Clinical Decision Support Consortium: Overview of the Knowledge Management Portal and Repository

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The KMPR Team is developing and implementing collaborative knowledge management tools.

Collaboration tool infrastructure leverages Partners-hosted EMC tool called eRoom.

Repository infrastructure consists of Documentum tools for publishing and life-cycle management of content as well as Partners-developed web portal for access, search and retrieval of content.

These tools support development, review, publication, cataloging and archival of knowledge specifications in human and machine readable forms.

As the CDS Consortium instance of these technologies are work-in-progress, we will illustrate how these tools are used today at Partners Healthcare System and extrapolate how these will be re-designed and deployed for the Consortium.
Knowledge Management for Clinical Decision Support Life-Cycle

Challenges:

1. Governance and Stewardship poorly defined
2. Which US Preventive Services Task Force, 
   HEDIS or JCAHO measure do you focus on first?
3. Inadequate tools and lack of personnel to support vetting and update of knowledge
4. Physician, nursing, and pharmacy resources are precious
5. Bottlenecks the time it takes to agree on content
6. No time for meetings
7. Lack of transparency of knowledge already in production to enable sharing across the enterprise
8. Little ability to re-use prior specifications – leads to duplication of effort and proliferation of unnecessary clones
9. Project and resource competition with other engineering projects, prioritization processes unclear
10. Editors inadequate
11. Lack of access to analytic data available on decision support content or impact on clinical outcomes impact to direct updating
12. No content management tools to support process and ensure timeliness of update and maintenance
Key Research Questions for the KMPR Team

• How do we *improve* the efficiency and effectiveness of translation of clinical practice guidelines into actionable CDS in healthcare information technology?

• How do we *collate, aggregate*, and *curate* knowledge content for CDS in a knowledge portal used by members of the CDS Consortium?

• How may we use such a tool to support knowledge management and collaborative knowledge engineering for clinical decision support at scale, across multiple healthcare delivery organizations, and multiple domains of medicine?

• How do we take the learnings garnered through the course of these investigations and broadly *disseminate* them broadly to key stakeholders?
Enabling Technologies To Be Deployed:

• Collaboration tools for facilitate the content design process
  – Documentum’s eRoom

• Knowledge publishing and content life-cycle management tools:
  – Documentum’s Web Publisher and Content Management Services

• Knowledge Management Portal
  – User-friendly, searchable library of content
Key Roles in Content Lifecycle

• Clinical Content Committee Members:
  – provide direction/guidance on focus and prioritization of knowledge engineering activities

• Subject Matter Experts (SMEs):
  – physicians, nurses, pharmacists, allied health professionals who participate in vetting and validation of guidelines

• Knowledge Analysts:
  – typically have a clinical background, are stewards of a given knowledge asset, drive the design of knowledge specifications, surface questions to SMEs, manage the life-cycle, publishes to knowledge management portal

• Knowledge Engineers:
  – Ensure the content spec is “implementable” in the available technological framework, encode the knowledge into systems

• Developers:
  – Develop systems and tools for knowledge engineering
CDS Consortium Knowledge Specification Team is focusing on the following disease areas:

- **Diabetes Mellitus**

- **Coronary Artery Disease**
  - American College of Cardiology’s guideline on Antiplatelet Therapy Prescribed for Patients with Coronary Artery Disease
  - U.S. Preventive Services Task Force recommendation on Aspirin for the Primary Prevention of Cardiovascular Events

- **Hypertension**
  - U.S. Preventive Services Task Force recommendations on Screening for High Blood Pressure
Multilayered model – Knowledge Stack

Machine Execution
Abstract Representation
Semistructured Recommendation
Narrative Guideline

Narrative Recommendation layer
- Narrative text of the recommendation from the published guideline.

Semi-Structured Recommendation layer
- Breaks down the text into various slots such as those for applicable clinical scenario, the recommended intervention, and evidence basis for the recommendation
- Standard vocabulary codes for data and more precise criteria (pseudocode)

Abstract Representation layer
- Structures the recommendation for use in particular kinds of CDS tools
  - Reminder and alert rules
  - Order sets
- A recommendation could have several different artifacts created in this layer, one for each kind of CDS tool

Machine Executable layer
- Knowledge encoded in a format that can be rapidly integrated into a CDS tool on a specific HIT platform
- E.g., rule could be encoded in Arden Syntax
- A recommendation could have several different artifacts created in this layer, one for each of the different HIT platforms

Precision and executability
Flexibility and adaptability
Partners Healthcare System Deployment of KM Infrastructure

• Began in 2004
• KM Portal currently hosts about 600 specification documents representing 10s of 1000s of rows of content
• The portal supports transparency and sharing of content across a system with 5 internally developed CPOE systems (different architectures), 3 flavors of Meditech, and a Siemens Invision implementation
• 69 eRoom Collaboration Spaces now in production serving 400 and growing active users participating in content life-cycle management
• These collaboration spaces serve knowledge management activities at the enterprise and site-specific level and are organized by various topic areas
Collaboration Tools Enable Virtual, Asynchronous CDS Content Design

- Organization of collaboration spaces by array of topic areas and participants
- Issue tracking and scheduling of maintenance
- Versioning and annotation of documents
- Decision capture and tracking
- Reporting on design process, labor, participation for transparency
Here the knowledge engineering lead draws the discussion to a “close” and affirms that the design is consistent with the U.S. Preventive Services Task Force guidelines.

B. Perhaps we could automate a reminder to start doing stool cards at the 5-year mark (if experts think this strategy is actually helpful).

Option #2 looks good. (M.D., M.P.H., 15 Oct 07 4:25pm)
It is more specific, adding an extra inducement for us to get the facts straight with patients.

Nathan, regarding the 10-year interval, this is for patients at moderate-to-high risk and so the recommendation is q 5 years.

Rachel, I know getting information from endoscopy and path reports remains a problem, but does information from the problem list feed these reminders. That is, if I put “colonic adenoma” on the problem list, does that add my patient (at least) into the q 5 year category?

Problem list (Regier, Rachel, 19 Oct 07 11:53am)
Note: This is addressed in the discussion on other conditions. Short answer: This panel’s feedback is needed to determine which problems trigger the reminder, and at what risk level. Follow this link to the discussion:
http://kmcolab.partners.org/eRoom/CDS/PrimaryCareContentLMR/0_1c17a

Sorry, my mistake (E., M.D., 17 Oct 07 9:59pm)
Jeff, you are of course correct -- 10 yr interval does not apply to this group.

Ready to close? (Regier, Rachel, 19 Oct 07 11:51am)
It looks like we have general agreement on this one. It seems like there may be a little confusion regarding how long the reminder will turn off if the clinician does not chose coded responses but instead enters test results. Here’s the summary:

Colonoscopy -- turns reminder off for 5 yrs
Sigmoidoscopy -- turns reminder off for 5 yrs
Stool guaiac -- turns reminder off for 1 yr

These were based on USPSTF guidelines and the recommendations of the MGH GI Unit.
Once specifications are validated, they are published to the knowledge repository.
Portal enables Keyword and Filter-based Search, metadata filters will be modified to support CDS consortium.
Quantitative and Qualitative Measurement Strategy

• Quantitative measures
  • Collaboration: number and growth rate of logins, participants, and postings
  • Repository: number of guidelines posted, institutions represented, portal searches

• Qualitative measures
  • Technology Acceptance Model, a validated instrument for measuring perceived usefulness and ease of use
  • Instrument will be modified for the context of collaborative knowledge engineering