VA Center for Applied Systems Engineering (VA-CASE)

- **Primary Mission:** Development, testing, and deployment of innovative methods of operational systems engineering (OSE) within VHA nationally to enable new models for VA healthcare delivery

- **VA-CASE Vision:**
  - Interdisciplinary, collaborative entity
  - Paired partnership of VHA staff and OSE faculty
  - Leverage significant OSE, informatics and implementation science expertise present in VHA health systems and affiliated academic partners

- **FY13 budget:** $12M
VHA’s Mission: Honor America’s Veterans by providing exceptional health care that improves health and well-being.

Characteristics of the VHA System
- 152 Medical Centers
- 986 Outpatient Clinics
  - 817 Community-Based,
  - 152 Hospital-Based,
- 11 Mobile, and
- 6 Independent
- 300 Vet Centers
- 70 Mobile Vet Centers
- 98 Domiciliary Residential Rehabilitation Programs
- 133 Community Living Centers
Veterans Health Administration (VHA) Background

Vital Statistics FY 2011

- 8.57M Enrollees
- 6.17M Unique Patients Treated
- 79.8M Outpatient Visits
- 295,500 Outpatient Surgeries
- 692,100 Inpatient Admissions
- 266.8M Lab Tests (Inpatient & Outpatient)
- 263M Prescriptions Dispensed (30-Day Equivalent)
- 12.5M Prosthetics Services Performed

* Over 269,000 employees – 20,000 Physicians, 70,000 Nurses
VHA’s Bridge to Excellence

“Patients are in control of their health care, and the system is designed around the needs of the patient.”

- Robert A. Petzel, M.D., Under Secretary for Health Department of Veterans Affairs

*Patient-Driven * Team Care * Continuous Improvement*
* Data-Driven & Evidence-Based * Value *Prevention / Population Health*

<table>
<thead>
<tr>
<th>Past VA</th>
<th>Present VA</th>
<th>Future VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>“What can I fix?”</td>
<td>“How can we help what is wrong with you?”</td>
<td>“How can we help you live the life you want to live?”</td>
</tr>
<tr>
<td>Physician</td>
<td>Clinical Team</td>
<td>Veteran, Family and Health Care Team</td>
</tr>
<tr>
<td>Case-Based Paper Medical Record</td>
<td>Disease-Based Electronic Medical Record</td>
<td>Whole-Person Electronic Health Record</td>
</tr>
<tr>
<td>“We’ll address your immediate concern.”</td>
<td>“You have a risky problem, please follow this plan to improve by your next visit.”</td>
<td>“We can design your personalized health plan to meet your goals.”</td>
</tr>
</tbody>
</table>
Traditional (Physician-Centric, Episodic) Health Care Delivery Model

Outpatient Medical Record

Primary Care Physician

Specialty Care Services

Outpatient Care

Inpatient Services

Inpatient Medical Record

N=1
Patient Centered, Integrated Health Care Delivery Model

VHA Key Enablers (1997-present)*:

- Comprehensive Care Management Approach (Primary Care Medical Home)
- Standardized care pathways and clinical guidelines
- Funding aligned with desired outcomes
- Accountability driven through performance measures/public reporting
- System-wide electronic health record

Result (1997-2003)*:

- Increase patient volume by 24%
- Reduced BDOC by 68%
- Decreased staffing by 12%
- Significant reduction in annual operating costs
- Improved Patient Satisfaction
- Improved quality of care per standardized measures

VAMC EMR Implementation

8 feet of paper per week
Incoming Documentation by type/unit

Figure 2. Weekly incoming documentation by type/unit
RVAMC, 11/2007

- Inpatient = 35%
- Outpatient = 30%
- Administrative = 16%
- Outside Scanning = 10%
- ER = 9%
Personalized, Proactive, Veteran-Driven Health Care

Clinical Care

- Primary Care Team
- Specialty Care Services
- Inpatient Services

Veteran

Health Management Platform

Social System

Friends

Family

Community Services

Near Real-time Decision Support related to:
- Clinical Outcomes
- Customer Satisfaction
- Operational Performance

Data Sciences/Analytics

N=60,000

N=1

N=60,000
Key Challenges:
Health Care as a Complex Adaptive Systems

• Relationship vs Systems focus
• Significant Inequities in Risk Distribution
  • Key Stakeholders (Insurance Companies, Device Manufacturers, Pharmaceutical Companies) transfer risk to Healthcare Systems and (uninsured) patients in order to maximize profits
• Long term vs short term focus on behavioral change – customer/patient + staff
• Complexity shift to consumer
Medication Delivery

- Estimated 30% of all medical errors occur during medication delivery processes

- Average litigation expense = $680,000

- Technology available to prevent errors:
  - BCMA – Bar Code Medication Administration
  - Pyxis – Automated Medication Delivery
  - Infusion (Alaris) pumps – regulates IV flow
14 minutes in the life of a Pharmacy Tech
BCMA Medication Pass

Steps per patient: 181 steps
Attempts: 3.3
Total time per patient: 18 mins
Supply time per patient: 9 mins
Med administration time: 9 mins
Personalized, Proactive, Veteran-Driven Health Care

Evidence Base related to:
• Clinical Outcomes
• Customer Satisfaction
• Operational Performance

Data Sciences/Analytics

Clinical Care

Primary Care Team

Specialty Care Services

Inpatient Services

Veteran

Health Management Platform

Community Services

Friends

Family

N=60,000

N=1

Operational Systems Engineering
If you build it with them…they’re already there!
Systems Engineering Tools/Methods

- Predictive Analytics
- Modeling and Simulation
- Measurement System Analysis (MSA)
- Value Stream Mapping
- Time and Motion Studies
- Process Observation
- Process Mapping
- PDSA Cycles

80% of issues can be resolved with lower complexity tools
Over 170 distinct on-site engagements:

- Consultation
- Training
- Project Team Mentoring
- Technology Integration/Implementation

Denotes VA-CASE Industrial Engineer or Informatics on-site support/training or engagement activity, individual markings may indicate multiple engagements
# VA-CASE Partnerships

<table>
<thead>
<tr>
<th>VHA Partners</th>
<th>Academic/Affiliate Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>VISN 11 Office</td>
<td>University of Michigan (UM) College of Engineering</td>
</tr>
<tr>
<td>VISN11 Contracting</td>
<td>Wayne State University</td>
</tr>
<tr>
<td>VHA Office of Patient Care Services</td>
<td>Regenstrief Institute</td>
</tr>
<tr>
<td>VHA Purchased Care Program Office (CBO)</td>
<td>Purdue Center for Medication Safety Advancement</td>
</tr>
<tr>
<td>VHA Business Policy Division (CBO)</td>
<td>Purdue School of Engineering &amp; Technology</td>
</tr>
<tr>
<td>VHA Business Integration Service Lines (BISL)</td>
<td>Indiana University School of Medicine</td>
</tr>
<tr>
<td>VHA Optimizing Cancer Care Committee</td>
<td>Worcester Polytechnic Institute</td>
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<tr>
<td>National ISO9000 Compliance Division</td>
<td>University of North Carolina (UNC)– Chapel Hill</td>
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<tr>
<td>National PACT Steering Committee</td>
<td>University of Georgia</td>
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<tr>
<td>National Office of Specialty Care</td>
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<tr>
<td>National Surgery Office (NSO)</td>
<td></td>
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<tr>
<td>VHA Office of Sterile Processing</td>
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<tr>
<td>VHA Office of Informatics/Analytics</td>
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<tr>
<td>National Real Time Locating Systems PMO (RTLS PMO)</td>
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</table>
VA-CASE

Rapid Cycle Innovation ➔ Impact Model

<table>
<thead>
<tr>
<th>Innovation</th>
<th>Implementation</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>Proof of Concept</td>
<td></td>
</tr>
<tr>
<td>Proposal Development</td>
<td>Current State Analysis</td>
<td>Evaluation</td>
</tr>
<tr>
<td>Concept Development/Testing</td>
<td>Future State Optimization</td>
<td>Deployment</td>
</tr>
<tr>
<td>Initial Pilot (single site/VISN)</td>
<td>Demonstration Pilot (multiple sites/VISNs)</td>
<td>Review/ Approval</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Deployment</td>
<td></td>
</tr>
</tbody>
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Customer
Facility/VISN
National Program Office

Customer Requirements Insights

Development Cycle
Problem Identification ➔ Current State Assessment/Analysis ➔ Future State Development/Optimization ➔ Pilot Testing ➔ Reporting/National Approval ➔ Process/Policy Standardization

Sustainability Cycle
Initial Pilot (single site) ➔ Demonstration Pilot (multi-site)

User Stories
Data Feedback Insights

VA Center for Applied Systems Engineering

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iPhone Applications

“Health 4 Heroes”
- Funded through OPCC/CT
- Mobile app to assist Veterans in integration of healthcare information
- App development for iPhone, iPad
- Agile software development methodology used
- Next: TBI Symptom Self-Assessment App
Human Computer Interaction (HCI) Lab

- HSRD/VA-CASE co-funded (FY11)
- Developed to investigate the usability of clinical documentation and decision support tools

- Rapid Usability Evaluation (RUE) Method developed and utilized to capture usability data, assess user interaction with information systems and conduct simulation studies
Serious Gaming for Stroke Policy Experimentation

Compact Model
Realistic Scenario
Relevant Metrics

Researchers
Executives
Leaders

Gaming Environment
Simulation Tools

Organizational Learning
Insight Generation
Collaboration

Strategic Thinking
RME Re-Processing Future State

Design Strategy

Design Evaluation

Location
Inventory
Demand

RTLS

ISO 9001:2008

PRISM iQMS

Effective Re-processing

Formal QMS Governance

Business Intelligence for High Reliability

IVN

Logistics Governance

Work Process Governance

RME Near Real Time Decision Support System

New Informatics /Analytics Universes, New Ways of Decision Support in Near Real Time

VAMC – NRT Resource Management
SPS - OR - ER - Clinics - Labs
RME NRT DSS FRAMEWORK

SPS
- SPS/RTLS Input
- SPS/RTLS Output

Sterile Processing Service
- SQWM

RTLS & IVN
- RTLS

RME NRT DSS (Modular Architecture)
- Simulation & Optimization Tools

- Prioritization of RME Sterilization
- RME Delay & Availability Reports
- Appointment & Surgery Case Cancellation Reports
- OR, ED, Clinic, Lab, Radiology, BMS, Utilization Reports
- Expedited RME Orders
- Advisory Schedule Changes

Users/Suppliers
- GI ENT Dermatology
- OR
- Radiology
- ED
- Labs
- Clinics
- Inpatient Wards ICU/PACU
- Logistics

User/Supplier Input

User/Supplier Output
Questions?
Thank you!