Clinical Decision Support Consortium
Technical Expert Panel

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December 6, 2011
Agenda

- Status Update (10 min)
- Discussion of Challenges (5 min)
- Questions for the Technical Expert Panel (TEP) (5 min)
Legal work

- Developed Steering Committee Charter
- Philips signed Letter of Understanding and joined Clinical Decision Support Consortium (CDSC) as an ‘Observer’
- Finalized the CDSC collaboration agreement for CDS service integration and shared with both vendors (GE and NextGen)
- Work on the agreement for vendor customers
- Started discussion with AT&T and research team from Norway on a potential collaborations
Terminology

- Guided NextGen through filtering list of 16,000 SNOMED codes to 110 codes needed to align with the CDSC rules
- Identified codes (40+) that need to be reviewed for inclusion in the Partners HealthCare System (PHS) value sets.


- CDSC team discussed different options for building ICD9-based subsets for use by GE. Currently, PHS subset editor only supports SNOMED-based problem subsets.
- Initial review of the ICD9 determined that many of the ICD9 subsets are not equivalent with the SNOMED subsets used in CDSC rules. The CDSC subsets and classification rules may need to be modified to address this inequality.
- Discussed with GE shared roles and responsibilities for building ICD9-based subsets.
Content creation and publishing

RI Care Rules

• Finished analyzing the Preventive Care Blocks which provide preventive care decision support reminders. Created boundaries in the program logic to define 81 level 4 (L4) rules.

• Ranked rules based on feasibility and generalizability. Presented candidate list to CDSC Content Governance Committee (CGC) and incorporating feedback. Final list of rules delivered to eRoom.

• Created first two valid L3 documents.

Publishing

• Editorial Policy was unanimously ratified by the CDSC Steering Committee.

• Published Structured Care Recommendations (eRecs) content on the CDSC knowledge management (KM) portal Related References page. http://cdsportal.partners.org/RelatedResources.aspx?pageId=3

• Published ONC-funded Advancing CDS (ACDS) project content, which uses expanded L3 schema developed by the CDSC project team.
KM schemas and models

- Created XML schema for unified model for modality-specific knowledge representation. Made progress on a stylesheet for unified model.
- Roll-out of initial beta-test release, with new features: infobutton, order set, bug-tracking, note log.
- Use of schematron for specifying modality-specific constraints. Later modifications permit different modalities in the same file.
- Began development for inter-level content mapping: L1 to L2 and L4 to L3.
- Developed a detailed process for identifying the high priority rules that will be forward engineered.
- Re-published the L3 Diabetes specification to include diabetic foot exam and digital retina exam as requested by RI.
Knowledge Document Structure (example)

<table>
<thead>
<tr>
<th>CDS Knowledge Base</th>
<th>Knowledge Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Element: Reminder Rule</td>
<td>Metadata</td>
</tr>
<tr>
<td>Knowledge Element: Order Set</td>
<td>Action</td>
</tr>
<tr>
<td>Knowledge Element: Documentation Template</td>
<td>Behavior</td>
</tr>
<tr>
<td>Knowledge Element: Info Button</td>
<td>Presentation</td>
</tr>
</tbody>
</table>
Knowledge Document Implementation

- XML Schema
  - Specifies a generic structure for all modalities
- Schematron rules
  - ISO Standard
  - Constrain which elements can be used and how for any modalities
Schematron Rule Example

```
<sch:pattern id="CheckActionIsKnowledgeAssetRequestOrMessageRequest">
  <sch:title>Checks all actions are KnowledgeAssetRequest or MessageRequest</sch:title>
  <sch:rule context="CDSKnowledgeBase/knowledgeElement[metadata/implementation/knowledgeType='Reference Information']/action">
    <sch:assert test="@xsi:type ='KnowledgeAssetRequest' or @xsi:type ='MessageRequest'">
      Infobutton only allows KnowledgeAssetRequest or MessageRequest actions
    </sch:assert>
  </sch:rule>
</sch:pattern>
```
Community Acquired Pneumonia Order Set
This dummy order set was based on extracts from NWH...

Coverage (Use this order set if...):

<table>
<thead>
<tr>
<th>Focus</th>
<th>Display Name</th>
<th>Code</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>patient</td>
<td>Adult Patient</td>
<td>255397009</td>
<td>inclusion</td>
</tr>
<tr>
<td>careSetting</td>
<td>Inpatient Environment</td>
<td>416800000</td>
<td>inclusion</td>
</tr>
<tr>
<td>clinicalFocus</td>
<td>Coronary Artery Disease</td>
<td>537410008</td>
<td>inclusion</td>
</tr>
</tbody>
</table>

Medication Orders

- **No MRSA and no pseudomonas risk**
  - Ceftriaxone 1 gm IV times 1
  - Azithromycin 500 mg IV times 1
  - Moxifloxacin 400 mg IV times 1 (where appropriate may be used as a single agent)

Lab Orders

- Blood cultures times 2 prior to antibiotics
- Na
- Cl
- K
- BUN
- Microalbumin/Creatinine [Mass ratio] in Urine
- Albumin/Creatinine [Mass ratio] in Urine
- Phosphate [Mass or Moles/volume] in Urine
<table>
<thead>
<tr>
<th>Main search concept/term</th>
<th>Query modifier/subtopic</th>
<th>Patient</th>
<th>Care setting</th>
<th>Task context</th>
<th>User</th>
<th>Information recipient</th>
<th>Resource</th>
</tr>
</thead>
<tbody>
<tr>
<td>extrinsic asthma with acute exacerbation <em>(ICD-9-CM: 493.02)</em></td>
<td>diagnosis</td>
<td>adult</td>
<td>inpatient</td>
<td>Physician</td>
<td>Physician</td>
<td>ICSI Guideline for Hypertension Diagnosis and Treatment <a href="http://guidelines.gov/content.aspx?id=24719&amp;search=hypertension">http://guidelines.gov/content.aspx?id=24719&amp;search=hypertension</a></td>
<td></td>
</tr>
</tbody>
</table>
CDS Service – PHS and RI

Trial of Enterprise Clinical Rules Service (ECRS) with RI and Longitudinal Medical Record (LMR) is continuing.

– June 16, 2011 - RI demonstration goes live. Stage 1 - system was used by only the RI Medical Informatics team (Drs. Linas Simonaitis, Burke Mamlin, and Jon Duke).

– July 18, 2011 - Stage 2 initiated, four clinicians at the Wishard Health Services Blackburn Health Center began receiving CDSC alerts.

– August 24, 2011 - additional clinicians at Blackburn begin receiving alerts; nurses and medical assistants also start receiving alerts.

• 200 patient visits processed for the month of July.

• Software developers eliminate some duplicate queries.
Terminology

- Changed CCD’s to include new RI LOINC codes mapping blood pressure measurements, diabetic foot exam, and dilated retinal exam.
- Ensured that non-SNOMED based subsets will be correctly processed by downstream services.
- Problem of false-positive related decision support reminders have been corrected for Blood Pressure.
- Counts of reminders to check Diabetic Foot Exams decreased. Counts remain high, but are true-positives rather than false-positives as before. Foot exams may be performed, but are not coded, and thus appropriately lead to the generation of the reminder.
CDS Service - NextGen

- ECRS integration with NextGen EHR has gained needed access to development environment through PHS firewall.
- NextGen’s legal counsel is reviewing the legal agreements.
- Sent test list of patients and data to NextGen in preparation for integration testing.
- Began development for changes to service component underlying the CDS Service identified as needed for NextGen integration.
Evaluation

- Conducted literature review, prepared outline of the business model report.
- Met with faculty members at Harvard Business School (HBS), continued work with each of the CDSC teams to identify their unique value.
- Had discussions with encoders of American College of Chest Physicians (ACCP) guidelines on using CDSC schemas and KAT for forward engineering of those guidelines.
- Successfully identified three software packages for CDSC Dashboard open-source analysis based on suitability as enterprise reporting systems.
- KMLA team created schedule for site visits during OY2 and received approval from Jim Walker for making the Geisinger visit.
- Set up queries to provide data to CDSC Research Committee meetings and began matching of RI-provided data with service results.
- Performance data is being loaded to the research database.
# KM Portal and Dashboards usage summary statistics to date

## CDSC KM Portal Statistics

<table>
<thead>
<tr>
<th>Current Published Assets</th>
<th>October, 2011</th>
<th>Since February, 2010</th>
<th>Most Viewed Content</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unique IP Addresses</td>
<td>Number of Visits</td>
<td>Unique IP Addresses</td>
</tr>
<tr>
<td>48</td>
<td>43</td>
<td>69</td>
<td>693</td>
</tr>
</tbody>
</table>

## CDS Dashboards Usage Summary

<table>
<thead>
<tr>
<th>Provider View:</th>
<th>Usage for: 10/8-11/7/2011</th>
<th>Total number of usage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12 times by 10 unique people</td>
<td>278 times by 138 unique people</td>
</tr>
<tr>
<td>9 people used it once</td>
<td>91 people used it once</td>
<td></td>
</tr>
<tr>
<td>1 person used it three times</td>
<td>9 people used it three times</td>
<td></td>
</tr>
<tr>
<td>Designer View:</td>
<td>------------------------------------- 7 people used it once</td>
<td></td>
</tr>
<tr>
<td></td>
<td>------------------------------------- 1 person used it three times</td>
<td></td>
</tr>
<tr>
<td>Month</td>
<td>Current Published Assets</td>
<td>Searches</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Feb '10</td>
<td>32</td>
<td>97</td>
</tr>
<tr>
<td>Mar '10</td>
<td>35</td>
<td>46</td>
</tr>
<tr>
<td>Apr '10</td>
<td>35</td>
<td>268</td>
</tr>
<tr>
<td>May '10</td>
<td>35</td>
<td>52</td>
</tr>
<tr>
<td>Jun '10</td>
<td>35</td>
<td>51</td>
</tr>
<tr>
<td>Jul '10</td>
<td>35</td>
<td>17</td>
</tr>
<tr>
<td>Aug '10</td>
<td>35</td>
<td>59</td>
</tr>
<tr>
<td>Sep '10</td>
<td>35</td>
<td>51</td>
</tr>
<tr>
<td>Oct '10</td>
<td>35</td>
<td>71</td>
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<tr>
<td>Nov '10</td>
<td>35</td>
<td>240</td>
</tr>
<tr>
<td>Dec '10</td>
<td>35</td>
<td>64</td>
</tr>
<tr>
<td>Jan '11</td>
<td>35</td>
<td>68</td>
</tr>
<tr>
<td>Feb '11</td>
<td>35</td>
<td>65</td>
</tr>
</tbody>
</table>
KM Portal summary data for the entire evaluation period

- **Visits and Pageviews**
  - Average: 3.08 P/V
  - Visits: 657
  - Pageviews: 2,025

- **Visits by New and Returning**
  - Returning Visitor: 76.62%
  - New Visitor: 29.38%

- **Geo Map Overlay**

- **Visits by Source**
  - (direct): 77.63%
  - webreports.partner.google: 5.18%
  - wlapp: 5.94%
  - partners.org: 6.24%
  - (other): 6.04%
## Services usage summary statistics

**Statistics: Calls to ECRS & Success Rates**  
Data from 10/12/2011 through 11/09/2011

<table>
<thead>
<tr>
<th></th>
<th># Days</th>
<th># Calls</th>
<th>Avg/Day</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Days</td>
<td>28</td>
<td>51660</td>
<td>1845</td>
</tr>
<tr>
<td>Weekend Days</td>
<td>8</td>
<td>2124</td>
<td>266</td>
</tr>
<tr>
<td>Weekdays</td>
<td>20</td>
<td>49536</td>
<td>2477</td>
</tr>
<tr>
<td><strong>RI</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Days</td>
<td>11</td>
<td>190</td>
<td>17</td>
</tr>
<tr>
<td>Weekend Days</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Weekdays</td>
<td>11</td>
<td>190</td>
<td>17</td>
</tr>
</tbody>
</table>
CDS Demonstrations
Toward a National Knowledge Sharing Service

Mid-Valley IPA (NextGen)
Salem, Oregon

Kaiser Roseville
UC Davis
Kaiser Sacramento
Kaiser San Rafael
Kaiser San Francisco
California

CDS Consortium
PECARN TBI CDS
<table>
<thead>
<tr>
<th>Organization</th>
<th>Type</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>NextGen (Virtual, pre-implementation)</td>
<td></td>
<td>December 5-12, 2011</td>
</tr>
<tr>
<td>GE (Virtual, pre-implementation)</td>
<td></td>
<td>January 2012</td>
</tr>
<tr>
<td>Duodecim (Virtual)</td>
<td></td>
<td>February at HIMSS or in June 2012</td>
</tr>
<tr>
<td>Geisinger (In-person, post-implementation)</td>
<td></td>
<td>March 2012</td>
</tr>
<tr>
<td>NextGen (In-person, post-implementation)</td>
<td></td>
<td>April 2012</td>
</tr>
<tr>
<td>NextGen (Virtual, post-implementation)</td>
<td></td>
<td>May 2012</td>
</tr>
</tbody>
</table>
Dissemination


- Presented findings at American Medical Informatics Association (AMIA)

- Received Distinguished Paper nomination at AMIA for: A Legal Framework to Enable Sharing of Clinical Decision Support Knowledge and Services Across Institutional Boundaries. Hongsermeier T, et al.

- Sent all OY1 recommendations to Jacob Reider, MD, new senior policy director for CDS at ONC.

- Updated CDSC website with OY2 projects and new members.
Challenges and Barriers

- CDSC KAT is not fully deployed yet.
  - Making KAT available as a Web Service would be helpful for Forward and Reverse Engineering projects.

- Current schematron constraints limit an XML instance file to contain only one modality type.
  - It is useful to allow one XML file (equivalent to one guideline) to contain different modalities.

- To upload ACDS and eRecs artifacts, the team spent a significant amount of time addressing/resolving portal publishing issues.
  - Useful to utilize common knowledge representation format to share artifacts
Challenges and Barriers (cont.)

- Limited clinical informatics expertise for terminology harmonization for services integration
  - Specify in detail CCD terminology model, and vendor complies with the spec.
- Difference of opinions on who should QA CCDs.
  - CDSC tested manually, but ideally a vendor would conduct QA with a web test harness
- Unacceptable failure rate in the LMR due to the slowness in generating the CCD.
  - Efforts are ongoing within the Services team to improve performance of the CCD Factory.
  - We are also analyzing other optimizations, such as direct data access or asynchronous calls.
- Matching records from service execution calls with those from RI preparation is proving to be challenging.
  - Need to clean up record identifiers.
Acknowledgements

Principal Investigator: Blackford Middleton, MD, MPH, MSc

CDSC Team Leads:
Research Management Team: Lana Tsurikova, MSc, MA
KMLA/Recommendations: Dean F. Sittig, PhD
Knowledge Translation and Specification: Aziz Boxwala, MD, PhD
KM Portal: Tonya Hongsermeier, MD, MBA
CDS Services: Howard Goldberg, MD
CDS Demonstrations: Adam Wright, PhD
CDS Dashboards: Jonathan Einbinder, MD
Evaluation: David Bates, MD, MSc
Content Governance Committee: Saverio Maviglia, MD, MSc
Questions to TEP

• Which is more important: Open Source rules engine, or Open Source knowledge?
• What is the right level of standardization for an enhanced CCD to support CDS?
• What guidance can the TEP provide to contractors (and the ONC) on the ability to 'certify' CDS in EHRs?