

- CAN provides estimated probability of death/hospital admission within specified time frame (90d or 1 yr)
- Score expressed as a percentile 0-99; higher score indicates follow-up assessment
- Provides patient level detail
- Accessible through VHA Support Service Center (VSSC) website and Computerized Patient Record (CPRS) tools menu
- For primary care providers, and/or nurse care manager
- Model developed in collaboration with VA researchers and policy leaders
Predicted and Observed Likelihood of Death/Admission 4,505,501 Primary Care Patients

Primary Care Almanac

Almanac combines Primary Care panel assignments (PCMM) with clinical data including lab, pharmacy, clinical cohorts, patient demo-graphics, care coordination program enrollment.

- Provides detail clinical support for diabetes and hypertension
- Provides patient and provider level detail
- Accessible through VSSC website and CPRS tools menu
- For primary care providers, team members & managers
### Clinical and Operational Metrics — Aspire

<table>
<thead>
<tr>
<th>Domains · Measures · Aspirational Goals</th>
<th>Aspirational Goals Met · [click VISN (01 to 23) to expand]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td></td>
</tr>
<tr>
<td>Effectiveness</td>
<td></td>
</tr>
<tr>
<td>Composite Behavioral Health Screening</td>
<td>Avg. Goal 98 96 97 96 96 95 94 97 95 96 95 95 95</td>
</tr>
<tr>
<td>Composite Diabetes</td>
<td>Avg. Goal 98 87 89 88 87 89 88 87 88 86 91 88 88</td>
</tr>
<tr>
<td>Blood pressure less than 140/90 (dm)</td>
<td>Avg. Goal 85 79 80 83 83 84 77 79 80 82 79 85 80</td>
</tr>
<tr>
<td>HbA1 GT 9 or not done in past year</td>
<td>Avg. Goal 10 14 15 10 17 16 17 17 13 12 11 10 10</td>
</tr>
<tr>
<td>LDL-C less than 100 (diabetes)</td>
<td>Avg. Goal 75 63 72 70 61 70 68 66 69 68 64 76 72</td>
</tr>
<tr>
<td>LDL-C less than 100 (vascular dx)</td>
<td>Avg. Goal 75 70 68 69 64 71 66 72 72 67 56 72 87</td>
</tr>
<tr>
<td>LDL-C measured (vascular dx)</td>
<td>Avg. Goal 98 97 98 95 95 96 96 94 96 90 99 98 94</td>
</tr>
<tr>
<td>Blood pressure less than 140/90 (HTN)</td>
<td>Avg. Goal 84 78 79 79 77 77 74 78 78 75 75 75 75</td>
</tr>
<tr>
<td>Screening for colorectal cancer</td>
<td>Avg. Goal 100 84 81 84 84 84 81 79 76 81 80 85 77</td>
</tr>
<tr>
<td>Women screened for cervical cancer</td>
<td>Avg. Goal 100 93 94 94 94 93 95 93 94 94 92 94 92</td>
</tr>
<tr>
<td>Women screened for breast cancer</td>
<td>Avg. Goal 100 81 91 93 89 88 90 87 91 89 88 90 93</td>
</tr>
<tr>
<td>Pneumococcal pneumonia immunization</td>
<td>Avg. Goal 100 95 94 96 94 94 94 95 91 94 90 91 94</td>
</tr>
<tr>
<td>Obese patients offered weight mgmt</td>
<td>Avg. Goal 100 93 96 95 97 96 95 96 95 98 95 99 99</td>
</tr>
<tr>
<td>Composite Tobacco</td>
<td>Avg. Goal 100 97 95 95 93 93 96 97 98 97 95 98 100</td>
</tr>
<tr>
<td>Composite acute myocardial infarction</td>
<td>Avg. Goal 100 98 97 100 98 99 97 97 98 97 95 98 100</td>
</tr>
<tr>
<td>Composite heart failure</td>
<td>Avg. Goal 100 98 98 98 98 98 97 99 99 98 92 99 96</td>
</tr>
<tr>
<td>Composite community acquired Pn</td>
<td>Avg. Goal 99 96 96 96 97 97 97 96 95 97 94 98 97</td>
</tr>
<tr>
<td>CHF RSMR</td>
<td>Avg. Goal 9.33 8.12 0.56 9.71 9.00 11.04 6.06 8.76 10.09 7.45 8.62 8.89 7.89 8.16 8.63 7.56 9.61 8.21 11.44</td>
</tr>
</tbody>
</table>

### Efficiency
- ?

### Timeliness
- ?

### Patient-Centeredness
- ?

### Equity
- ?
VHA’s Analytic Journey – Summary Themes

• Leverage and integrate information (break down silos) to gain insight & efficiency
• Collaborate across multiple data sources and agencies (e.g., VBA, Department of Housing and Urban Development (HUD), Department of Health and Human Services (HHS))
• Move from retrospective performance reports to real-time prediction, decision support, and practice support
• Enhance analytic skills throughout VHA workforce
• Promote Transparency and Accountability
VistA Evolution
Why VistA

• Inpatient and Outpatient records – integrated, single interface
• Highly effective across Large Integrated Network
• High-end user satisfaction
• Open standards, non-proprietary interfaces
• Mobility – Connected and Asynchronous Care
• Increasing Secondary Data Use at the Point of Care
  – Analytics/ Research/ Population Health
• The Future – VistA Evolution
Currently, our EHR and HIT systems are disconnected and fragmented.

This impacts our ability to deliver on the mission - excellent quality, access, satisfaction, and value.

Interoperability is critical for success.

Acronyms:
- CAPRI – Compensation and Pension Record Interchange
- HMP – Health Management Platform
- iEHR – integrated Electronic Health Record
- JLV – Joint Legacy Viewer
- RDV – Remote Data Views
Care Coordination Framework

Care Coordination

Care Management & Planning, plus:
- Healthcare System Focus
- More developed approaches to
  - Healthcare Home
  - Proactive Plan of Care
  - Communication
  - Information Systems
  - Transitions/Handoffs

Care Management

Care Planning, plus:
- Population and Panel Focus
- Holistic
- Identification, Stratification, Prioritization of At-Risk Patients
- Evaluation

Care Planning

- Individual Patient Focus
- Problem-specific
- Interdisciplinary
- Identify care needs, treatment goals & plan to meet goals
- Criteria for terminating interventions
- Documentation of progress
By 2017, we will have an architecture and framework that supports interoperability, care coordination, meaningful use and partnership.

**Acronyms:**

- DoD – Department of Defense
- IHS – Indian Health Service
- VBA – Veterans Benefits Administration
Full Operating Capabilities (FOC) (September 2017)

- Full Operating Capabilities enterprise wide
  - Support for care coordination—patient-centric, team-based care with facilities for quality improvement
  - New user experience with multifaceted support for understanding and decisions that speeds use of EHR and improves quality of clinical reasoning
  - Pharmacy management & laboratory information systems
  - Radiology enhancements
  - Meaningful Use demonstration & EHR certification – Stage 2
  - Capability for technical and semantic interoperability; groundwork for process interoperability
  - Many others
HIT That Supports Integrated Management Information Systems

• Standardized data of dependable quality
• Real-time time data flows
• Data collection integrated into workflow and process improvement
• Flexible, customizable, context-sensitive reports
• Data extracted from text-based sources
• Population-based data
• Routine display of modeled data sowing probabilistic assessments of important trends and events
Challenges

• Identity Management
• Data Standards and Mapping
• HIT
  – Patient and Group Notes
  – Clinical decision support
  – Predictive Analytics
  – Point of care population health
  – Group Decision Making and Orders
• Interoperability Challenges
• Lifetime Record
Keeping the patient in focus ...
Questions?

Contact Information:
Theresa Cullen, M.D, M.S.
Theresa.Cullen@va.gov
Why Health IT Matters

• Every patient has a story.
• If you want to go far, go together.
• If you want new solutions, you have to look in new places.
• We can't afford to dream small dreams.
• What flows through you to the rest of the world?
Patients in highest percentile of risk have 62% probability of admission, 30% probability of death, and 72% probability of either event.
Geospatial Analysis

Inpatient Mental Health Utilization

Obesity “Hot Spots”

Care Assessment Need (CAN) Score