Extracting Data from the EHR Using CAPRI and VistAWeb

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Overview

- What are VistAWeb and/or CAPRI?
  - Orientation and comparison
- Why use central chart review in research?
- Examples using VistAWeb and CAPRI for research
  - INSPIRE SDP (L. Williams, PI)
  - CARE TIMe SDP (D. Bravata, PI)
  - Operational projects/Office of Clinical Analytics and Reporting
- Lessons learned
- Questions
Audience poll question 1

2015: What is the approximate total amount of snow received at your VA facility this FY?

a. No snow!
b. 0.1-2 inches
c. 2-5 inches
d. 6-10 inches
e. 10-24 inches
f. 25-35 inches
g. 36-48 inches
h. > 48 inches
Audience poll question 2

What experience do you have using central chart review for VA research?

a. Never tried to do this before
b. Used paper charts
c. Used VistAWeb
d. Used CAPRI
e. Used both VistAWeb and CAPRI
f. Used some other platform for central chart review
Question 1: What are VistAWeb and CAPRI?

- **VistAWeb**
  - A VA Intranet web portal
  - Read-only access to individual patient EHR data from all VA sites
  - Developed to facilitate sharing of individual patient data among that patient’s providers at other VAMCs

- **CAPRI**
  - A VA Intranet web portal
  - Read-only access to patient EHR data at one specific site of interest
  - Developed to facilitate coordination between the Veterans Benefit Administration (VBA) and the Veterans Health Administration (VHA) in the determination of Veteran benefits

- Both systems are useful and have unique strengths for VA EHR chart review studies
**EHR Data Portals - Compensation & Pension Data Interchange (CAPRI) & VistAWeb**

<table>
<thead>
<tr>
<th>CAPRI</th>
<th>Both</th>
<th>VistAWeb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires special software and access/verify codes</td>
<td>Read-only access to EHR one patient at a time</td>
<td>VA Intranet web portal accessed through local VistA</td>
</tr>
<tr>
<td>Data viewed from one healthcare site at a time</td>
<td>Require real SSN</td>
<td>Data consolidated on local site of VistA</td>
</tr>
</tbody>
</table>

**Recommendation:** Get both for maximum flexibility; no additional DART application required.
VistAWeb vs. CAPRI layout

Often looking within the Clinical Documents tab

Use tabs at the bottom to search for specific data categories similar to CPRS
Considerations using VistAWeb or CAPRI

• VistAWeb
  ▫ Shows patient data across different facilities
  ▫ Must pay attention when separate locations share a single facility identifier
  ▫ Text searching of some data, e.g., orders, note titles, meds but not note text (available in CAPRI)
  ▫ Able to access some scanned documents

• CAPRI
  ▫ Single location with option to link to VistAWeb
  ▫ Enhanced search capabilities
VistAWeb shows note title and location:
Notes from multiple care sites: VistAWeb

HISTORY & PHYSICAL - INPATIENT
Site: Tennessee Valley HCS
Date: 
Author: 
Location: 1A(MED)-MU

LOCAL TITLE: HISTORY & PHYSICAL - INPATIENT
STANDARD TITLE: PHYSICIAN H & P NOTE
DATE OF NOTE: 
AUTHOR: 
URGENCY: 

Resident: 
Intern: 

CHIEF COMPLAINT: Left sided weakness

HISTORY OF PRESENT ILLNESS
Patient is a MALE CHF, obesity hyperlipidemia Center in administered by the family patient had episodes of sequelae that the pain subsided and the patient complained of that he stopped breathing
The patient only stopped breathing

NEUROLOGY GENERAL NOTE
Site: Tennessee Valley HCS
Date: 
Author: 
Location: 2N-MED-NA

LOCAL TITLE: NEUROLOGY GENERAL NOTE
STANDARD TITLE: NEUROLOGY NOTE
DATE OF NOTE: 
ENTRY DATE: 
AUTHOR: 
EXP COSIGNER: 
URGENCY: 
STATUS: COMPLETED

*** NEUROLOGY GENERAL NOTE Has ADDENDA ***

Chief Complaint: Acute stroke

HPI: This year-old MALE w/ hx HTN who started having difficulty talking and left sided weakness yesterday at about 20 pm was brought to ER via ambulance. His initial SBP was which gradually went down at ER to . He denied any trauma, headache, change in vision, LOC or seizure activity. On arrival to ER, his speech improved but left hand became heavy as per patient. Head CT was negative.
On initial exam, NIH stroke scale was 1, suggesting that he does not need thrombolytics.
Admits at multiple care sites: VistAWeb

Patient cared for at Nashville VAMC

Patient cared for at Murfreesboro VAMC
Searching with VistAWEB using the find command: possible within some categories e.g. orders ("aspirin"), medications, labs, note titles but not note text.
Example of notes and text Search Function within notes in CAPRI

- In the “Clinical Documents” view, click on the “Notes” tab at the bottom
- All notes from one facility are shown in chronological order
Using the search term “carotid” (bottom right corner) only notes containing this word are shown, and the word is highlighted within the note.
Question 2: Why use central EHR-based chart review?

1) What about using notes in the CDW?
2) Cost/accuracy vs. local chart reviews
3) Confirm data in VA administrative datasets, e.g.:
   - Validate case ascertainment strategies
   - Assess clinical vs. administrative completion of an action
4) Capture data not available in VA administrative datasets, e.g.:
   - Scanned records
   - Some types of narrative data
     - Written orders
     - Comment fields
Issue 1: Using CPRS TIU notes in the VA Central Data Warehouse (CDW)

- TIU text notes are available in the CDW, but:
  - Review of bulk text notes not as user-friendly as the chronological notes organized in tabs in VistAWeb and CAPRI
  - Currently, date and time of note entry is stripped from the TIU notes in the CDW
  - Searching for specific text strings more straightforward in CAPRI and VistAWeb
- Not all text elements are available in the CDW (e.g. order text, addendums to data entry, scanned documents)
Issue 2: Local vs. Central Chart Review?

- Expense, training, quality control often favor central EHR-based chart review over independent local reviewers in research studies.
- **INSPIRE SDP example**
  - 11-site study comparing two methods of improving inpatient stroke quality indicators.
  - Stroke admission defined using ICD9 discharge codes.
    - Opened 2,305 charts
    - 1,600 full review
    - ~160 random 10% inter-rater reliability
  - 118+ variable chart review form, 11 quality indicators.
Central Chart Review Quality

- Data quality extremely high
  - 113/118 variables > 0.8 ICC/kappa
  - QI result agreement (ineligible, passed, failed) excellent with kappas 0.84-0.96

![Graphs showing ICC and Kappa values for various variables]
Chart review expense example

- 11-site study, reviewing 2.5 years of stroke admissions (approximately 2,300 charts)
  - Site level load is approximately 75 stroke cases per year
  - If prospectively reviewing cases, volume small
    - Difficult to find sites willing and able to hire some small % of a research assistant
  - If retrospectively reviewing cases, would still need central EHR review to assess local accuracy
  - Training, maintaining, retaining the off-site personnel over a 3-year study is not feasible
Issue 3: Confirm data in VA admin datasets

- Case ascertainment
  - Is the administrative algorithm you have defined actually capturing the subjects, events, episodes of care that you intend?
- Validation of electronic measures of VA processes of care
# E-measure example: TIA care

<table>
<thead>
<tr>
<th>Measure</th>
<th>Measure Validation</th>
<th>Pass Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Denominator</td>
<td>Numerator</td>
</tr>
<tr>
<td></td>
<td>(N=528)</td>
<td>(for patients in both admin &amp; chart denominator)</td>
</tr>
<tr>
<td></td>
<td>Disagree</td>
<td>% Agree</td>
</tr>
<tr>
<td>Carotid Imaging</td>
<td>44</td>
<td>91.7%</td>
</tr>
<tr>
<td>Carotid Stenosis Management</td>
<td>10</td>
<td>98.1%</td>
</tr>
<tr>
<td>Antihypertensive Intensification</td>
<td>77</td>
<td>85.4%</td>
</tr>
<tr>
<td>Hypertension Control</td>
<td>60</td>
<td>88.6%</td>
</tr>
<tr>
<td>Lipid Measurement</td>
<td>33</td>
<td>93.8%</td>
</tr>
<tr>
<td>Cholesterol Lowering Medication</td>
<td>72</td>
<td>86.4%</td>
</tr>
<tr>
<td>Cholesterol Med Intensification</td>
<td>85</td>
<td>83.9%</td>
</tr>
<tr>
<td>Brain Imaging</td>
<td>59</td>
<td>88.8%</td>
</tr>
<tr>
<td>Holter Monitor</td>
<td>27</td>
<td>94.9%</td>
</tr>
<tr>
<td>Antithrombotics at Discharge</td>
<td>43</td>
<td>91.9%</td>
</tr>
<tr>
<td>Atrial Fibrillation: INR Ordered</td>
<td>25</td>
<td>95.3%</td>
</tr>
<tr>
<td>Atrial Fibrillation: INR 2-3</td>
<td>21</td>
<td>96.0%</td>
</tr>
<tr>
<td>HbA1c Measurement</td>
<td>40</td>
<td>92.4%</td>
</tr>
<tr>
<td>Speech Language Pathology</td>
<td>14</td>
<td>97.3%</td>
</tr>
</tbody>
</table>
## E-measure example: Antithrombotic by hospital day 2

<table>
<thead>
<tr>
<th></th>
<th>Local Chart</th>
<th>CDW Chart</th>
<th>Sources of Error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Denominator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EHR</td>
<td>Elig</td>
<td>Inelig</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>79</td>
<td>1</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>65</td>
<td>2075</td>
</tr>
<tr>
<td>Inelig</td>
<td>6</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>29</td>
<td>55</td>
</tr>
<tr>
<td>Total</td>
<td>85</td>
<td>6</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>2036</td>
<td>94</td>
<td>2130</td>
</tr>
<tr>
<td>Sens</td>
<td>92.9%</td>
<td></td>
<td>98.7%</td>
</tr>
<tr>
<td>Spec</td>
<td>83.3%</td>
<td></td>
<td>30.9%</td>
</tr>
<tr>
<td>PPV</td>
<td>98.8%</td>
<td></td>
<td>96.8%</td>
</tr>
<tr>
<td>NPV</td>
<td>45.5%</td>
<td></td>
<td>52.7%</td>
</tr>
</tbody>
</table>

|                | Numerator** |           |                 |
| EHR            | Pass        | Fail      | Total           | False Negative |
|                | 80          | 0         | 80              | Meds only documented in notes = 23 |
|                | 1822        | 18        | 1840            |                 |
| Pass           | 0           | 5         | 5               | Others = 6      |
| Fail           | 29          | 167       | 196             |                 |
| Total          | 80          | 5         | 85              | False Positive  |
|                | 1851        | 185       | 2036            | Med order/not given = 9 |
| Sens           | 100.0%      |           | 98.4%           |                 |
| Spec           | 100.0%      |           | 90.3%           | Subq heparin = 4 |
| PPV            | 100.0%      |           | 99.0%           | Others = 5      |
| NPV            | 100.0%      |           | 85.2%           |                 |
Examples of surprising discrepancies: “False positives” in administrative data

- Admission with stroke ICD9 primary discharge code in VA administrative data is actually for an episode of non-VA care paid for by the VA.
- An inpatient consult electronically completed per administrative data states “patient discharged before being seen, will schedule as outpatient.”
- A medication noted as given in VA Bar Code Medication Administration (BCMA) data has a note entered that says “held, patient off floor.”
- An outpatient medication is not discontinued electronically but provider note records instruction to stop the medication.
Issue 4: Capture data not in VA admin datasets

- Scanned documents
  - Not always accessible in VistAWeb, not in CAPRI
- Data elements that reflect complex aspects of care
  - Discussion of comfort care or advanced directives
  - Coordination of care between providers
- Data elements that reflect clinician judgment
  - Documentation of reasons not to provide an evidence-based treatment (patient declines treatment, ineligibility, etc.)
- Text-based data elements with high inter-site and intra-site variability (difficult to use text mining/NLP)
  - Different methods for conducting and documentating dysphagia screening
  - Different locations, providers, notes, language to document ambulatory status
1. Was the patient hospitalized for at least 2 days?

2. Was the patient ambulatory by hospital day (HD) 2?

3. Were "comfort measures only" documented by HD2?

4. Were appropriate medications or mechanical prophylaxis given by HD2?

5. Were any contraindications to meds and mechanical prophylaxis recorded by the provider?
# TIA Guideline Concordant Care Components

<table>
<thead>
<tr>
<th>Processes of Care</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a Carotid Artery Imaging</td>
<td>Carotid imaging procedure within 2 days of index event</td>
</tr>
<tr>
<td>1b Carotid Stenosis Management</td>
<td>Carotid stenosis procedure (endarterectomy or stent) within 14 days of index event</td>
</tr>
<tr>
<td>3a Lipid Measurement</td>
<td>Fasting lipids measured within 2 days of index event or within the prior 180 days</td>
</tr>
<tr>
<td>3b Lipid Management</td>
<td>Prescribed cholesterol-reducing therapy within 7 days</td>
</tr>
<tr>
<td>3c Cholesterol Lowering Intensification</td>
<td>Intensification of cholesterol-reducing therapy within 7 days after discharge</td>
</tr>
<tr>
<td>4 Brain Imaging</td>
<td>Brain imaging (Brain CT or MRI) within 2 days of index event</td>
</tr>
<tr>
<td>5a Electrocardiography</td>
<td>ECG within 2 days of index event</td>
</tr>
<tr>
<td>5b Telemetry</td>
<td>Telemetry within 2 days of index event or admitted to ICU/CCU/SICU</td>
</tr>
<tr>
<td>5c Holter</td>
<td>Holter as part of their index event or within 30 days of discharge</td>
</tr>
<tr>
<td>6a Antithrombotics by Hospital Day 2</td>
<td>Antithrombotic therapy within 2 days of index event</td>
</tr>
<tr>
<td>6b Antithrombotics at Discharge</td>
<td>Antithrombotic therapy within 2 days after discharge</td>
</tr>
</tbody>
</table>

- Telemetry a written order
- Telemetry results in scanned docs
- Aspirin not recorded as non-VA med
- Exclusions not in admin data
Lessons learned about using VistAWeb and CAPRI for research:

- **Optimal way to collect complex clinical chart-recorded data**
  - Consider complexity and data quality requirements
    - Chart review is not a simple process, and it can be hard to consistently do it with a high level of accuracy
  - Develop standard chart review manual and update with local examples as they are noted
    - Where key data elements are most often found in a given facility: Orders? Notes? Consults?
    - What note titles are most likely to have data you need
  - Standardize search features and terms
Lessons learned about using VistAWeb and CAPRI for research:

- Increase estimated time per chart review from local CPRS by some small factor (10-15%) to take into account view switching and page loading issues
  - However, additional search features may end up saving time depending on what you are looking for
Lessons learned about using VistAWeb and CAPRI for research:

• **Surprising discrepancies between electronic and chart data**
  ▫ This is key to helping others learn about the strengths and weaknesses of various data sources
  ▫ Discrepancies can also suggest what data elements might be considered for standardization
Lessons learned about using VistAWeb and CAPRI for research

• **Organization/administrative pearls:**
  - Designate one person from your study to submit and stay in communication via the DART process

• **Keep your chart reviewers happy!**
  - Breaks for other types of work
  - Shared positions if possible
  - Regular team meetings to discuss questions, resolve differences, update chart review manual
  - Prizes for “Best Story of the Week”
Resources/Help

- VHA Data Portal (VA intranet only)

- VistA Documentation Library
  - [http://www.va.gov/vdl/default.asp](http://www.va.gov/vdl/default.asp)

- VIReC (VA intranet only)
  - [http://vaww.virec.research.va.gov/CAPRI-VistAWeb/CAPRI.htm](http://vaww.virec.research.va.gov/CAPRI-VistAWeb/CAPRI.htm)
  - Comparing CAPRI & VistAWeb
  - Using VistAWeb for the First Time for Research
Questions?

It's QUESTION TIME!!