Care Assessment Need (CAN) Score and the Patient Care Assessment System (PCAS): Tools for Care Management

Stephan Fihn MD MPH
Tami Box PhD
Office of Informatics and Analytics
Veterans Health Administration
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
Goal: Enhance Quality & Eliminate Unnecessary, Unplanned Care
Top 10 VHA Discharge Diagnoses 2008

- Affective psychoses
- Heart Failure
- Chronic ischemic heart disease
- Respiratory symptoms/other chest sx
- Pneumonia
- Cardiac dysrhythmias
- Schizophrenic disorders
- Chronic bronchitis
- Alcohol dependence
- General symptoms

(Maynard and Fihn, Internet Journal Epi 2010)
Knowledge of a patient’s risk of adverse event can help target services.

Providers can’t accurately predict Veterans at highest risk of deterioration.

PACT RN Care Managers charged to coordinate care.

No systematic way to identify Veterans who might benefit most → predictive analytics using data from EHR.

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
Modeling Strategy

• Patient characteristics
  – Demographics – age, priority level
  – Coexisting conditions – Deyo/Charlson score, HCCs
  – Vital signs
  – Utilization – inpatient and outpatient
  – Pharmacy
  – Lab values

• Outcomes occurring in subsequent yr.
  – Readmissions, deaths, either at 30, 60, 90 days & 1 yr

• Conjoint modeling admission and death using polytomous (multinomial) logistic regression
# Model Terms

## 1. Demographics
- **Age** (≥65)
- **Sex**
- **Marital status**
- **Svc. Conn.** ≥50%

## 2. Chronic Illness
- **Deyo-Charlson**
- **HCCs**
- **MI/UA/CABG**
- **Valvular dis.**
- **Resp. failure**
- **HTN**
- **Stroke**
- **Renal Failure**
- **COPD**
- **Atrial fib.**
- **ASPVD**
- **Pneumonia**

## 3. Utilization
- **Outpt visits** (>4)
- **PC visits** (>1)
- **Cardiology visits**
- **Pulmonary visits**
- **Mental health visits**
- **ER visits** (>1 last yr)
- **Other visits** (>3)

## 4. Vital Signs
- **Diabetes**
- **Liver disease**
- **Malnutrition**
- **Dementia**
- **Functional disease**
- **Metastatic Cancer**
- **Trauma**
- **Psych disease**
- **PTSD**
- **Depression**
- **Heart rate** (>85)
- **Resp. rate** (≥20)
- **BMI** (<25)

## 5. Pharmacy
- **Insulin**
- **BDOC (1-10 vs 0)**
- **No. providers** (>3)
- **Digoxin**
- **Furosemide**
- **Metolazone**
- **Metformin**
- **ACEI/ARB**
- **Alpha-blocker**
- **Nebulized drugs**
- **Antiplatelet drugs**
- **Anti-depressants**
- **Antipsychotics**
- **NSAIDS**
- **Lipid lowering drugs**
- **P-par-gamma-agonists**
- **K+ sparing diuretic**
- **Oral steroids**
- **Warfarin**

## 6. Interactions
- **RRR ≤0.8** or **RRR ≥1.5** (adm);
- **RRR ≤0.8** or **RRR ≥1.5** (death);
- **RRR ≤0.8** or **RRR ≥1.5** (both)

18 interaction terms
Care Assessment Need (CAN) Score

• Reflects estimated probability of admission or death within a specified time period (90 days or 1 year)
• Expressed as a percentile, ranging from 0 (lowest risk) to 99 (highest risk)
• Indicates how a given Veteran compares with other individuals in terms of likelihood of hospitalization or death
Predicted and Observed Likelihood of Death/Admission
4,505,501 primary care patients

Patients in highest percentile of risk have 62% probability of admission, 30% probability of death, and 72% probability of either event.
Comparison with other models

Readmission model for 10,946 pts disch home from general medicine svcs at 6 AMCs. *Hason, et al. JGIM Dec 2009 (epub ahead of print)*

“LACE” model tested on 1M randomly selected pts discharged from Ontario hospitals 2004-08 (C statistic =0.6935). *Walraven et al CMAJ March 2010 (epub ahead of print)*
Use of High Level Analytic Data for Population Management and Resource Planning

Dynamic Geospatial Mapping

1-yr likelihood of admission
- 1.86% - 5.93%
- 5.94% - 7.00%
- 7.01% - 7.97%
- 7.98% - 9.21%
- 9.22% - 16.99%

1-yr likelihood of admission or death
- 2.37% - 9.03%
- 9.04% - 10.01%
- 10.02% - 10.96%
- 10.97% - 12.18%
- 12.19% - 19.34%
How to Access the CAN Score Report

Primary Care Almanac
CPRS Providers' Menu
Data updated through: 03/31/2013

Care Assessment Need Score - CAN Score

Diabetic Cohort Reports Menu
Hypertension Cohort Reports Menu
Ischemic Heart Disease Reports
Primary Care Panel Overview Menu

**Patient level reports require an account for real SSN access.
Click here for instructions for establishing an account for real SSN access

Provider Panel Overview
ER / Urgent Care Visit Count by Provider
Primary Care Hypertension Patients Provider Level Summary
Hypertension Medication Possession Ratio Outlier Report
Hypertension Greater Than 140/90 report
Ischemic Heart Disease Reports work in progress

IHD Patients Report for LDL>=100 or LDL not done
Risk Data Updated Weekly

<table>
<thead>
<tr>
<th>CARE MANAGEMENT RESOURCES IN USE</th>
<th>UTILIZATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCHT</td>
<td>PALLIATIVE CARE</td>
</tr>
<tr>
<td>CHT</td>
<td>CARE</td>
</tr>
</tbody>
</table>

- About 1000 users monthly\n- Also reports can be developed using from Regional Data Warehouses
Marketing the CAN Score

- Available to all PCPs from EHR in Dec 2011 – “soft roll-out”
- Active roll-out in two VISNs
  - VISN 4 – PC Collaborative
  - VISN 17 – Live Broadcast (champion model)
- Broadcasts with live Q&A: primary care, nursing, VeHU
- Feedback to date – uniformly positive (some concerns about data overload)
Marketing the CAN Score

- Encouraging Care Coordination
  - all participants in the delivery of health services work cooperatively
  - facilitating access to care
  - right care in the right place at the right time
  - shared responsibility

- Encouraging Care Management
  - Linking patients with needed services, resources, and opportunities

- Discouraging “misuse” of the score
  - The score is not a performance measure to try to “improve”
  - A high score does not indicate a pt is not receiving high quality of care
  - A low score is not an indication to ignore a pt
Can CAN scores help?

After adjusting for age, sex, comorbidity, and mental health diagnoses, patients with CAN scores in the highest 10% who saw their assigned PCP for >60% of visits, were 10% less likely to die or be hospitalized than similar risk patients who did not see their PCP during the year before PACT implementation. Similar, but less pronounced association for high risk patients who saw their assigned PCP up to 60% of the time.
High Number of Health Care Providers per Patient by CAN Score
High Number of Different Drugs per Patient by CAN Score

![Bar chart showing the distribution of distinct drugs per patient by CAN Score. The chart indicates that a significant percentage of patients have a high number of different drugs, with a notable increase in the CAN >= 95 category.](chart_image)
Mental Health Diagnoses according to CAN Score
Bed Days - Per Patient, Average

Average # of Bed Days by CAN Score

VETERANS HEALTH ADMINISTRATION
Few Patients with High Scores Referred to Coordination Programs: Telehealth, HBPC, Palliative Care, and Hospice

Palliative Care
Score ≥ 95 -- 1,353 of 241,917 total patients (0.6%)

Hospice
Score ≥ 95 -- 569 of 241,917 total patients (0.2%)
Total Patients and Percentage with CAN Score ≥95 by Geographic Area

- 334 (South FL): 37,582 patients, 11.4% with CAN score ≥95
- 782 (San Antonio): 37,404 patients, 12.1% with CAN score ≥95
- 337 (Tampa, FL): 31,125 patients, 21.8% with CAN score ≥95
- 770 (Houston): 29,300 patients, 18.4% with CAN score ≥95
- 606 (Chicago): 27,401 patients, 21.1% with CAN score ≥95
How might a care manager or provider use the tool?

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scan list of pts weekly to identify those who may be at high risk</td>
</tr>
<tr>
<td>2</td>
<td>Call high risk patients to check in: are questions answered? are medications taken as prescribed?</td>
</tr>
<tr>
<td>3</td>
<td>Confirm that high risk pts have visits coming up soon</td>
</tr>
<tr>
<td>4</td>
<td>Ensure that high risk patients are on appropriate medical therapy</td>
</tr>
<tr>
<td>5</td>
<td>Review resources already in use, such as telehealth or specialty care</td>
</tr>
</tbody>
</table>
“Attached is the PP created for local executive leadership, to gain their buy-in and support, which we have fully received. I am beginning to educate frontline staff on this structured framework so they can better understand the importance of risk stratification. This education allows them to begin connecting the dots of the different settings, how they impact the continuum of care, and how we can better serve our Veterans together, especially those suffering from chronic diseases. So far I have received positive feedback from frontline staff and leadership. Our Home Telehealth program has begun utilizing the CANS to ‘pull’ their Veterans into the program, rather than waiting for Veterans to be ‘pushed’ into the program. The PACT teams utilize the CANS for specifically for patient selection for shared medical appointments. Several PACT teams also cross-reference the CANS with the DataMart database for patient selection of chronic disease management protocols.
We plan to implement the CANS in Specialty Clinic and Case Management over the next year. We are currently developing and expanding these two areas to center our care around Veterans actively suffering from chronic diseases by establishing a partnership to assist and guide Veterans with self-management. Case Managers are currently developing inclusion and exclusion criteria for their newly developed case management programs, and will include the CANS as a criteria point to consider when consulted. Specialty Clinic will utilize CANS for patient selection in shared medical appointments and chronic disease management protocol, similar to PACT. The CANS is the missing link, as we previously had no method to stratify the patient panel, to identify those high-utilizers, high-cost Veterans. Now with the CANS we can better serve our Veterans suffering from chronic diseases in a more efficient, ideal method.
Problems/ Limitations

- Processing requirements ➔ recoding production process, enhancement of analytic environment
- Model performance monitoring/degradation ➔ recalibration, updating
- Plateau in use and uncertainty about how being used ➔ PCAS, evaluation
- Generic issues with development and deployment of predictive models
Patient Care Assessment System (PCAS)

- Integration of key data from multiple sources
- Summary of patient risk factors
- Task Lists and notifications
- Multiple VAMCs & Community info
- Ability to create a care plan and write it back to CPRS as a standardized note
Project Team

Stephen Anderson  MS
Tami Box
Chris Bryson, MD MPH
Dean Delventhal
Stephan Fihn  MD MPH
Kathleen Frisbee  PhC
Brian Gillespie
Toni King
Fred Kirkland
Steve Krysiak
Betsy Lancaster MS
Shawn Loftus
Elliot Lowy  PhD
Charles Maynard  PhD
Mary McDonell MS
Chris Nielson MD
Clare Reda PhD
Haili Sun  PhD
Li Wang  MS
PATIENT CARE ASSESSMENT SYSTEM
A tool to identify, manage, and coordinate patient care.

Tamara L. Box, PhD
Office of Analytics and Business Intelligence,
VHA OFFICE OF INFORMATICS AND ANALYTICS
6.5 Million Patients
High Risk Patients
IDENTIFY
COORDINATE
MANAGE
Patient-Aligned Care Teams

- VHA Patient Care Services
- Initiative to support VHA’s Universal Health Care Services Plan to:
  - Increase access
  - Improve coordination and communication
  - Enable better continuity of care
Patient-Aligned Care Teams

• Patient-centered care managed by primary care providers
• Clinical and non-clinical staff
• Patient have more active role
High Risk Patient Identification
OUR MISSION

The Patient Care Assessment System is a web-based application to provide Patient Aligned Care Teams (PACT) with tools to identify, manage, and coordinate care for their paneled patients.

Special emphasis is given to high risk patients.
Patient Care Assessment System (PCAS)
Highly Desired Functionality

- Integration of key data from multiple sources
- Summary of patient risk factors
- Task Lists and notifications
- Multiple VAMCs & Community info
- Ability to create a care plan and write it back to CPRS as a standardized note
# Tools for Identifying and Coordinating Care

<table>
<thead>
<tr>
<th>PRIMARY AUDIENCE</th>
<th>CAN</th>
<th>PCAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROLE</td>
<td>CAN Scores</td>
<td>PACT PROVIDERS</td>
</tr>
<tr>
<td></td>
<td>Key risk data</td>
<td>CAN Scores</td>
</tr>
<tr>
<td></td>
<td>Dashboard format</td>
<td>PACT Team</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patient and Team</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Notifications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clinical data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Care planning</td>
</tr>
</tbody>
</table>
Quick Poll

If you are involved in the VA Patient Aligned Care Teams, what do you feel is the most challenging aspect of patient care?

A. Nothing – it’s a breeze!
B. With very large panels, understanding where to focus daily care/effort.
C. Knowing what services are available for my patients.
D. Coordinating care and care tasks for patients as a team.
### Manage Patients

<table>
<thead>
<tr>
<th>Patient ID</th>
<th>First Name</th>
<th>Last Name</th>
<th>Date of Birth</th>
<th>Last Visited</th>
<th>Other Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>TEST PATIENT D</td>
<td></td>
<td></td>
<td>10 Feb 2012</td>
<td></td>
</tr>
<tr>
<td>#2</td>
<td>TEST PATIENT E</td>
<td></td>
<td></td>
<td>11 Apr 2012</td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td>TEST PATIENT F</td>
<td></td>
<td></td>
<td>21 Feb 2012</td>
<td></td>
</tr>
<tr>
<td>#4</td>
<td>TEST PATIENT G</td>
<td></td>
<td></td>
<td>27 Apr 2012</td>
<td></td>
</tr>
</tbody>
</table>
### Manage Patients

Filter List By Patient:

Search By Name:  
Go

Search By Last 4 SSN:  
Go

<table>
<thead>
<tr>
<th>Last 4 SSN</th>
<th>Patient Name</th>
<th>High Risk</th>
<th>Risk Type</th>
<th>Last Appointment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1234</td>
<td>TEST PATIENT A</td>
<td>Y</td>
<td>Medication Complication (MUET), Poly Pharmacy, Suicide Risk, Test This</td>
<td>27 Apr 2012</td>
</tr>
<tr>
<td>5678</td>
<td>TEST PATIENT B</td>
<td>N</td>
<td>No longer has problems.</td>
<td>20 Apr 2012</td>
</tr>
<tr>
<td>9012</td>
<td>TEST PATIENT D</td>
<td></td>
<td>Clinical Priority, Flagged as High Risk, Frequent</td>
<td></td>
</tr>
</tbody>
</table>

- **TEST PATIENT D**: 10 Feb 2012, 18 Jul 2012
- **TEST PATIENT E**: 11 Apr 2012, 18 Jul 2012
- **TEST PATIENT F**: 21 Feb 2012, 09 Jul 2012
- **TEST PATIENT G**: 27 Apr 2012, 09 Jul 2012
Risk Characteristics
Patient Demographics
Team Information
Discharges
Encounters
Diagnosis List
Clinical Data
Medications
Consults
Tasks/Notifications
## RISK INDICATORS

- CAN Scores (all models; 0-99)
- CAN Score Graph Over Time
- Clinical Priority (0-10)
- Manual High Risk Flag

### Risk Type
- Statistical High Risk
- High Intensity Medical Management
- Suicide Risk
- Homeless
- Frequent ER User
- Polypharmacy
- Frequent PCP Visits
- Frequent Admissions
- Medication Non-Adherence (MUET)
- OID/OIF/OND High Risk
KEY CLINICAL & COST RISK FACTORS
(past 12 mos)

- Number of ER Visits
- Number of Discharges
- DSS Cost
- National BDOC
- Fee Cost
- VERA Classifications
- Polypharmacy
- Pain Scale
CARE & CASE MANAGEMENT

High-Level Primary Care Management
Primary Care RN Case Manager
Primary Care MSW Case Manager
Other Case Manager Activity
Help

TEAM MANAGEMENT

All PCMM Team Members – any location
Expanded Team Members
Home/Community Providers

Patient Information
Risk Characteristics
Patient Demographics
Secondary Contacts
Legal Documents
Team Information
Discharges
Diagnosis List
Clinical Data
Medications
Encounters
Tasks/Notifications

Care Plan
Situation/Background
Learning Preference
Assessment/Goals
Planning & Implementing
Evaluation & Monitoring/Plan Update
PACT Interdisciplinary Care Plan Note

PACT RN Care Manager Note

Patient Care Assessment System
Username / Clinic Location [ROLE]
## Diagnosis List
10 Most Recent (last 24 months)

<table>
<thead>
<tr>
<th>Major Category</th>
<th>Diagnosis</th>
<th>Diagnosis Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DIAGNOSIS LIST**

10 Most Recent (last 24 months)
### CLINICAL DATA

#### Immunizations (last 2 years)

<table>
<thead>
<tr>
<th>Immunization</th>
<th>Date</th>
<th>Facility Location</th>
</tr>
</thead>
</table>

#### Lab Values (with extended filter capability)

- **Test Name**: [Input Field]
- **Date**: [Input Field]
- **Results**: [Input Field]
- **Unit**: [Input Field]
- **Reference Range**: [Input Field]
- **Reference Flag**: High
<table>
<thead>
<tr>
<th>Scheduled Date</th>
<th>Encounter With</th>
<th>Encounter Type</th>
<th>Facility</th>
<th>Clinic Name</th>
<th>Primary Stop Code</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ENCOUNTERS**

- **Date**
- **Provider Name**
- **Type**
- **Facility**
- **Clinic Name**
- **Stop Code**
- **Diagnosis**
TASKS & NOTIFICATIONS

Team & patient-related
Scheduling
Reminders
Priorities
Historical Tracking
CONSULT TRACKING

Full Panel Overview
Search/filter – date range, patient, status
Per-Patient Consult Report
Per-Consult Details
CARE PLANNING

Situation/Background
Learning Preferences
Assessment/Goals
Planning/Implementing
Evaluation & Monitoring/Plan Update
PACT Interdisciplinary Care Plan Note

PACT RN Care Manager Note

Functional Status Assessment

Fall Risk:
- No-Risk
- Low-Risk
- High-Risk
View Morse Scale
ASSSESSMENT & GOALS

Case Management Report
Problem Identification
Functional Status Assessments
PACT Interdisciplinary Care Plan Note

Dynamically created
Include specific Care Plan sections if changed
Include any option patient information
QUERY FUNCTIONALITY

Appointment Range
Risk Types
Risk Categories
Care Plan Evaluation
Nationally-Standardized Reports

Clinic Overall Summary
Case Management
Upcoming PC Appointments
Intensive Care Management
Functional Status Trends
Open Consults

MY REPORTS

Standardized Ad Hoc #1
Standardized Ad Hoc #2
## PCAS Functionality and Release Schedule

<table>
<thead>
<tr>
<th>RELEASE</th>
<th>highly desired FUNCTIONALITY</th>
<th>implementation GOAL</th>
</tr>
</thead>
</table>
| 1.0 ONGOING Pilot Site review initiated 09. 2012. | • Infrastructure  
• PACT Team management  
• Administrative access management module  
• Panel overview  
• Consults  
• Patient demographics & contacts  
• Risk characteristics (including CAN) | IDENTIFY  
1. National awareness of PCAS  
2. Manage PACT teams  
3. Identify highest risk patients  
4. Track consults |
## PCAS Functionality and Release Schedule

<table>
<thead>
<tr>
<th>RELEASE</th>
<th>highly desired FUNCTIONALITY</th>
<th>implementation GOAL</th>
</tr>
</thead>
</table>
| 2.0* To pilot 07.2013 | • Outpatient encounters  
                         • Discharge summaries  
                         • Care management tasks and notifications  
                         • Query functionality | **MANAGE**  
Adoption for tasks and notifications |

**GOAL**

- **MANAGE**
  Adoption for tasks and notifications
<table>
<thead>
<tr>
<th>RELEASE</th>
<th>highly desired FUNCTIONALITY</th>
<th>implementation GOAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>• Medications</td>
<td>MANAGE</td>
</tr>
<tr>
<td></td>
<td>• Problem lists</td>
<td>Establish routine</td>
</tr>
<tr>
<td></td>
<td>• Additional clinical and</td>
<td>tasks for patient</td>
</tr>
<tr>
<td></td>
<td>vitals data</td>
<td>management to</td>
</tr>
<tr>
<td></td>
<td>• Legal documents</td>
<td>facilitate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>implementation of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>care planning</td>
</tr>
<tr>
<td>RELEASE</td>
<td>highly desired FUNCTIONALITY</td>
<td>implementation GOAL</td>
</tr>
<tr>
<td>---------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>4.0</td>
<td>• CARE PLANNING Service (VA and community-based) administration</td>
<td>COORDINATE Adoption of care planning</td>
</tr>
<tr>
<td>5.0</td>
<td>• CARE PLAN NOTES Advanced reports and query</td>
<td>COORDINATE Full use of PCAS for PACT care plan documentation</td>
</tr>
<tr>
<td></td>
<td>• Additional community integration (where possible)</td>
<td></td>
</tr>
</tbody>
</table>
Ongoing Evaluation

- Implementation
- Standards of care
- High risk ambulatory patient evaluation

- Primary Care Services
- Office of Nursing Services
Ongoing Evaluation
PILOT SITE EVALUATION SUPPORT

- Implementation
- Standards of care
- High risk ambulatory patient evaluation

- Team-Based Care vs Episodic Care
- Workflow Patterns
- Bugs/Issues/Suggestions!
TEAM

- PACT Nurse and Provider Members of Requirements Team
- Stephen Anderson, MS
- Tamara Box, PhD
- Chris Bryson, MD MPH
- Stephan Fihn, MD MPH
- Kathleen Frisbee
- Betsy Lancaster, MS
- Toni King
- Mary McDonell, MS
- Chris Nielson, MD
- Steve Krysiak
- Sophie Lo
- Indra Gupta
- Dean Delventhal
- SP Thakur
- Fred Kirkland
- Shawn Loftus
- Elliot Lowy, PhD
- Charles Maynard, PhD
- Haili Sun, PhD
- Li Wang, MS
THANK YOU

Tamara L. Box, PhD (Tami)
Tamara.Box@va.gov