Guideline-Based Decision Support for Hypertension with ATHENA DSS

Organizational Issues in Implementation

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Views expressed are those of the speaker and not necessarily those of the Department of Veterans Affairs or other funding agencies or affiliated institutions.
Imagine you have a new informatics tool to share…

Interactive Visualization and Exploration of Time-oriented Clinical Data Using a Distributed Temporal-Abstraction Architecture
Yuval Shahar, et al 2003
Available in pubmedcentral
Where to Start?

• You have a cool new tool to improve quality of health care, for example,
  – to help clinicians with complex decisions
  – to transfer research knowledge into practice faster
  – to help quality managers analyze clinical data

• The IT tool is designed to integrate with the electronic databases/medical record

• How to get started implementing it?
Goals/Objectives of Session

• Overall goal
  – to share experience implementing information technology (IT) for clinical quality improvement (QI)

• Objectives: at end of session, participants should be able to…
  – consider sociotechnological approach to implementing IT in VA health care settings
  – identify several key stakeholders
Perspective

• Physician/health services researcher
• Drawing on expertise of others from wide variety of fields (interdisciplinary)
  – computer science/medical informatics
  – biostats
  – sociology
  – …and more
What the Clinician Sees…

ATHENA Hypertension Advisory

**Guideline Goal:** SBP < 130 and DBP < 85 [presence of diabetes, heart failure or renal insufficiency]

**BP apparently NOT UNDER CONTROL**, based on most recent available BP.

(Enter "Today's Decision Blood Pressure" and press "Update Advisory" for new recommendations.)

**Recommendations**

- Consider INTENSIFYING drug treatment: BP ELEVATED based on most recent available BP.

**Compelling Indication**

- Increase dosage of **Nifedipine**
- Add Thiazide Diuretic (HCTZ)

**Adverse Events**

- Heart Failure
- Diabetes
- Hypertension

**Your comments for the Guidelines Team**

Do not display Advisory for this clinic visit again.

Complete clinical information may not be available through the computer system. Please use all the information that you have about the patient together with your clinical judgment to decide on the best therapy for this patient.
ATHENA Hypertension Advisory: BP- Prescription Graphs

What is ATHENA DSS?

• Automated decision support system (DSS)
  – Knowledge-based system automating guidelines
    • Built with EON technology for guideline-based decision support, developed at Stanford Medical Informatics
    – For patients with primary hypertension who meet eligibility criteria

• Patient specific information and recommendations at the point of care

• Purpose is to improve hypertension control and prescription concordance with guidelines

• Athena in Greek mythology is a symbol of good counsel, prudent restraint, and practical insight

• Proc AMIA 2000
Sites for Clinical Trial

Palo Alto (in 7 cities), San Francisco, and Durham VAMC’s (total 9 separate sites)
Building ATHENA System From EON Components

Data Converter
- VA VISTA (DHCP)
- SQL Patient Database
- Pre-computed Advisories
- ATHENA HTN Guideline Knowledge Base

 nightly data extraction

EON Servers
- Temporal Mediator
- Guideline Interpreter
- Protégé

ATHENA Clients
- Event Monitor
- Advisory Client

VA CPRS

ATHENA GUI

VA VISTA

SQL Patient Database

Pre-computed Advisories

ATHENA HTN Guideline Knowledge Base

Temporal Mediator

Guideline Interpreter

Protégé

Event Monitor

Advisory Client
Server-Client

VA San Francisco Clinics

VA Palo Alto Clinics:
- Palo Alto
- Menlo Park
- San Jose
- Monterey
- Livermore
- Stockton
- Modesto

Server in Palo Alto, CA

Durham VA Clinics

Server in Durham, NC
Developing a Model Program

To Provide a Model Program that can be extended to other clinical areas

We selected hypertension as a model for guideline implementation because...

- Hypertension is highly prevalent in adult medical practice
- There are excellent evidence-based guidelines for management
- There is also evidence that the guidelines are not well-followed
  - a big ‘improvability gap’ in IOM terms

The theoretical model we use for the path to guideline adherence is the “Awareness to Adherence” model, in which the clinician must

- Awareness of guideline
- Acceptance of guideline
- Adoption of guideline
- Adherence to guideline

<table>
<thead>
<tr>
<th>Step</th>
<th>Facilitators</th>
<th>Informatics Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness</td>
<td><em>Priming Activities</em> such as profiling of baseline performance</td>
<td>Profiling from pharmacy and diagnosis database</td>
</tr>
<tr>
<td>Acceptance</td>
<td>Active education such as Academic Detailing; Clinical Opinion Leaders</td>
<td>Present evidence relevant to patient; allow opinion leaders to browse knowledge</td>
</tr>
<tr>
<td>Adoption</td>
<td><em>Enabling strategies</em> such as incorporation into clinic workflow</td>
<td>Integration with existing EMR</td>
</tr>
<tr>
<td>Adherence</td>
<td><em>Reinforcing Strategies</em> such as reminders</td>
<td>Point-of-care patient-specific advisories</td>
</tr>
</tbody>
</table>
Challenge of Using IT for Quality Improvement

- Technical challenges of using information technology for quality improvement (QI)
  - Difficult to integrate new forms of decision support into legacy data systems and electronic record interfaces
  - We had many design requirements in order to meet research goals and institutional goals
  - A “sociotechnical” challenge to implement

Available in pubmedcentral
Decision Support for Common Chronic Diseases

The physician often seen as wondering about a clinical question and then seeking out decision support:

The “Field of Dreams” approach to medical informatics implementations:

*If you build it, they will come*
Will it Be Used?

• Once decision support is integrated technologically, will clinicians use it?
• Many clinical decision support systems are used only a tiny percent of time available
  • For example, physicians viewed a hyperlipidemia guideline only 20 of 2610 visit opportunities (0.8%)
    – (note that even infrequent use may still be beneficial at very low cost)
“Sociotechnical”* Success

• Technical success
  – generates correct recommendations offline
  – extracts and uses patient data correctly
  – integrates with CPRS to display for the right
    • Patient, provider, clinical location, time window
  – logs the data needed for research evaluation

• “Sociological” success
  – clinicians find it usable and useful

Working with Stakeholders

[Diagram showing the relationship between IRMS, PCPs, Admin/Clinical Mgrs, and Clinical Applications Coordinators within the Athena Team.]
Some Technical Challenges

• Extracting clinical data from VistA
• Generating a popup window that appears in CPRS
  – At the right time, in the right clinic settings, for the right clinician, about the right patient
• Logging data about activity in the system
• Security issues
• Maintaining a system that is not on IRMS standard priority list
Some of the Social Challenges

• Clinicians extremely time-pressured in clinic
  – Strike balance between ease of access to system and ease of ignoring it
• Enormous variability in comfort with computers
  – And virtually no training time available
• Disagreements about the guidelines
  – some want VA GLs, some want JNC
Working with Stakeholders

Athena Team

PCPs

Admin/Clinical Mgrs

Clinical Applications Coordinators

Stckn

LD

SJ and VAMC

Mod

Durham

San Francisco

IRMS

Clinic computer Support staff

programming

networking
Taking on the Sociotechnical Challenge

• Aligning with institutional goals
  – Discuss with local stakeholders
  – VA performance standards and guidelines

• Speaking the language(s)
  – understanding that different computer worlds are worlds apart
    • Identify a bridge person to span the gap between IRMS expertise and non-VA programmers

• Iterative Design
  – With opportunity for re-design cycles after input from key clinical staff
  – Don’t test in clinic prematurely
    • Do your offline testing first
  – Test with typical users, not just early adopters
  – Recognize need for continual adaptation to our evolving informatics infrastructure
Working with Stakeholders

Athena Team

- PCPs
- PAD
- LD
- SJ and VAMC
- Stckn
- Mod
- Clinical Applications Coordinators
- National guideline groups
- Dep COS for LD
- Med Serv Chief
- Admin/Clinical Mgrs
- IRMS
- Clinic computer Support staff
- programming
- networking
## VA Guidelines

### Clinical Practice Guideline

#### Hypertension in Primary Care Update 04

<table>
<thead>
<tr>
<th>Guideline Reference</th>
<th>Download Center</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overview</strong></td>
<td>View Online</td>
</tr>
<tr>
<td>Information about the HTN guideline</td>
<td></td>
</tr>
<tr>
<td><strong>Guideline</strong></td>
<td>Complete guideline online (Interactive site)</td>
</tr>
<tr>
<td><strong>Algorithms</strong></td>
<td>The HTN-CPG algorithms</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
<td>Summary of recommendations July 2005</td>
</tr>
<tr>
<td>Pocket Card</td>
<td>HTN Pocket Card - [PDF format] July 2005</td>
</tr>
<tr>
<td><strong>Key Points</strong></td>
<td>The key points addressed by the HTN guideline</td>
</tr>
<tr>
<td><strong>Reminders</strong></td>
<td>Definition of clinical reminders:</td>
</tr>
<tr>
<td>1. HTN Lifestyle Education</td>
<td></td>
</tr>
<tr>
<td>2. HTN Elevated BP &gt; 140/90</td>
<td></td>
</tr>
<tr>
<td>3. HTN Elevated BP &gt; 160/100</td>
<td></td>
</tr>
<tr>
<td><strong>Archive</strong></td>
<td>Hypertension Guideline - 1999</td>
</tr>
</tbody>
</table>

### Related Performance Issues

- **Measures**: The HTN measures - Technical Manual
- **Database Questions**: EPRP database question FY2004
- **Reports**: Available on Intranet Only

### Related Guidelines

- Ischemic Heart Disease
- Stroke Rehabilitation
- Chronic Heart Failure
- Diabetes Mellitus
- End-Stage Renal Disease

### Guideline Community

#### Related Resources

Speaking the Language

• Recruit a VA staff person who is able to talk with both IRMS and non-VA programmers
  – Who understands VistA file structures
• Recognize that Office of Information has a complex and sophisticated process for managing projects
  – And many competing demands
• High-level support is important to have but is not enough
Understanding the Clinical Workflow

• Computer timestamps and clock time
• Conceptualizations of workflow in computer systems versus actual workflow
• (see next few slides)

Computer system workflow diverges from actual workflow.
Coordination redundancy: Entering and interpreting orders

In 97 interruptions of RN to MD, 25% were reminders
Planning the Timeline

• Conceptualization of tasks sequentially
  • Develop system
  • Test offline for accuracy and usability
  • Deploy in production system, limited to users who are testing it
  • Test in production system (in clinic)
  • Go live for clinical trial

• In reality, many tasks have subtasks that must be done concurrently with tasks from later in sequence
Usability and Usefulness Evaluation in Lab Setting

Evaluation Flowchart

Patient Data

Rules

• Eligibility
• Target BP
• BP under control
• Risk group
• Drug recommendations
• Messages

Comparison MD versus ATHENA

Martins SB et al Proc AMIA 2006 in press
“Physician Testers” in Clinical Setting

• Project-friendly physicians who test the system in early stages in clinic
  – Understanding it is not yet complete
  – Must be prepared to make changes in response to their comments
  – Some of these physicians become champions for the system

• Include clinical managers in early testing
Consensus Conference Calls

• Knowledge updates required in light of newly published clinical trials or new guidelines
  – Need a knowledge management process for vetting new material and deciding what will be incorporated
  – Make this process known to the clinicians who are end-users (especially local opinion leaders)
  – Invite local input to the discussion
  – Encode with a system that allows for easy updating

Eliciting Clinician Feedback

• Clinical Applications Coordinator (CAC) involvement at initial launch for large group
• Ongoing monitoring over time*
  – Real-time feedback about the patient being seen
    • Collected thru the display window
    • Must commit to reviewing regularly
    • Respond to all comments
    • Immediately address problems

Adapting to the Evolving IT Infrastructure

Example:

Basis for triggering a popup display window

Current method:

- CPRS Open Architecture broadcast of CPRS events via Windows messaging
  - IRMS was going to deactivate this and change to CCOW-compliant Context Vault
    - We developed a version that works with context vault
  - Problem of no user information in Context Vault and inconsistent implementation
    - Reverting to Windows messaging
Continuing Challenges

• No infrastructure support for lab
  – scramble from project to project
    • Scant funds for development, so doing the work of implementation and clinical trial
  – need to fund staff through multiple projects

• Funding gap
  – National Library of Medicine (NLM) funds new informatics (basic science of informatics)
  – HSR&D/AHRQ fund implementations for clinical trials with patient outcomes
  – Who funds all the work in between?
Additional Learning Resources for Clinical Decision Support

• Want to learn more about knowledge-based decision support?
  – Short Course (one afternoon) at Society for Medical Decision Making in Boston October 2006

• Want to hear more about a wide variety of clinical decision support tools for health professionals and for patients?
  – Symposium and Workshop at Society for Medical Decision Making in Boston October 2006

• AMIA meeting November 2006
  – barriers to following guidelines (Lin N et al); offline testing (Martins SB et al); CPOE (Zeiger/Johnson et al); decision tool in development for use on a patient portal (Das A et al); and others
Review of Objectives

- at end of session, participants should be able to…
  - consider sociotechnological approach to implementing IT in VA health care settings
  - identify several key stakeholders
Working with Stakeholders

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