

Knowledge Management (KM) and Knowledge encoding for Clinical Decision Support in VA



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ATHENA-Hypertension Decision Support System



- Previous workshop introduced Protégé-EON model for encoding guidelines...

ATHENA-HTN: What the Clinician Sees...

TESTPATIENT_GOLF
000-00-4422 Jun 10,1961 (41)

Visit Not Selected
Provider: GOLDSTEIN,MARY K

Primary Care Team Unassigned

Remote Data

Postings **AD**

Active Problems

- Congestive Heart Failure
- Diabetes
- Hypertension
- * Cerebral Hemorrhage
- Contact dermatitis and other eczema du
- * Hair Loss
- Health Care Maintenance

Allergies / Adverse Reactions

- Aspirin
- Valproic Acid

Postings

Allergies
Advance Directive Apr 09,01

ATHENA Hypertension Advisory

Patient SSN Name Patient Summary

Most Recent BP in Database **150/68** Date

ENTER Today's Decision BP 150/95 Date Update 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
Precautions
Assumptions
Lifestyle
Adherence
Glossary
 BP-Prescription Graphs

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

Compelling Indication
 Relative Indication
 Strong Contraindication
 Relative Contraindication
 Adverse Events

Consider one of the following therapeutic possibilities	Click here for important ...	Reasons	Click here to provide ...
Increase dosage of lisinopril	Info		Feedback
Add Thiazide Diuretic (HCTZ)	Info	<ul style="list-style-type: none"> Heart Failure Diabetes Hypertension 	Feedback

Your comments for the Guidelines Team (optional and welcome!)

Do not display Advisory for this clinic visit again.

Recommendations considered
Not Read
Not a clinical priority today

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.

Oct 10,02 11:30 Diet-Shinoda-5/3(pad) Canc

Sep 27,02 12:00 Diet-Shinoda-5/3(pad) Canc

Sep 20,02 15:00 Diet-Shinoda-5/3(pad) Canc

Sep 20,02 14:00 Diet-Shinoda-5/3(pad) Canc

Sep 11,02 09:00 Diet-Shinoda-5/3(pad) Canc

/Admissions

/iet-Bhow-5/2(pad)

/iet-Bhow-5/2(pad)

/iet-Bhow-5/2(pad)

/iet-Shinoda-5/3(pad)

/iet-Shinoda-5/3(pad)

/iet-Shinoda-5/3(pad)

/iet-Shinoda-5/3(pad)

/iet-Shinoda-5/3(pad) Canc

/iet-Bhow-5/2(pad)

/iet-Shinoda-5/3(pad) Canc

/iet-Shinoda-5/3(pad) Canc

/iet-Shinoda-5/3(pad) Canc

/Pharmacy-Dulpa(er)(pad)

/iet-Shinoda-5/3(pad) Canc

/iet-Shinoda-5/3(pad) Canc

/patient Stay 5intm

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/iet-Shinoda-5/3(pad) Canc

/iet-Shinoda-5/3(pad) Canc

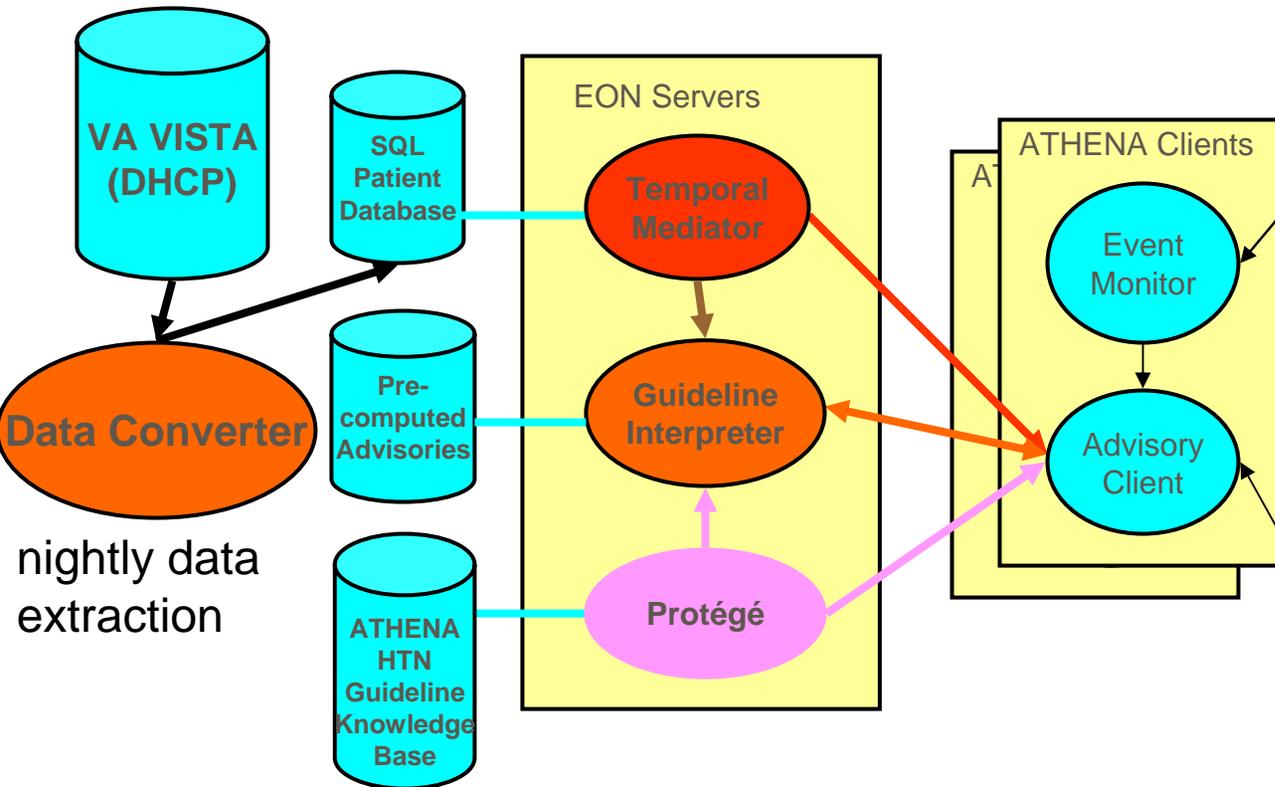
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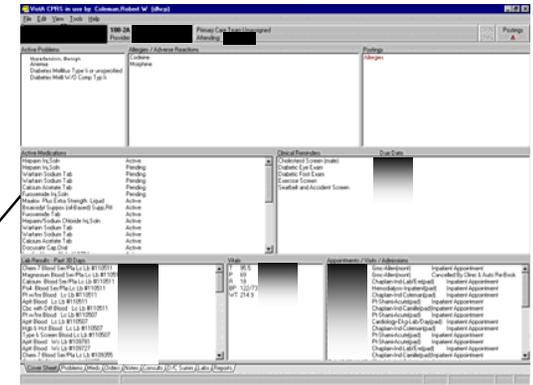
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Cover Sheet / Problems / Meds / Orders / Notes / Consults / D/C Summ / Labs / Reports /

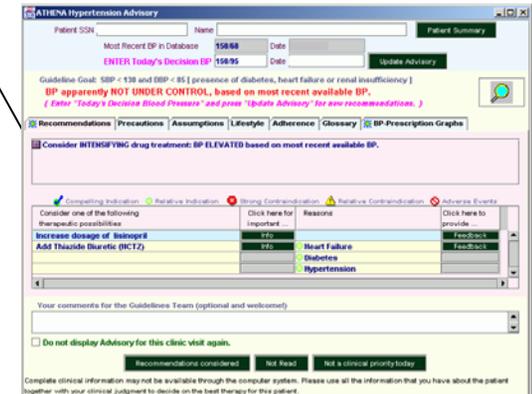
Building ATHENA System From EON Components



VA CPRS



ATHENA GUI

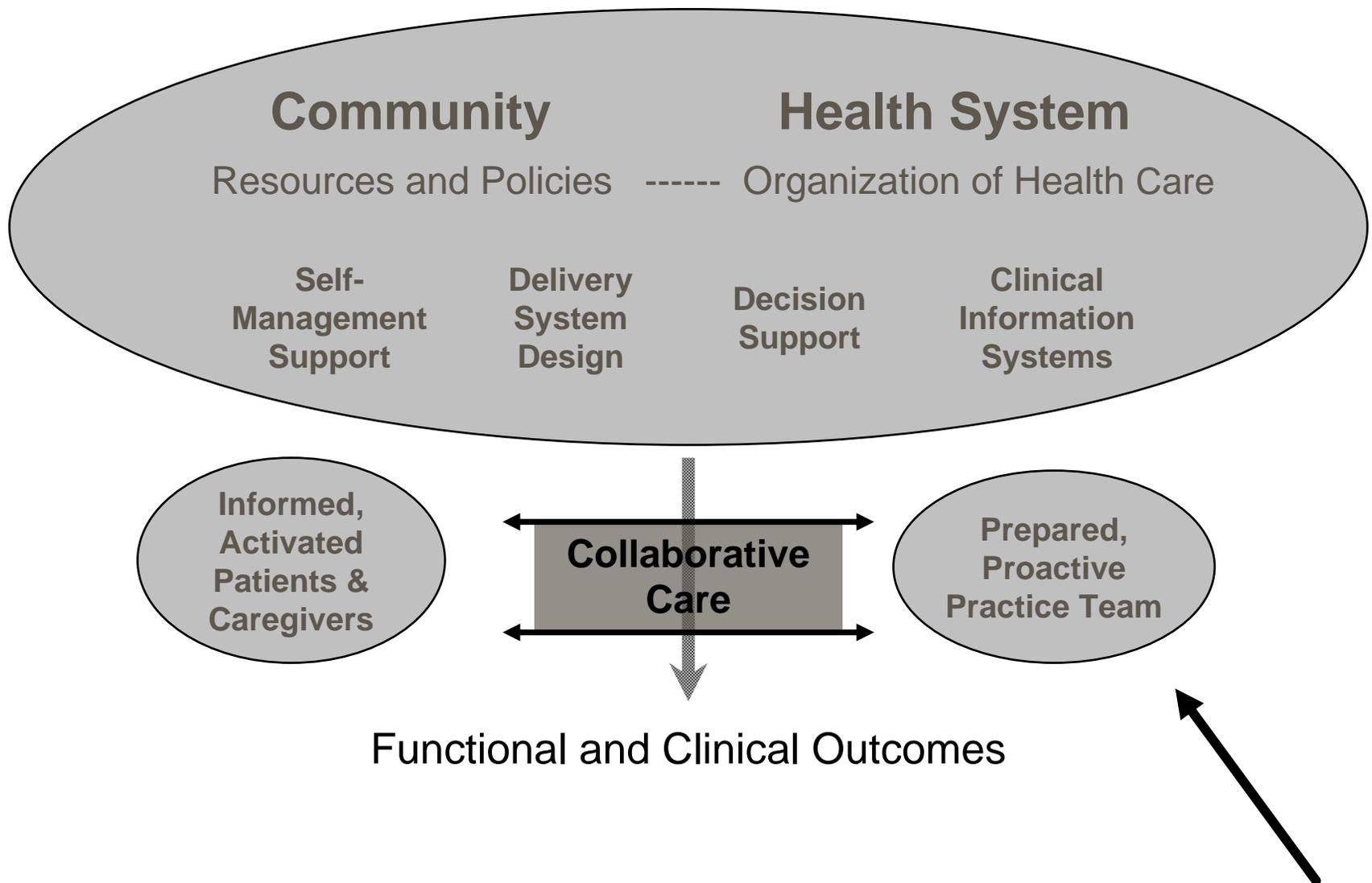


Objectives for this Session



- In this 2-day workshop, you will learn how to use Protégé to encode medical knowledge into computable formats
 - ◆ building capacity within VA
- In this 30-minute session, will show why we need this capacity using 3 examples
 - ◆ primary care clinician in clinic with patient
 - ◆ quality assessment/quality indicators
 - ◆ pharmacy change in drug on formulary

Improving Care for Chronic Illness



From: E.H. Wagner & RWJF Improving Chronic Illness Care Initiative

The health care professional



In clinic with patient with hypertension and diabetes...
Knows there is a new guideline for target BP...

Library search to read up...



The real world of the health care professional attempting to keep up with medical literature



The Guideline Availability Conundrum



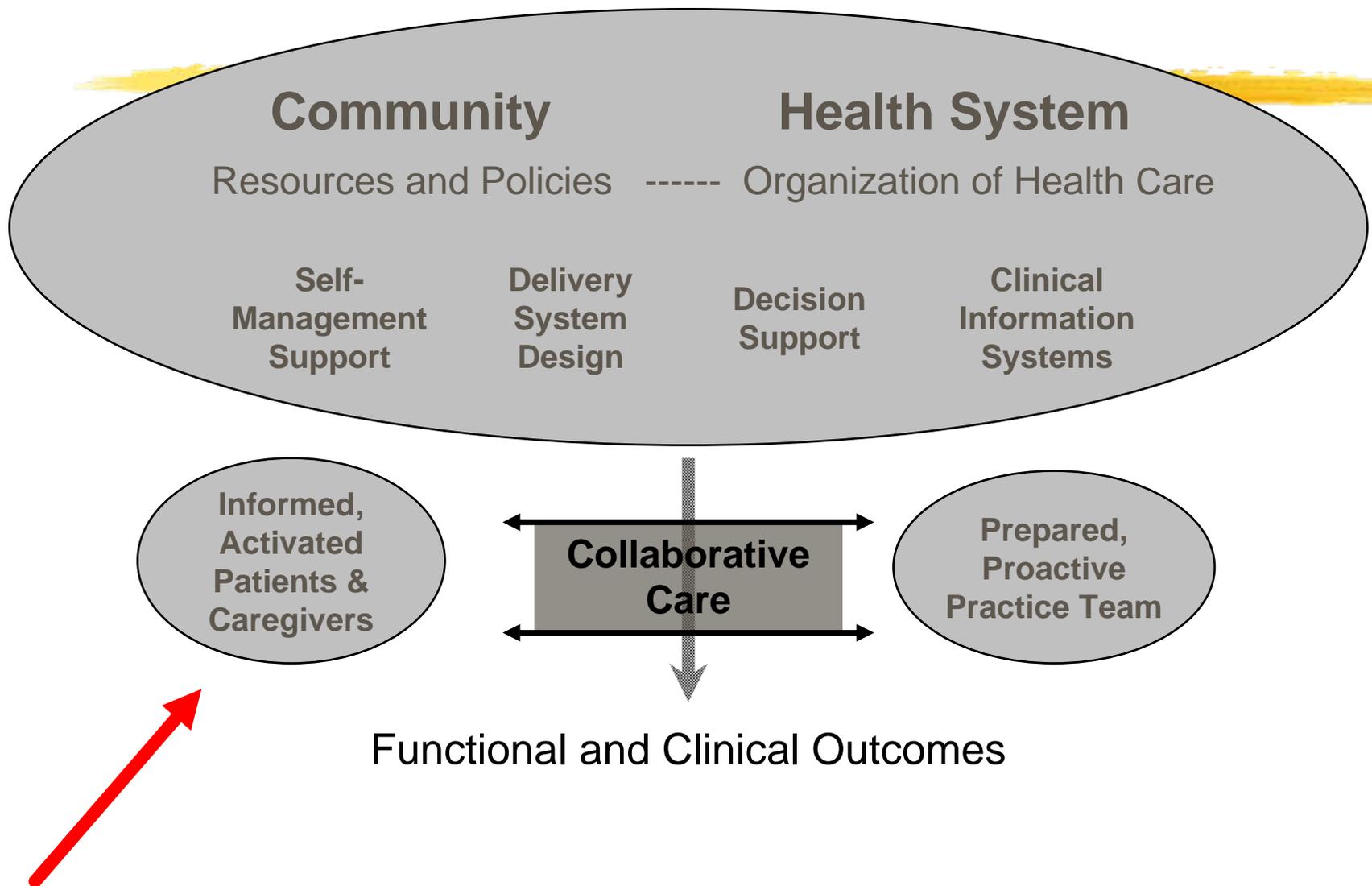
- Takes too long within a clinic visit to access a website with guidelines
- Once at the website, takes too long to locate the right guideline
 - ◆ and then to locate the right place within the guideline for the exact item of information

Patient Data Analogy



- At one time in the past, patient data were not encoded, but now we have patient databases with patient data broken into separate data elements
 - ◆ lab
 - ◆ pharmacy
 - ◆ diagnoses
 - ◆ etc
- Imagine if clinicians were expected to locate patient data by going to a website, doing a search, getting a huge free text document and then having to search within it to find the right item of data for the patient

Improving Care for Chronic Illness



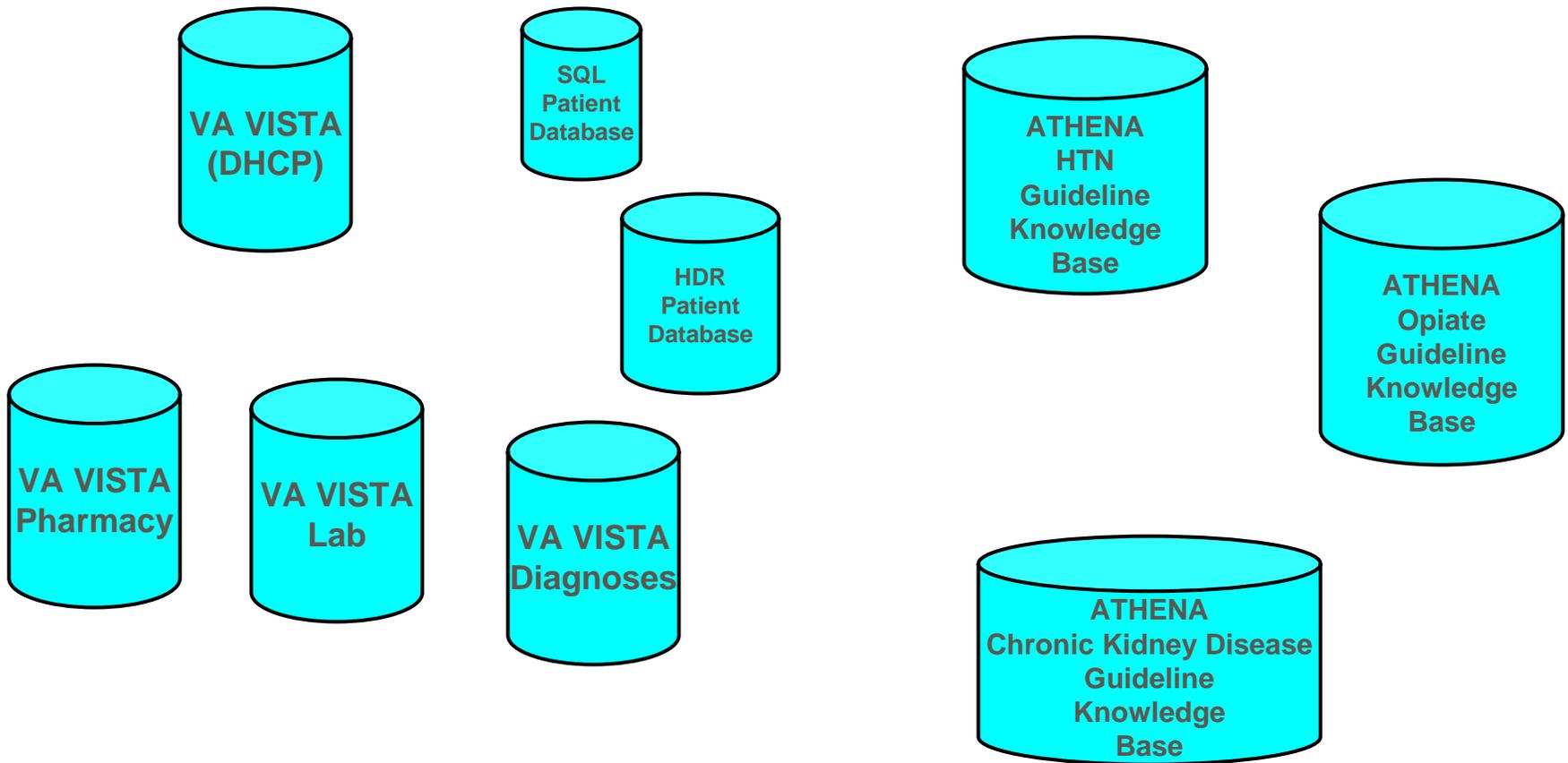
From: E.H. Wagner & RWJF Improving Chronic Illness Care Initiative

Patient-Centered Care



- Making evidence-based information available to the patient
 - ◆ My Health e Vet patient portal
 - ◆ Could provide patient the same information
 - which guidelines that patient's medical condition activates
 - where in the guideline the patient is at present
 - what are recommended next steps
 - That patient can take himself/herself
 - That patient can discuss with physician (eg drug prescribing)
- Potentially could include decision models and elicitation of patient preferences

Databases and Knowledge Bases



Certification Process for Patient Data



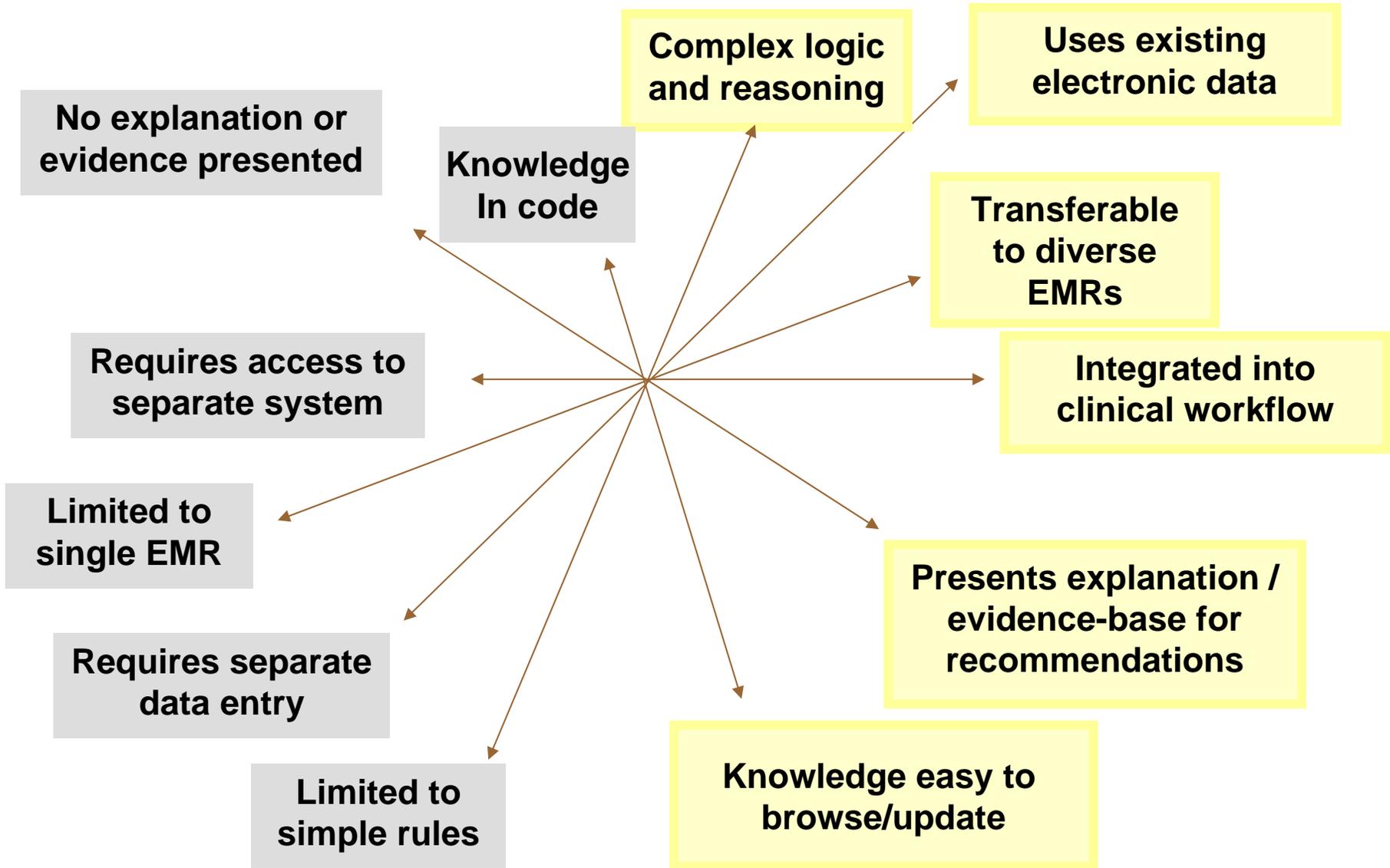
- Clinical data “vetting” procedures
 - ◆ standard collection procedures
 - ◆ database records
 - source of the data (eg lab, pharmacy dispensing, outpatient encounter diagnosis)
 - date-time stamp
- Knowledge bases will need vetting procedures as well
 - ◆ need for systematic knowledge management (KM) system

Using KB and DB together



- EON model allows the patient data to be matched with the clinical knowledge encoded in the knowledge base
 - ◆ to see where in the guideline pathway the patient fits
 - ◆ to present the information that is pertinent to that patient's medical condition at that point in time
 - targets for that patient (BP, HbA1c, lipids, etc)
 - next steps in therapy for that patient
 - evidence for the recommendations

Additional Dimensions of Decision Support Tool



Developmental work in Automating Clinical Guidelines



- Rapid automation of guidelines for a digital library
 - Shahar, Y., E. Shalom, A. Mayaffit, O. Young, M. Galperin, S. Martins, and M. Goldstein, *A Distributed, Collaborative, Structuring Model for a Clinical-guideline Digital-library*. Proc AMIA Symp, 2003: p. 589-93.

Quality Assessment Issues



- VA EPRP process
- Quality Indicators in general
 - ◆ numerator / denominator
 - e.g., (patients meeting BP target)/ (pts with HTN)
- Problems:
 - ◆ denominator: may exclude too many so that it is not applicable to most patients, or may not exclude enough and then appears incorrect to physicians
 - ◆ numerator: may not capture all the information
 - Walter et al JAMA article
- Many quality indicators seem to be overly simplistic
 - ◆ because they have been limited by available data and labor-intensive chart reviews

QA Example



- Chief of QA wants to measure performance of medical center against standards for achieving blood pressure (BP) targets
- EPRP process
 - ◆ limited number of charts
 - ◆ very few patient factors taken into account
- Knowledge base system of the future
 - ◆ apply easily to thousands of charts
 - Enhances statistical validity
 - ◆ account for multiple patient characteristics
 - Improves physician sense that the system measures something real

Pharmacy Example: Getting information to Prescribers



- Pharmacy drug contract changes
 - ◆ scramble to get providers to prescribe the new drug
 - ◆ consumes extensive pharmacist and physician time
- How to get information out quickly to physicians at the time they write prescription
 - ◆ rather than having to do time-consuming re-work after the prescription is entered
- Knowledge base can include table for formulary-preferred drugs
- A trigger can be set up to generate recommendation at time of order-entry

Most Recent BP in Database

166/80

Date 8-23-2002

ENTER Today's Decision BP

Date 12-8-2002

Update 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](#) [Precautions](#) [Assumptions](#) [Lifestyle](#) [Adherence](#) [Glossary](#) [BP-Prescription Graphs](#)

Recommend INTENSIFYING antihypertensive therapy: BP MARKEDLY ELEVATED based on most recent available BP.

Compelling Indication Relative Indication Strong Contraindication Relative Contraindication Adverse Events

Consider one of the following therapeutic possibilities	Click here for important ...	Reasons	Click here to provide ...
Increase dosage of fosinopril	Info		Feedback
Add Thiazide Diuretic (HCTZ)	Info	Isolated Systolic Hypertension	Feedback
		Diabetes	
Add DHP Calcium Channel Blocker (felodipine, nifedipine)	Info	Isolated Systolic Hypertension	Feedback

Your comments for the Guidelines Team (optional and welcome!)

Do not display Advisory for this clinic visit again.

Recommendations considered

Not Read

Not a clinical priority today

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.

The Translation Paradigm: What the public expects...



- basic research leads to
- clinical research leads to
- implementation research leads to
- improved clinical care leads to
- improved health outcomes

Vision for the Future



- Patient enters data and obtains information from kiosk in waiting room
 - ◆ or accesses via web at home
- Provider receives point-of-care information tailored to the patient being seen
- VA has national knowledge management system that includes knowledge bases of clinical knowledge
 - ◆ procedures for vetting the knowledge
 - ◆ knowledge maintenance

Funding Sources



■ Development of ATHENA DSS

- ◆ **NLM** LM05708 (PI: Musen) for development of EON architecture and collaboration on building ATHENA DSS, built with EON Technology for guideline-based decision support systems
- ◆ **VA HSR&D** Career Development Award for Dr. Goldstein's time; VA Palo Alto Health Care System for other staff time

■ Implementation and Clinical Trial

- ◆ **VA HSR&D** CPI 99-275 (PI: Goldstein/Hoffman)
- ◆ **VA Palo Alto Health Care System** IRMS for support in integration with VistA/CPRS
- ◆ **NLM** funding for Stanford Medical Informatics EON Group collaboration in implementation and further testing

Acknowledgements



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◆ ATHENA Group at VA Palo Alto and Stanford

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■ Randomized Clinical Trial using ATHENA DSS as intervention

◆ Phil Lavori, PhD, Biostatistician

- ◆ Eugene Oddone, MD; Hayden Bosworth, PhD; and Michael Shlipak, MD: investigators at VAMCs Durham and San Francisco

◆ Other participants