

Medical Diagnostic Systems

Previous Attempts at Artificial Intelligence in Medicine

- Mycin- Stanford
 - Doctoral dissertation of Edward Shortliffe designed to identify bacterial etiology in patients with sepsis and meningitis and to recommend antibiotics
 - Had simple inference engine and knowledge base of 600 rules
 - Proposed acceptable therapy in 69% of cases which was better than most ID experts
 - Never actually used in practice largely due to lack of access and time for physician entry >30 minutes
- Caduceus – similar inference engine to Mycin and based on Harry Pope from U of Pittsburgh's interviews with Dr. Jack Myers with database of up to 1,000 diseases

Previous Attempts at Artificial Intelligence in Medicine

- Internist I and II – Covered 70-80% of possible diagnoses in internal medicine, also based on Jack Myers' expertise
- Worked best on only single disease
- Long training and unwieldy interface took 30 to 90 minutes to interact with system
- Was succeeded by “Quick Medical Reference” which was discontinued ten years ago and evolved into more of a reference system than diagnostic system
- Each differential diagnosis includes links to origin evidence to provide meaningful use of EMR's and supports adoption of evidence based medicine/practice

Medical Diagnostic Systems

- Dxpplain used structured knowledge similar to Internestist I, but added hierarchical lexicon of findings
- Iliad system developed in '90s added probabilistic reasoning
 - Each disease had associated a priori probability of disease in population for which it was assigned

Diagnostic Systems using Unstructured Knowledge

- ISABEL uses information retrieval software developed by “Autonomy”
- First CONSULT allows search of medical books, journals, and guidelines by chief complaints and age group
- PEPID DDX is diagnosis generator

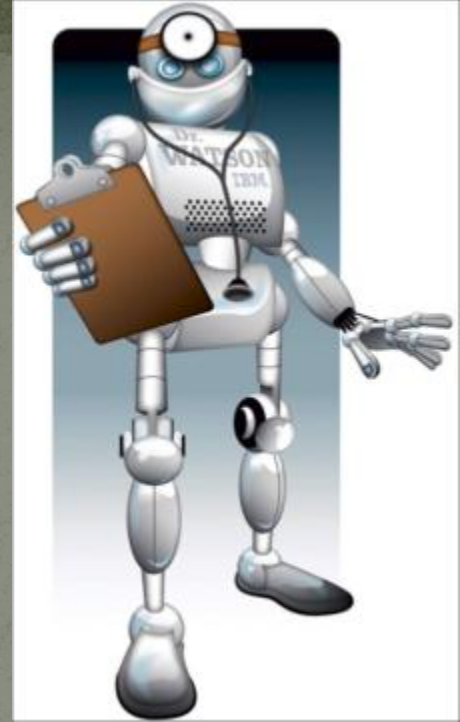
Diagnosis Systems Using Clinical Rules

- Acute cardiac ischemia time insensitive predictive instrument uses ECG features and clinical information to predict probability of ischemia and is incorporated into heart monitor/defibrillator
- CaseWalker system uses four item questionnaire to diagnose major depressive disorder
- PKC advisor provides guidance on 98 patient problems such as abdominal pain and vomiting

Reasons Current Diagnostic Systems Aren't Widely Used

- They aren't integrated into day to day operations and workflow of health organizations and patient information is scattered in outpatient clinic visits and hospital visits and their primary provider and specialists
- Entry of patient data is difficult – requires too much manual entry of information
- They aren't focused enough on recommendations for next steps for follow up
- Unable to interact with practitioner for missing information to increase confidence and more definitive diagnosis
- Have difficulty staying up to date

Watson as Diagnostician





Samantha Darren - March 3, 2011

History of Present Illness

Patient has red eye with pain, inflammation, blurred vision, floating spots and sensitivity to light.

Symptoms

Question

What condition has red eye, pain, inflammation, blurred vision, floating spots and sensitivity to light?

Evidence

Ask Watson

Answer

Google Search



red eye, pain, inflammation, blurred vision, floating spots, sensitivity to light

Search

About 54,700 results (0.33 seconds)

Everything

Images

Maps

Videos

News

Shopping

More

Severna Park, MD

Change location

Show search tools

[Eye Diseases Pictures Slideshow: Recognize These Common Eye ...](#)

www.medicinenet.com/home/eyesight_center/eyesight_az_list

Aug 3, 2011 – Blepharitis is an **inflammation** of the eyelids. ... Symptoms of a corneal ulcer include **red eyes, pain**, feeling like something is in ... Floaters are deposits of condensation that cause people to see **floating spots**. redness and irritation, **blurred vision**, eye **pain**, increased **sensitivity to light**, and **floating spots**. ...

[Eye Problems -- FamilyDoctor.org](#)

familydoctor.org/familydoctor/en/health-tools/.../eye-problems.html

Eye pain or redness and changes in your **vision** may be signs of a problem that ... of **spots** and strings **floating** in your field of **vision**; flashes of **light** in 1 or both eyes; ... Your symptoms may be a sign of a serious **inflammatory** condition called ... Are your eyes **red** or **sensitive to light**, are you experiencing **eye pain**, and do you ...

[Cataract Surgery Complications](#)

www.cataractfreeamerica.org/cataracts/complications.htm

Treatment is commonly anti-**inflammatory** eye drops or tablets. ... Symptoms include **pain, red eye**, and/or severe and rapid decrease of vision. redness of the eye, **blurred vision**, **sensitivity to light** (photophobia), dark **floating spots** within the ...

[Eye Health Guide - Eye Diseases, Eye Problems and Eye Conditions](#)

www.allaboutvision.com/conditions/

Itchy, **red**, swollen, tearing **eyes** may mean **eye allergies**. ... Flashes of **light** and **floating spots** are classic warning signs of a detached retina — get them ... **Painful inflammation** of the uvea causes **light sensitivity**, floaters and **blurred vision**. ...

[Getting A Regular Eye Exam From An Ophthalmologist Is Important ...](#)

www.bayridgeeyes.com/ophthalmologist.shtml

Floating spots are alarming when they first appear and an eye exam by an ... people who have had eye surgery, eye injuries or serious eye **inflammatory** conditions. ... The sudden development of a **red eye** can be due to a variety of causes, some of ... tearing, foreign body sensation, eye **pain, light sensitivity**, or **blurry vision**. ...

[Dr. Kenneth Sparks - Uveitis](#)

www.laretinasurgeon.com/uveitis.aspx

Uveitis refers to the **inflammation** of the uvea, the middle layer of the eye. It also may ... **Blurry vision**, eye **pain**, and **sensitivity to light** may also be present, with some patients experiencing dark, **floating spots** in their field of vision. Uveitis may ... A case of simple **red eye** may in fact be a serious problem of uveitis. If your eye ...



Samantha Darren - March 3, 2011

History of Present Illness

Patient has red eye with pain, inflammation, blurred vision, floating spots and sensitivity to light.

Symptoms

Question

What condition has red eye, pain, inflammation, blurred vision, floating spots and sensitivity to light?

Evidence

Ask Watson

Answer

Uveitis		91%
Iritis		48%
Keratitis		29%
Anterior Uveitis		16%
Photophobia		13%



Samantha Darren - March 3, 2011

History of Present Illness

The patient has a confirmed case of uveitis.

Present illness

Question

What disease or condition can cause uveitis in a patient?

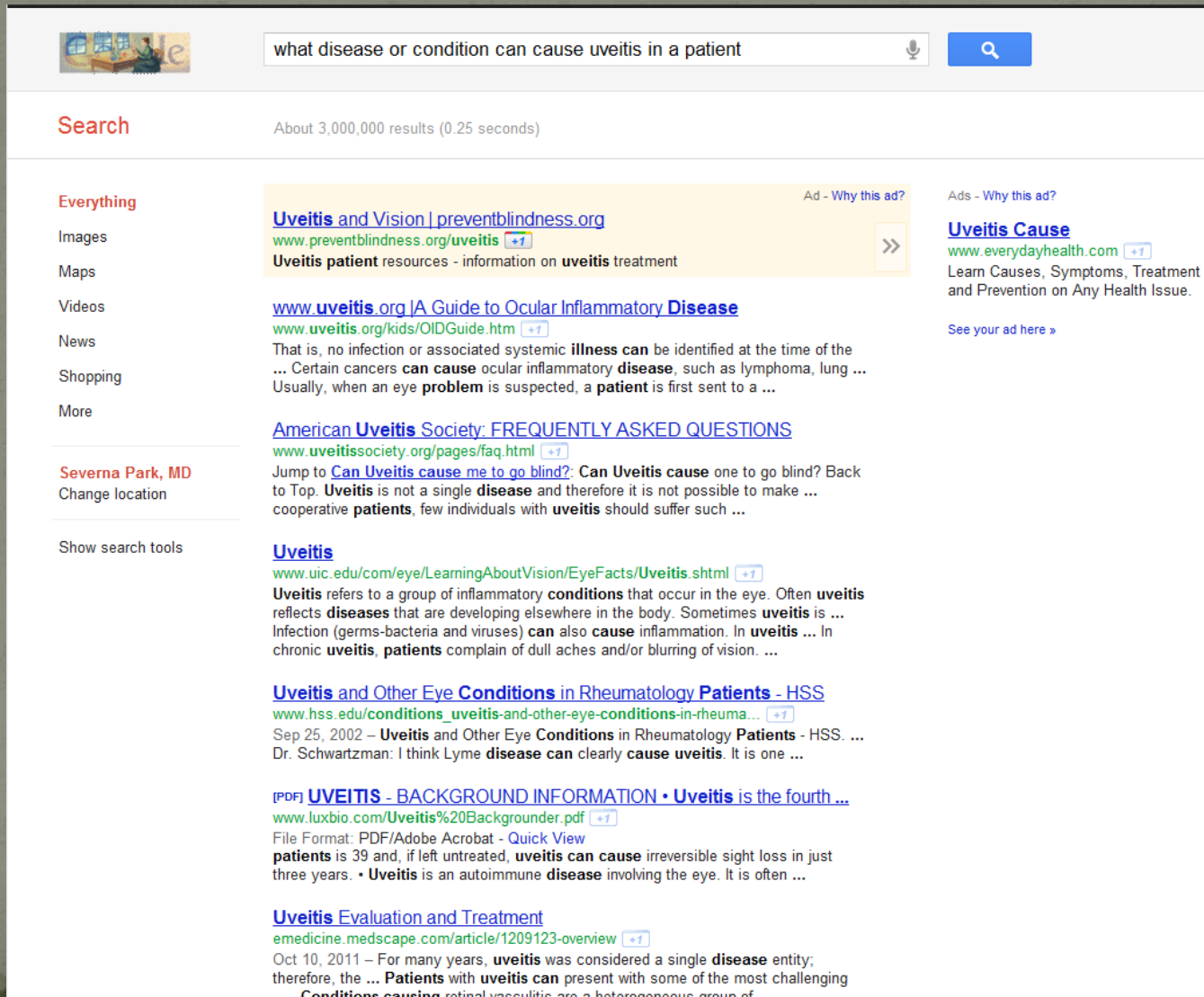
Evidence

Ask Watson

Answer

Behcet's Disease		45%
Sarcoidosis		32%
Ankylosing Spondylitis		30%
Arthritis		13%
Iritis		11%

Google Search: Uveitis Cause



Google search interface showing results for the query "what disease or condition can cause uveitis in a patient". The search bar contains the query and a magnifying glass icon. The results page shows a search bar with the query, a search button, and a search icon. The results are displayed in a list format with various filters on the left side.


Search About 3,000,000 results (0.25 seconds)


Everything


- Images
- Maps
- Videos
- News
- Shopping
- More


Severna Park, MD
Change location


Show search tools


Uveitis and Vision | preventblindness.org
www.preventblindness.org/uveitis 
Uveitis patient resources - information on uveitis treatment


Uveitis Cause
www.everydayhealth.com 
Learn Causes, Symptoms, Treatment and Prevention on Any Health Issue.


www.uveitis.org | A Guide to Ocular Inflammatory Disease
www.uveitis.org/kids/OIDGuide.htm 
That is, no infection or associated systemic illness can be identified at the time of the ... Certain cancers can cause ocular inflammatory disease, such as lymphoma, lung ... Usually, when an eye problem is suspected, a patient is first sent to a ...


American Uveitis Society: FREQUENTLY ASKED QUESTIONS
www.uveitissociety.org/pages/faq.html 
Jump to [Can Uveitis cause me to go blind?](#): Can Uveitis cause one to go blind? Back to Top. Uveitis is not a single disease and therefore it is not possible to make ... cooperative patients, few individuals with uveitis should suffer such ...

Uveitis
www.uic.edu/com/eye/LearningAboutVision/EyeFacts/Uveitis.shtml 
Uveitis refers to a group of inflammatory conditions that occur in the eye. Often uveitis reflects diseases that are developing elsewhere in the body. Sometimes uveitis is ... Infection (germs-bacteria and viruses) can also cause inflammation. In uveitis ... In chronic uveitis, patients complain of dull aches and/or blurring of vision. ...

Uveitis and Other Eye Conditions in Rheumatology Patients - HSS
www.hss.edu/conditions_uveitis-and-other-eye-conditions-in-rheuma... 
Sep 25, 2002 – Uveitis and Other Eye Conditions in Rheumatology Patients - HSS. ... Dr. Schwartzman: I think Lyme disease can clearly cause uveitis. It is one ...

[PDF] UVEITIS - BACKGROUND INFORMATION • Uveitis is the fourth ...
www.luxbio.com/Uveitis%20Backgrounder.pdf 
File Format: PDF/Adobe Acrobat - Quick View
patients is 39 and, if left untreated, uveitis can cause irreversible sight loss in just three years. • Uveitis is an autoimmune disease involving the eye. It is often ...

Uveitis Evaluation and Treatment
emedicine.medscape.com/article/1209123-overview 
Oct 10, 2011 – For many years, uveitis was considered a single disease entity; therefore, the ... Patients with uveitis can present with some of the most challenging Conditions causing retinal vasculitis are a heterogeneous group of


 Samantha Darren - March 3, 2011

History of Present Illness

The patient has a confirmed case of uveitis.

She reports a family history of arthritis.

On physical examination a circular rash is observed. She complains of fever and headache.

Present Illness

Family History

Finding






Question

What disease or condition can cause uveitis in a patient with circular rash, fever, headache, and family history of arthritis?




Evidence

Ask Watson

Answer

Lyme Disease		62%
Systemic Lupus Erythematosus		17%
Juvenile Rheumatoid Arthritis		12%
Erythema Migrans		7%
Rocky Mountain Spotted Fever		6%

Google Search: Uveitis, Arthritis, Circular Rash, Headache



Search About 52,100 results (0.25 seconds)

Everything

Images

Maps

Videos

News

Shopping


More


Severna Park, MD
Change location


All results



Related searches


More search tools


[Watson and healthcare](#)
www.ibm.com/developerworks/industry/library/ind.../index.html?ca... 
Apr 12, 2011 – Question: This disease can cause **uveitis** in a patient with family history of **arthritis** presenting **circular rash**, **fever**, and **headache**. Answer: 76% ...


[Arthritis of the Eyes](#)
www.innvista.com › Health › Common Ailments › Arthritis 
Uveitis Arthritis is usually thought of as a disease of the joints, only and rarely thought of ... including **headaches**, injuries, infections (as tuberculosis, herpes, or syphilis), ... numbness or weakness, vitiligo (patches of depigmentation), skin **rashes**, ... The iris is the **circular**, coloured part of the eye behind the cornea, which also ...

[Lyme Disease Clinical Presentation - Johns Hopkins Arthritis Center](#)
www.hopkins-arthritis.org › Arthritis Info › Lyme Disease 
Johns Hopkins **Arthritis** Center Johns Hopkins Medicine ... This **rash** begins as a small red papule at the site of a tick bite, generally 3-30 ... **Headache** 40-50% ... It was previously thought that all target-shaped **rashes** (i.e., **circular**-shaped with red ... the eye (e.g., follicular conjunctivitis, keratitis, and rarely **uveitis** or vitritis). ...


[Behcet's Syndrome \(Behcet's Disease\) Causes, Diagnosis ...](#)
www.medicinenet.com › ... › behcet's syndrome index 
 by +Dr. William Shiel
2 days ago – A reddish, scaly **rash** often located over the surfaces of the elbows, knees, scalp, and ... Managing Osteoarthritis Pain: Coping with **Arthritis** ... The inflammation of the area of the eye that is around the pupil is called **uveitis**. ... (meninges) include **headaches**, neck stiffness, and is often associated with **fever**. ...


[Q&A Behcet's Disease](#)
www.niams.nih.gov/Health_Info/Behcets_Disease/ 
In some people, the disease also results in **arthritis** (swollen, painful, stiff joints), skin problems, and ... Meningitis can cause **fever**, a stiff neck, and **headaches**. ...

[Vasculitis Symptoms - Gernal Help - Vasculitis.ca](#)
www.vasculitis.ca/vasculitissymptoms/.../vasculitis-symptoms.html 
People with meningoencephalitis may have **fever**, **headache**, stiff neck, and difficulty Other symptoms include **rashes**, **arthritis**, conjunctivitis or **uveitis**. ...

[Syphilis: Sexually Transmitted Diseases \(STD\): Merck Manual ...](#)
www.merckmanuals.com/professional/infectious.../syphilis.html 

Ads - Why these ads?

Fever Headache Rash
www.healthline.com 
Symptoms, Causes, Treatments of **Fever Headache Rash**.

Diagnosed with Uveitis?
www.uveitisclinicaltrials.com 
Get information about **uveitis**.

[See your ad here »](#)

Samantha Darren - March 3, 2011

History of Present Illness

The patient has a confir

She reports a family his

On physical examinatio

The patient lives in Cor

Present Illness

Family Hist

Question

What disease or cond
arthritis, who lives in

Answer

Lyme Disease

Juvenile Rheumatoid

Rocky Mountain Spott

Dengue

Erythema Migrans

Evidence Profile

Close

Lyme Disease

Negative | Positive

Present Illness

Family History

Finding

Demographics

Finding - Evidence Sources

Textbook: For people who live in areas where **Lyme disease** most often occurs-in the United States along the Atlantic coast, the Midwest, and parts of Oregon and California-the **circular rash** can be a sign of **Lyme disease**, especially when it appears during the summer months.

Journal: For the initial systemic **Lyme disease**, on the other hand, the symptoms include fatigue, pains in the joint and muscle, mild **fever**, **headache**, drowsiness and swollen lymph glands. For the majority of people, once a tick has bitten its human host, a slow growing **circular rash** called erythema migrans appears around the site of the bite.

Web Site: One of the early symptoms of **Lyme disease** is development of a **circular rash**, known as erythema migrans (EM). This rash is seen in about 70-80% of infected people and it starts within duration of three days to one month.

dache, family history of

Ask Watson

73%

12%

9%

8%

6%



Samantha Darren - March 3, 2011

History of Present Illness

The patient has Lyme disease. The treatment plan is antibiotics.

Present Illness

Question

What antibiotics are prescribed for treating Lyme disease?

Evidence

Ask Watson

Answer

Doxycycline		97%
Amoxicillin		68%
Ceftriaxone		30%
Cefuroxime		29%
Tetracycline		29%



Samantha Darren - March 3, 2011

History of Present Illness

The patient has Lyme disease. The treatment plan is antibiotics.

The patient is pregnant. She has a penicillin allergy.

Present Illness

Current Condition






Question

What is the recommended antibiotic prescription for Lyme disease in a woman during pregnancy with penicillin allergy?

Evidence

Ask Watson

Answer

Cefuroxime		95%
Ceftriaxone		17%
Lyme Disease Vaccines		7%
Amoxicillin		6%
Steere		5%

User Information Design for Decision Support



Samantha Darren

IBM WATSON

Profile Card

Dashboard

Evidence Profile: Diagnosis

Back to Results

Uveitis

91%

Iritis

48%

Keratitis

42%

Factors

SYMPTOMS

Red eye

Eye pain

Eye inflammation

Blurred vision

Floating spots

Sensitivity to light

FAMILY HISTORY

Arthritis

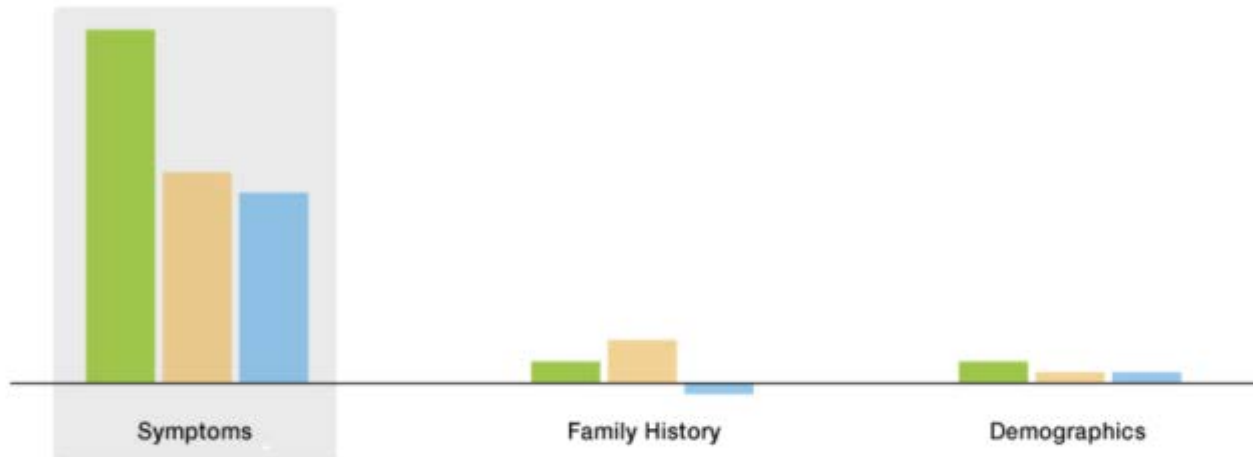
ALLERGIES

Penicillin

DEMOGRAPHICS

34 years old

Female



Sources and Factors for Uveitis Symptoms

Sources

Factors

Textbook

Uveitis specifically refers to **inflammation** of the middle layer of the eye, termed the "uvea" but in common usage may refer to any inflammatory process involving the interior of the eye. ★★☆☆

Website

Uveitis usually develops quickly and generally affects only one eye. Signs and symptoms may include any or all of the following, **pain in the eye** or brow region, worsened eye **pain when exposed to bright light**, and **reddened eye**, especially adjacent to the iris. ☆☆☆☆

Medical Journal

The most common form of **uveitis** is anterior **uveitis**, which involves **inflammation** in the front part of the eye. It is often called **iritis** because it usually only affects the iris, the colored part of the eye. ☆☆☆☆

Textbook

Uveitis is often marked by moderate to intense **pain** and usually involves **impaired eyesight**. ☆☆☆☆

My Involvement in Helping to Train Dr. Watson



- Initial research and grant to help educate Watson in medical domain
- Could Watson software for Jeopardy! be successfully ported into the medical domain?
 - Began discussing challenge associated with NEJM Clinico-Pathological Conference
 - Talked about books and journals and other sources that could augment the general knowledge built into the Jeopardy! playing software

After Jeopardy! Match: Initial Reactions/Expectations



- E-mails and interviews from all over the world:
 - Most were incredibly impressed with potential for medicine and opportunities for the future
 - Some however:
 - SKYNET and end of world as we know it
 - Pre-medical students speculating that it really doesn't make sense to attend medical school any more
 - Physicians writing blogs predicting that they would be replaced by the computer within a short period of time

Taking Watson to Medical School



- Want 3 components similar to medical students education
 - Book knowledge
 - Sim Human Model
 - Experiential learning from actual EMR



UNIVERSITY OF MARYLAND
SCHOOL OF MEDICINE

Book Learning

- Textbook, journal, and Internet resource knowledge.
Quiz materials
- Like medical student this alone not enough don't want to make hypochondriac

Advancing Deep Q/A's Medical Knowledge

- Continue to develop medical knowledge database
 - Harrison's
 - Merck
 - Current Medical Diagnosis and Treatment
 - American College of Physicians Medicine
 - Stein's Internal Medicine
 - medical Knowledge Self Assessment Program
 - NLM's Clinical Question Repository

Advancing Deep Q/A's Medical Knowledge

- Use New England Journal of Medicine 130 CPC cases and quiz material
 - Additional CPC cases at U of Maryland
- Begin developing interactive capability to develop hypotheses and refine them depending on the answer to those questions
- Develop a tool that allows for physician feedback to the system for various hypotheses so community can interact and teach Watson

SIM Human

- SIM Human model of physiology – work done at the University of Maryland School of Medicine and UMBC by Dr. Bruce Jarrell and colleagues
- Want to have understanding from model of physiology
- Work has been done to create simulations of disease processes and then observe how it affects other physiology in the body

Clinical/Hospital “Experience”

- Consumption of electronic medical record which is largely just paper represented digitally, cannot search for “rash” for example
- Access to records at U of Maryland and VA but also larger repositories from the VA in de-identified manner

Electronic Medical Record Challenges and Limitations

- Epic system at the University of Maryland
- VA's VISTA System
- University of Maryland EPIC system
 - EMR
 - Electronic version of paper records
 - Review large number of discharge summaries
 - Review progress notes and structured and unstructured additional information from EMR

IBM and VA Team Review of EMR

- Patient EMR such as VA's highly publicized and praised VISTA revealed numerous challenges



Despite the fact that virtually 100% of patient information is available in the electronic EMR with records going back more than 15 years

- Not possible to search for a term within or among patient records such as “rash”
- Majority of data is unstructured and in free text format
- Much of the text in progress notes and other types of notes is highly redundant since interns and residents and attending physicians typically cut and paste information from lab and radiology and other studies and other notes
- Information is entered with abbreviations that are not consistent and misspellings

Patient Problem List

- Patient problem list has no “sheriff” and each physician is free to add “problems” but very few delete them for “problems” that are temporary
 - The problem lists themselves often have contradictory information

Vista CPRS in use by: User,Nurse (vista.medsphere.com)

File Edit View Action Tools Help

PATIENT, TEST ONLY MED1 4S401-1 Primary Care Team Unassigned
 756-11-0665P Nov 06,1965 (42) Current Provider Not Selected Attending: Manager,System

Flag Remote Data Postings AD

View options: Active Problems (9 of 9)

Stat...	Description	Onset Date	Last Upda...	Provider	Service
A *	Myasthenia Gravis with (Acute) Exacerbation	Feb 11 2006	Feb 11 2006	User,Medsphere T	
A	Postherpetic neuralgia	Sep 19 2006	Sep 19 2006	Manager,System	
A *	Stroke	Sep 26 2006	Sep 26 2006	User,Medsphere T	Audiology & Spe
A	Silica Pneumocon NEC	Aug 18 2006	Oct 18 2006	Manager,System	
A	Hypertension		Dec 12 2006	User,Medsphere T	
A	Immune Thrombocytopenic purpura	Feb 21 2007	Feb 21 2007	User,Medsphere T	
A	Diabetes Mellitus Primary Diagnosis	Jan 08 2006	Nov 02 2007	Manager,System	
A	Chronic ischemic heart disease Secondary Diagnosis	Jan 08 2006	Nov 02 2007	Manager,System	
A	CAD		Feb 12 2008	User,Medsphere T	

New problem

Medical Domain Adaptation

- 5000 questions from American College of Physicians Doctor's Dilemma competition
- E.g.
 - The syndrome characterized by joint pain, abdominal pain, palpable purpura, and a nephritic sediment
 - **Henoch-Schonlein Purpura**
 - Familial adenomatous polyposis is caused by mutations of this gene: **APC gene**
 - Syndrome characterized by narrowing of the extrahepatic bile duct from mechanical compression by a gallstone impacted in the cystic duct: **Mirizzi's Syndrome**

3 Areas of Adaptation for Deep QA

- **Content**

- Organizing domain content for hypothesis and evidence generation such as textbooks, dictionaries, clinical guidelines, research articles
- Tradeoff between reliability and recency

- **Training**

- Adding data in the form of sample training questions and correct answers from the target domain so system can learn appropriate weights for its components when estimating answer confidence

- **Functional**

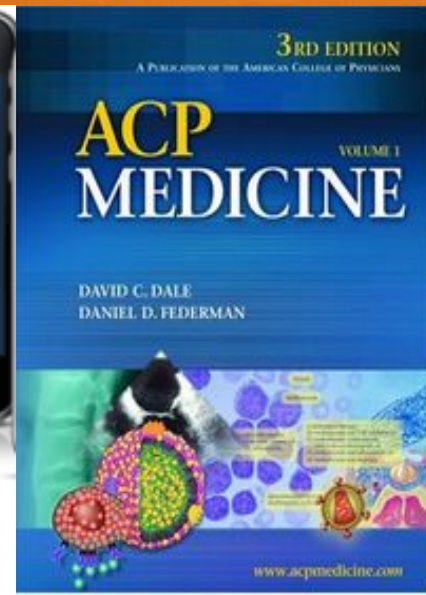
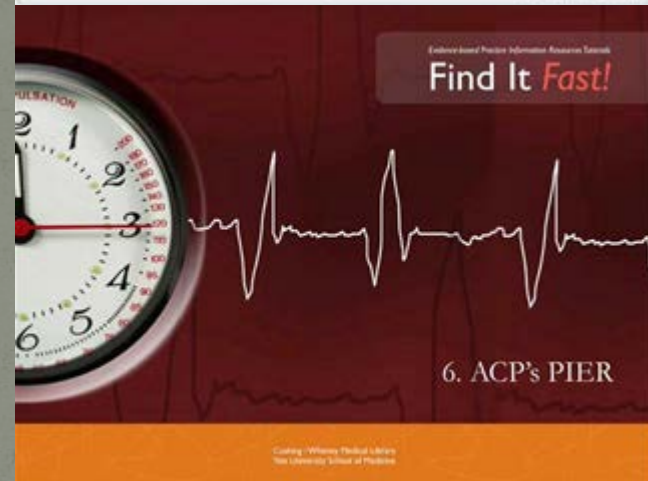
- Adding new question analysis, candidate generation, and hypothesis evidencing analytics specialized for the domain

Content Adaptation

- Text content is converted into XML format used as input for indexing
- Text analyzed for medical concepts and semantic types using Unified Medical Language System terminology to provide for structured query based lookup
- “Corpus expansion technique” used by DeepQA searches web for similar passages given description of symptoms for example and generates pseudo documents from web search results

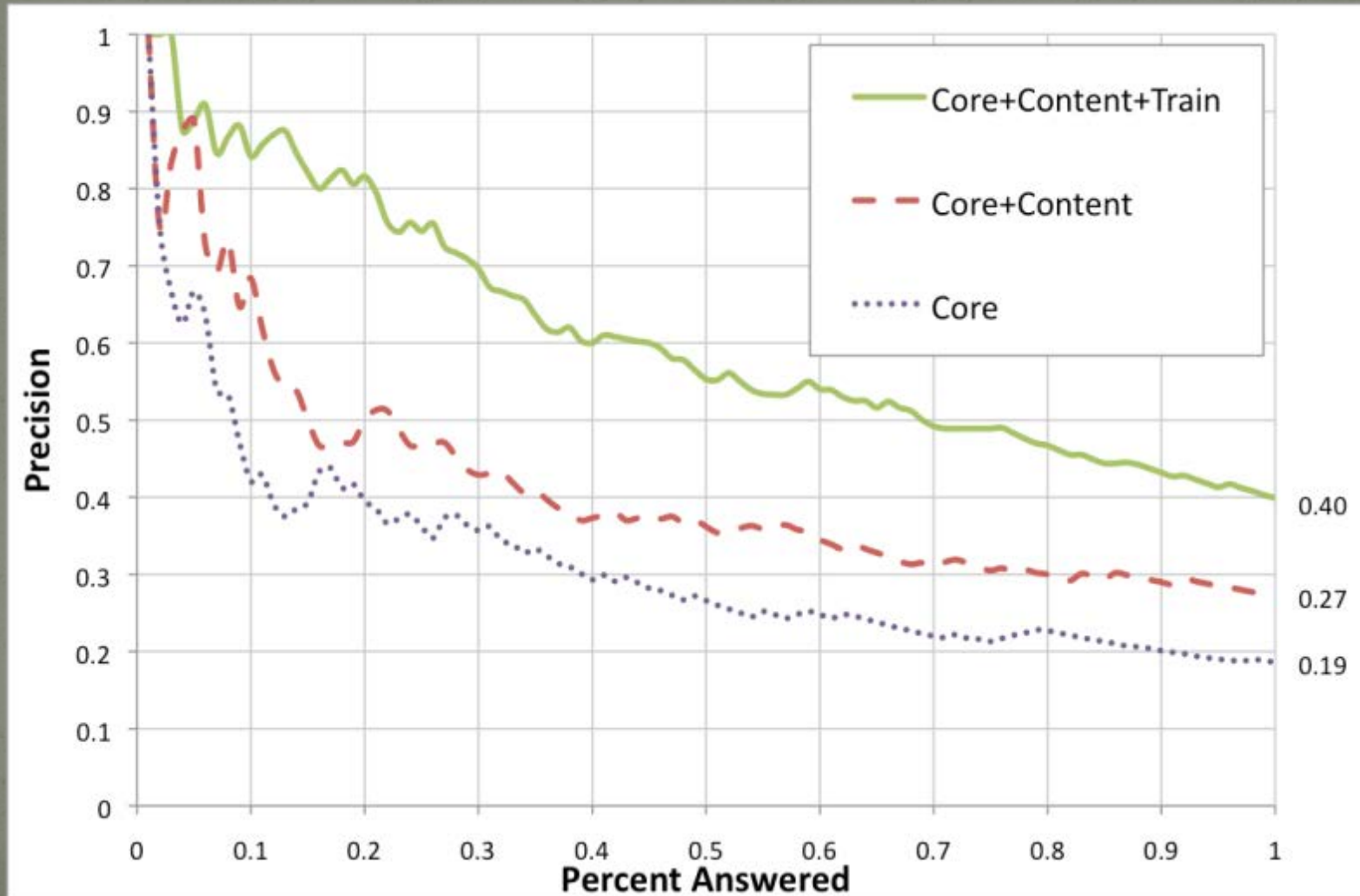
Medical Content Sources for Watson Include

- ACP (American College of Physicians) Medicine
- Merck Manual of Diagnosis and Therapy
- PIER (collection of guidelines and evidence summaries)
- MKSAP (Medical Knowledge Self Assessment Program study guide from ACP)
- Journals and Textbooks



Training Adaptation: **188** Unseen ACP Doctor's Dilemma Questions

Precision: % of questions correct for top answer when chooses to answer



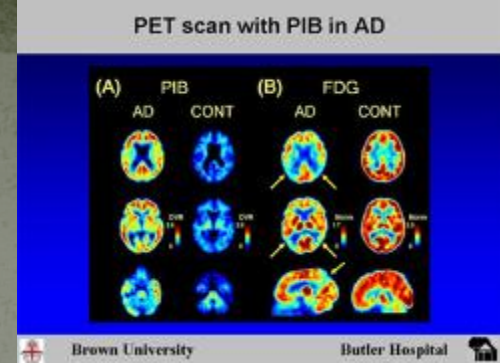
Discovering the Untapped, Disconnected Gold Mines of Clinical and Research Data

- Despite all of the advances in computer technology we are arguably still at the paper stage of research as far as ability to discover and combine important data
 - Research data including those associated with major medical journals and clinical trials are typically created for a single purpose and beyond a one or two manuscripts, remain largely locked up or inaccessible
 - Even when the data are made accessible, they are typically associated with limited access through a proprietary Internet portal or even by requesting data on a hard drive
 - Often requires submission of a research plan and data and then a considerable wait for permission to use the data which is often not granted

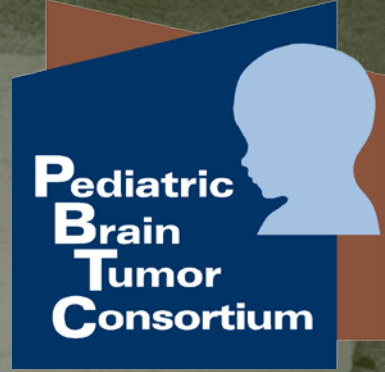


ADNI

- Alzheimer's Disease Neuroimaging Initiative
- Excellent example of patient data and associated images with great sharing model
- However requires access through their own portal and requires permission from ADNI Data Sharing and Publications Committee



CTEP (NIH Cancer Therapy Evaluation Program) Pediatric Brain Tumor Consortium One of the Better Sources of Data



- As an NCI funded Consortium, the Pediatric Brain Tumor Consortium (PBTC) is **required** to make research data available to other investigators for use in research projects
- An investigator who wishes to use individual patient data from one or more of the Consortium's completed and published studies must submit in writing:
 - Description of the research project
 - Specific data requested
 - List of investigators involved with the project
 - Affiliated research institutions
 - Copy of the requesting investigator's CV must also be provided.
- The submitted research proposal and CV shall be distributed to the PBTC Steering Committee for review
- Once approved, the responsible investigator will be required to complete a Material and Data Transfer Agreement as part of the conditions for data release
- Requests for data will only be considered once the primary study analyses have been published

Institutional Database General Practice Research Database

Much more than *the* database

GPRD+

GPRD News Bibliography Customer Area

▶ GPRD News ▶ Archived News

Search

The Database

GPRD, the most published, most used and validated database. [Read more»](#)

Global

More than just UK data. [Read more»](#)

Interventional

Randomised trials
Patient Reported Outcomes
Genetic studies
[Read more»](#)

Links

Hospital data
Disease Registers
[Read more»](#)

Research Services

Full pharmaco-epidemiological service
Advice service
[Read more»](#)

Risk Management

Complete new system- ExEtrac
[Read more»](#)

Archived News

Select a Topic:

Please select



Go

LSHTM Pharmacoepidemiology Course

London School of Hygiene and Tropical Medicine in collaboration with GPRD are running a short course entitled '**Practical**

Pharmacoepidemiology' from **Monday 12th to Thursday 15th September 2011**. The course is designed for students with a basic grounding in epidemiological methods and concepts and/or some prior knowledge of pharmacoepidemiology.

For further details and to apply please click [here](#)

[Back to top](#)

User Group Meeting Update

Dear Colleague

This years GPRD User Group Meeting is scheduled for the **18th of August 2011** and will be held in Chicago to follow on from the 27th International Conference on Pharmacoepidemiology and Therapeutic Risk Management.

These meetings give GPRD users the chance to learn about key developments with the database as well as current research projects. This meeting will also provide users the opportunity to meet with members of GPRD's research team and engage in discussions with other users.

Please register your interest if you wish to attend, give a presentation or lead a discussion group by contacting:

jenny.campbell@gprd.com

GPRD

Not for Profit
The Gold Standard
History
Facts and Figures

Services and Products

On-Line GPRD
Pharmacovigilance
Drug Utilisation
Health Outcomes
Verification Services
Consulting

Pharma - Biotech

Devices Research

Academic Research

Primary Care
Services and Cost
Access under MRC
licence

Information for GPs

FAQs
Contribute

ISAC

Members
Minutes
Annual Reports

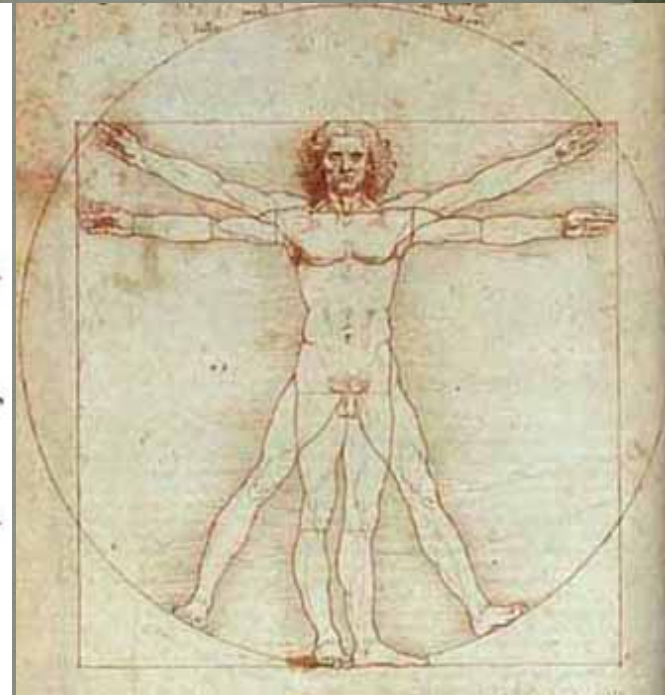
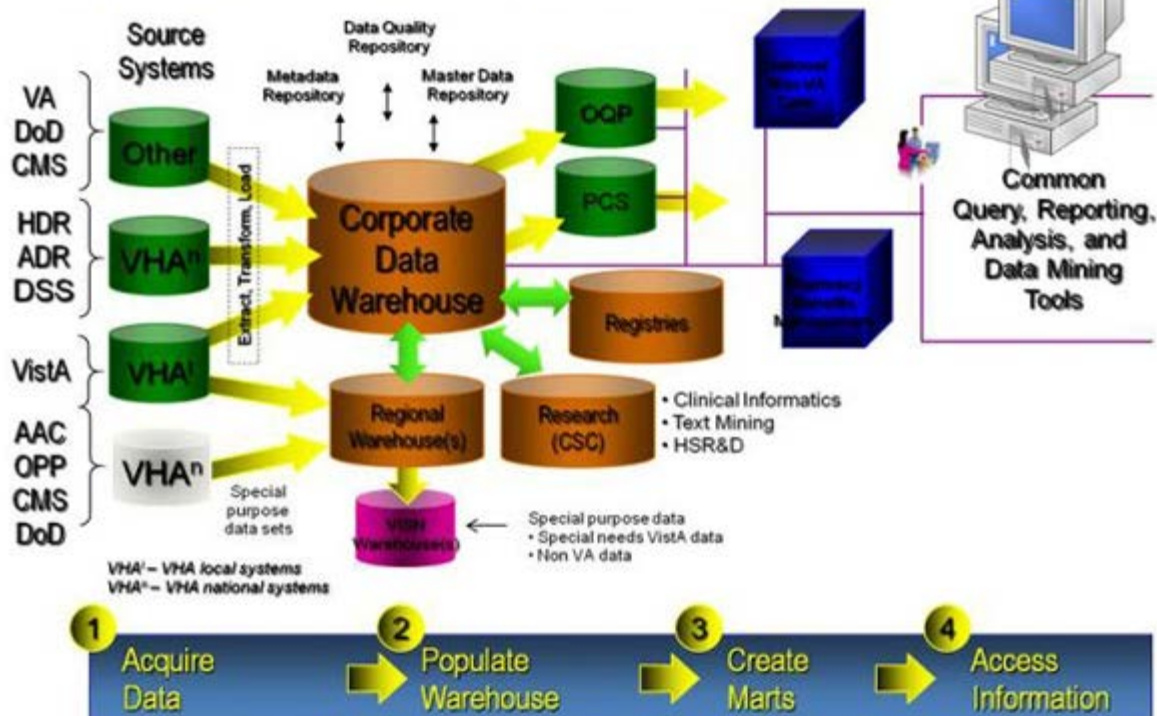
Contact Us

Enquiry Form
Our People
MHRA

Vacancies

Institutional Database: VA's Corporate Data Warehouse Vinci

VHA Data Warehousing Visual Architecture – Current Vision



Disease Specific Databases

Alzheimer's, Parkinson's, Schizophrenia

Disease-specific databases: AlzGene, PDGene, SzGene

Lars Bertram, MD

Assistant Professor of Neurology (HMS)

Assistant in Genetics (MGH)



Genetics and Aging Research Unit
MassGeneral Institute for Neurodegenerative Diseases
Massachusetts General Hospital
Harvard Medical School



Cornucopia of Sources of Data for Dr. Watson

- University hospital databases
- Large medical system e.g. Kaiser Permanente data warehouse
- Insurance databases such as WellPoint
- State level databases



Discovering and Consuming Databases

- At best, freely sharable databases are accessed using their own idiosyncratic web portal
- Currently no index of databases or their content
- No standards exist to describe how databases can “advertise” their content and availability (free or business model) and their data provenance and sources and peer review, etc.
- Would be wonderful project for AMIA or NLM to investigate the creation of an XML standard for describing the content of databases
- This will be critical to the continuing success of the Dr. Watson project in my opinion

Medical Guidelines

- Medical guidelines are increasingly being put into machine intelligible form although this is not an easy process
- Incorporating these into Watson software could serve multiple purposes including health surveillance, could factor into diagnostic decision making, and could be an early implementation of the Watson technology

Peleska et al: General Graphic Model Making Guidelines "Formal" and Machine Readable 2003 European Guidelines on Cardiovascular Disease Prevention and 2003 ESH/ESC Hypertension Guidelines

- Established CVD (CHD, peripheral artery disease, cerebrovascular atherosclerotic disease)
- Presence of diabetes type 2 or diabetes type 1 with microalbuminuria
- LDL cholesterol \geq 6 mmol/l (240 mg/dl) and/or Total cholesterol \geq 8 mmol/l (320 mg/dl)
- DBP \geq 110 mm Hg and/or SBP \geq 180 mm Hg

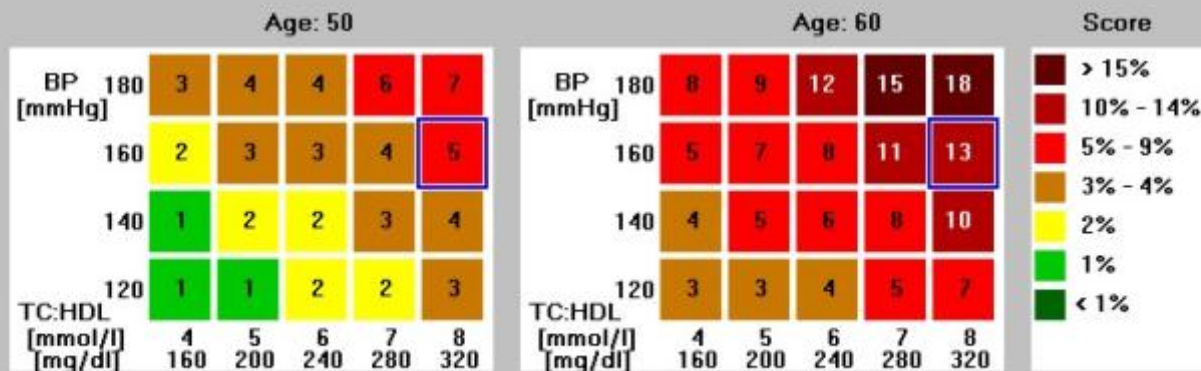
- Smoker
- Low risk region (Belgium, France, Greece, Italy, Luxembourg, Spain, Switzerland, Portugal)

Age: Gender: Systolic BP: [mm Hg] Cholesterol: [mmol/l]
HDL chol.:

Result

Risk of fatal CVD: 10-year: 5%. Projection to age 60 years: **13%**

Absolute risk of fatal CVD: \geq 5 %



The Electronic Medical Record

- The transition to the 3rd year of medical school begins a new phase in education from theoretical to empirical
- Medical students are exposed for the first time to the wards and of course, importantly, to one of their major jobs for the next few years:
 - Maintenance and review of patient charts, nowadays the Electronic Medical Record

Introducing Dr. Watson to the Electronic Medical Record

Vista CPRS in use by: Michalski,Tj (CAMPCPRS2)

File Edit View Tools Help

CLUTIER,OUTPATIENT 111-11-1741 Dec 19,1922 (75)	RAIN Mar 30,98 13:00 Provider: MICHALSKI,TJ	Postings CAD
--	---	------------------------

Active Problems Diabetes mellitus ▲ Coronary Artery Disease ▬ Angina ▬ Copd ▼	Allergies / Adverse Reactions Strawberries Chocolate Tylenol	Postings Crisis Note Dec 05,97 ▲ Allergies ▬ Advance Directive Mar 30,98 Advance Directive Mar 18,98 ▼
--	--	---

Active Medications Halcinonide 0.1% Cream 60gm ▲ Fluoxetine (prozac) 20mg Cap ▬ Tetracycline 250mg Cap ▬ Calcium Lactate 325mg C.T. ▬ Isosorbide Dinitrate 40mg S.A. Tab ▼	Clinical Reminders Influenza Immunization Pneumovax Fecal Occult Blood Test Problem Drinking Screen Flexisigmoidoscopy	Due Date Oct 07,97 ▲ Apr 22,98 ▬ Apr 22,98 ▬ Apr 22,98 ▬ Apr 22,98 ▼
--	--	--

Lab Results - Past 30 Days Prothrombin Time Blood Plasma Routine-Not For S Glucose Blood Serum Routine-Not For Sat,Sun,Holi Cbc,Plt,Diff Blood Routine-Not For Sat,Sun,Holi W	Vitals T 99 Ma ▲ P 82 Ma ▬ R 20 Ma ▬ BP 138/76 Ma ▬ WT 219 Ma ▼	Appointments / Visits / Admissions Rainbow I (primary Care) visited: Apr 09,98 ▲ Rainbow I (primary Care) visited: Apr 02,98 ▬ Rainbow I (primary Care) visited: Mar 30,98 ▬ Rainbow I (primary Care) visited: Mar 29,98 ▬ Rainhwo I (rimaru Care) visited: Mar 18,98 ▼
---	--	--

[Cover Sheet](#) / [Problems](#) / [Meds](#) / [Orders](#) / [Notes](#) / [Consults](#) / [D/C Summ](#) / [Labs](#) / [Reports](#)

Watson and the EMR

- Despite the tremendous strides we have made toward an electronic medical record, we are really just at the 1.0 stage and arguably most current EMR systems really represent just a digital form of paper
- The Watson development team was really surprised when we reviewed the EMR at how primitive it was, even in 2011
 - Lack of ability to search for terms within a patient's record
 - Lack of ability to search across patient records
 - Lack of ability to perform basic statistics or have access to basic decision support tools in EMR

EMR

- The diagnosis of a specific type of pneumonia, for example, can be made according to patient signs and symptoms using journal articles and textbooks
- But it can also be made more reliably by a system such as Watson by also mining the local EMR database as to what diagnoses have been made over the past few days, weeks, months, etc. locally

EMR

- It can then be further refined by not necessarily being constrained to tentative diagnoses that have been made but the microbiology/pathology proven causes of pneumonia
- The EMR provides empirical data about the association of these signs and symptoms with diagnoses and the means to verify what was found by lab tests etc.

EMR Challenges

- Challenges mining EMR
 - Unstructured free text with abbreviations, variable terms (e.g. MRI terminology)
 - Difficulty in having Watson technology analyze large databases such as VA's EMR due to PHI concerns and need to stay within the firewall
 - Watson needs to incorporate the concept of **changing signs and symptoms** in a patient over time which creates added dimension to diagnosis of a single patient presentation
 - Challenge is the **fragmentation** of electronic medical records by multiple hospitals, clinics, outpatient settings, etc.

EMR Opportunities

- Watson can gain empirical knowledge of vast numbers of physicians and patients in a way that would not be possible for any single practitioner
- Watson could use EMR to perform research and discovery in healthcare such as unanticipated drug responses and interactions and factors impacting patient response to therapy
- Watson can be impetus to medical community for the development of more structured EMR in a more friendly machine readable format

Personal Health Records May Help Ameliorate Fragmentation of EMR's Hospital and Clinics and Offices



- PHR's will enable Watson to get all information in one place when patients centralize and take control of their own electronic health records
- Patients will be able to control level of access to their information