IBM Watson Health

COACH Clinician Forum 2015

Making Connections: Trends & Tempos in Clinical Informatics & Professional Practice

Big Data, Cognitive Computing and the Impact on Clinical Decision Support

May 31st, 2015

V2.0

Three IT shifts are candidates to enable healthcare transformation - enabling a “Clinic without Walls” – a future based on ‘extended reach’, ‘vertical integration’ and ‘smarter care’.

Data is the new basis of strategic advantage

Data is becoming the world’s new natural resource, transforming industries and professions.

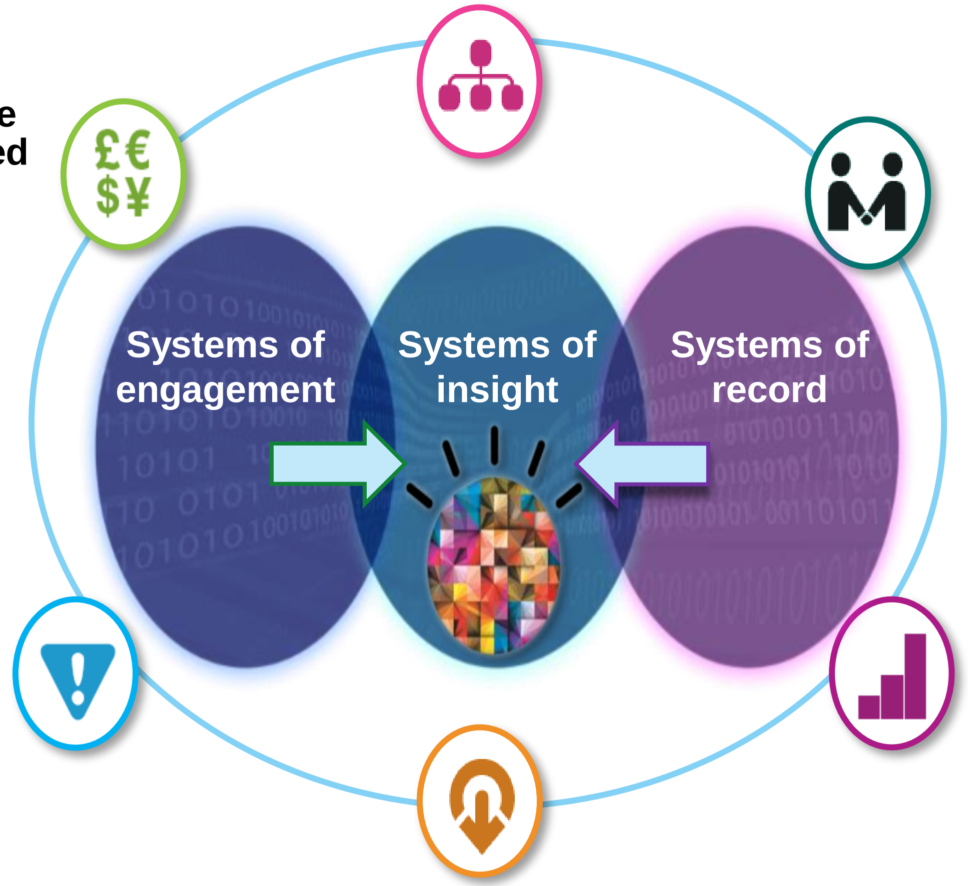
Cloud is the path to new business models

The emergence of cloud is transforming IT and business processes into digital services.

Engagement requires a systematic approach

Mobile is transforming individual engagement – increasing ability to deliver value via “extended reach”.

Create a new vision for health systems – Systems of Insight and Engagement are mandatory to complement our investments in "Systems of Record"..



Create care coordination models

Appropriate Standardized Process

Create Consumer Advocates

Systems of engagement

Systems of insight

Systems of record

Manage risk

Improve IT economics

Optimize operations – patient flow

Systems of Insight – analytic capabilities and health data scientists will redefine Clinical Decision Support.

• **EMR Summary of treatment**	⇨	• **EMR Summary of Risks**
• **Checking to prevent errors – “doing it right”**	⇨	• **Suggestions / Actions – “doing the right things”**
• **EMR Summary of what was done**	⇨	• **EMR summary of what is missing**
• **Retrospective Knowledge**	⇨	• **Real-time best evidence**
• **Knowledge enabled by Referral**	⇨	• **Democratization of Knowledge**

Agenda

- **Shifting Sands – Healthcare and Big Data**
- **Knowledge and Data-driven Analytics**
- **Watson and Emergence of Cognitive Computing**
- **Discussion**

Global trends are forcing integration of health care and social services delivery – and segmentation of populations based on social determinants of health.

Aging Population

66%

2 million aged over 65 in UK will lack informal care from adult offspring by 2030…a 66% increase from 1.2 million in 2012

Increasing Costs

$7 trillion+

The cost for health and social programs worldwide – health is 50% of Ontario's budget squeezing out other programs

Chronic Disease

1 out of 4

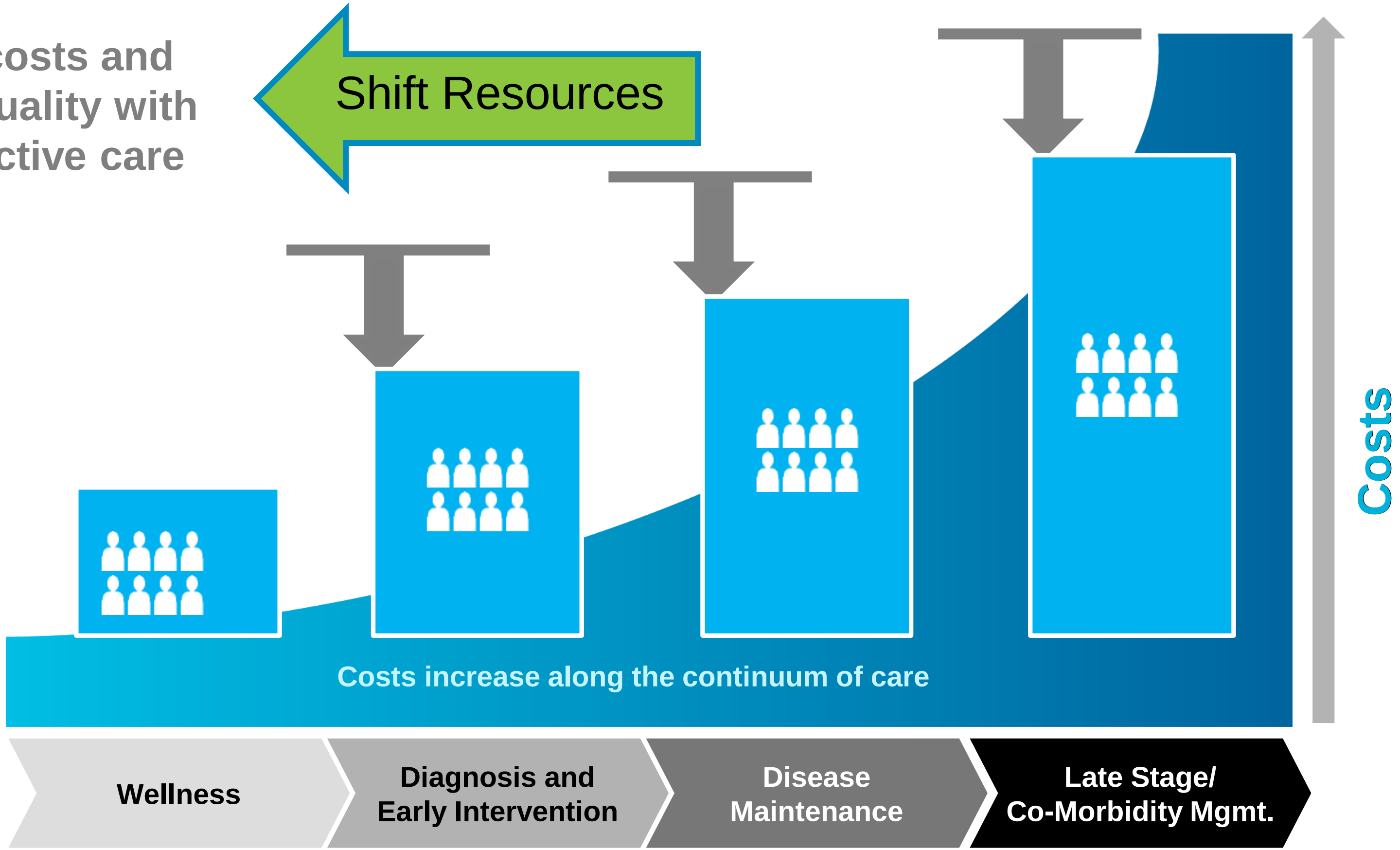
1 in 4 Canadians – and 2 of 3 over the age of 65 –have multiple chronic conditions. 5% of Ontario patients consume 66% of health costs

Health ecosystems are responding to be more proactive, driving the need to identify patients at risk, and intervene in time.

Reduce costs and improve quality with with proactive care

Rising costs:

- **Aging populations**
- **Chronic disease**
- **Complex conditions**



Shift Resources

Costs increase along the continuum of care

Costs

Wellness

Diagnosis and Early Intervention

Disease Maintenance

Late Stage/ Co-Morbidity Mgmt.

Evidence-based care protocols

Promote healthy behaviors

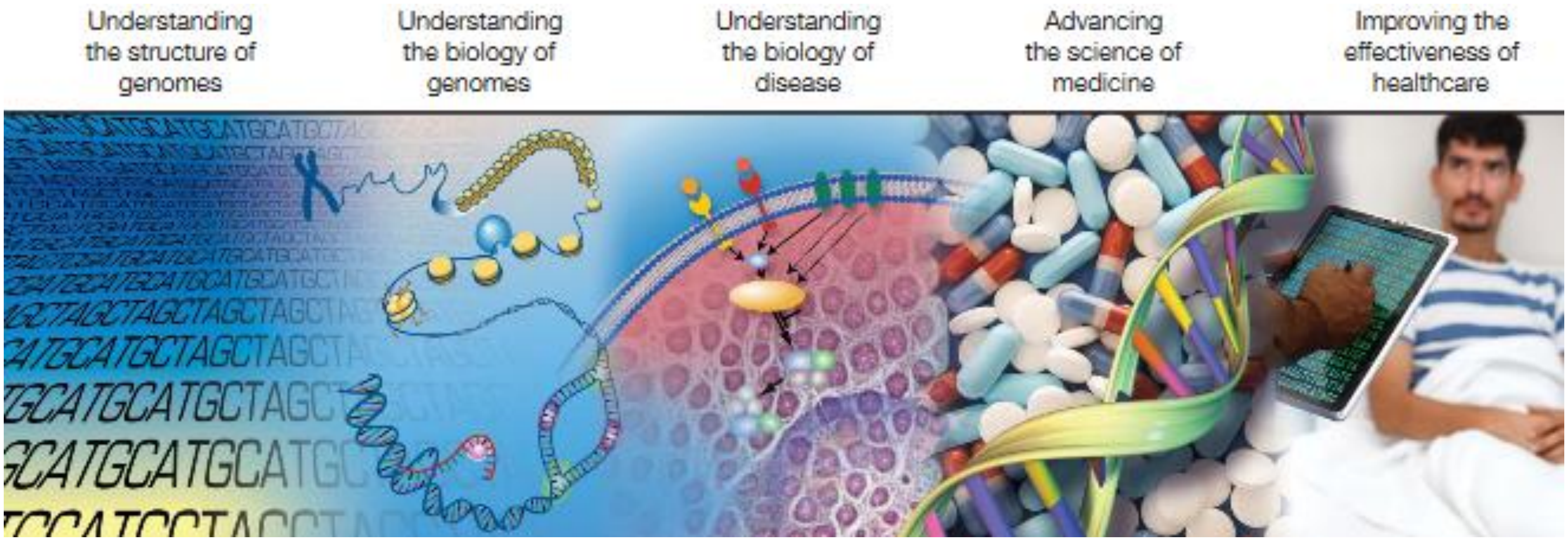
Proactive early detection

Best practice care protocols

Manage Closer to Home

Care coordination for complex conditions

Path Toward Personalized Medicine


Understanding the structure of genomes
Understanding the biology of genomes
Understanding the biology of disease
Advancing the science of medicine
Improving the effectiveness of healthcare

Green, ED et al (2011). Charting a course for genomic medicine from base pairs to bedside. *Nature* 470: 204-213

Change in personalized healthcare investment from 2005 to 2010 [1]

↑ **75%**

Biopharmaceutical companies investing in personalized healthcare research in 2010 [1]

94%

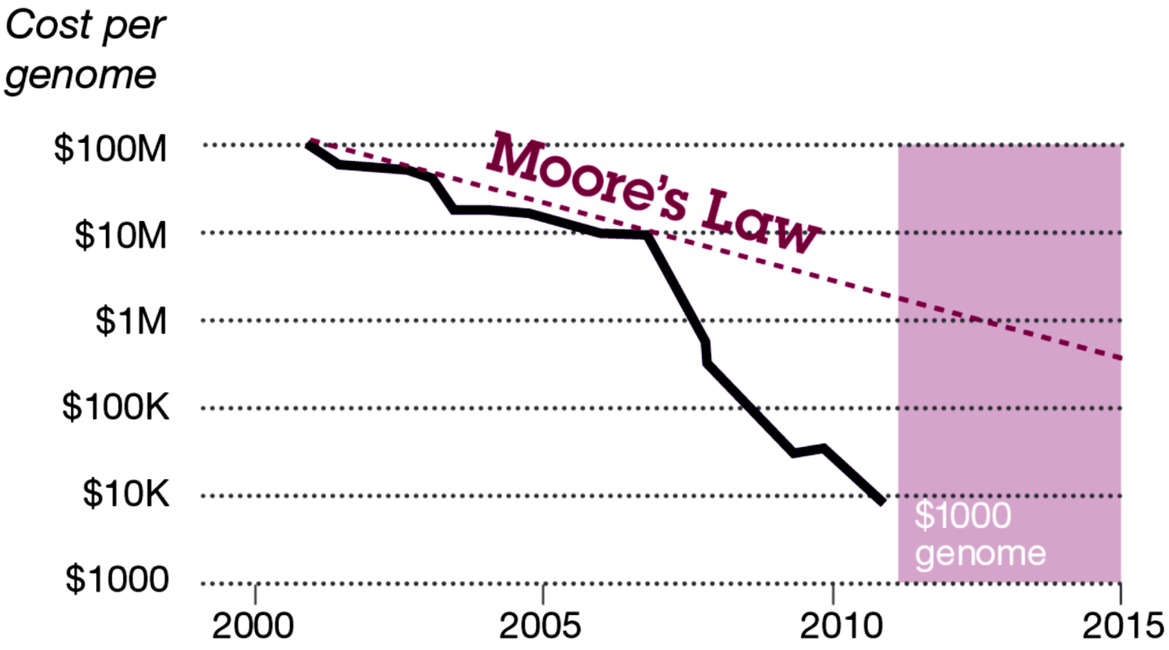
Prominent personalized medicine treatments & diagnostics available [2]

13 ▶ **113**

in 2006 in 2014

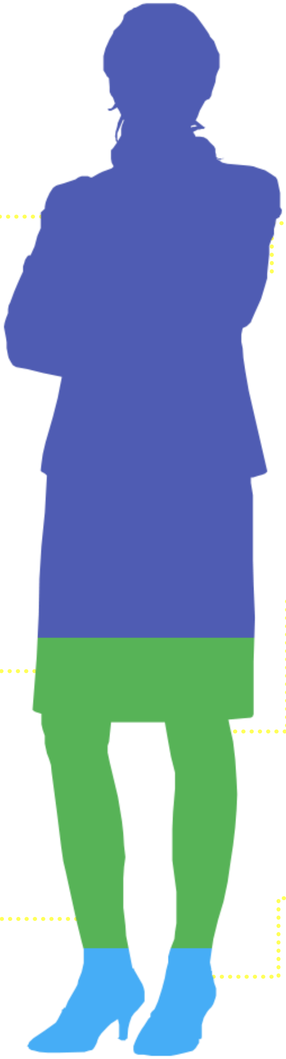
[1] Tufts Center for the Study of Drug Development, 2010; [2] Personalized Medicine Coalition, 2014

Decreasing Cost of Genome Sequencing



Source: National Human Genome Research Institute" http://www.genome.gov/images/content/cost_per_genome.jpg; Adapted by IBM Research.

Health data from new sources is exploding – and forcing reconsideration of investments that are aligned with future potential ….



Exogenous determinants

60%

Impact on individual health from behavior and environment

Genomic determinants

30%

Impact on individual health

Clinical determinants

10%

Impact on individual health

1,100 Terabytes

Generated per lifetime

Volume, Variety, Velocity, Veracity

Fitbits, Home Monitoring Systems, Educational records, Employment Status, Social Security accounts, Mental Health records, Caseworker files and more…

6 TB

Generated per lifetime
Volume

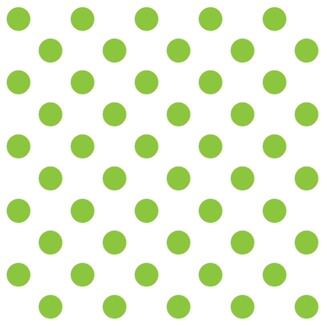
0.4 TB

Generated per lifetime
Variety

Source: "The Relative Contribution of Multiple Determinants to Health Outcomes", Lauren McGover et al., *Health Affairs, 33, no.2 (2014)*

For Healthcare, harnessing Data as a new ‘natural resource’ to strategic advantage means managing the ‘Four Vs’.

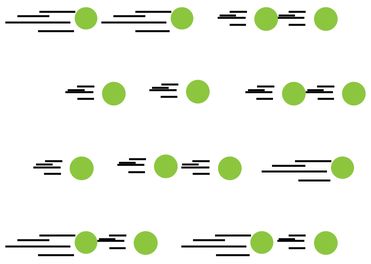
Volume



Data at Rest

Terabytes to exabytes of existing data to process

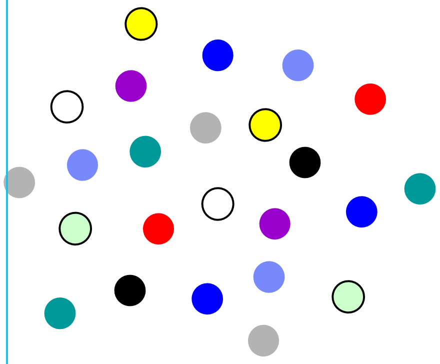
Velocity



Data in Motion

Streaming data, 1000’s per millisecond with seconds to respond

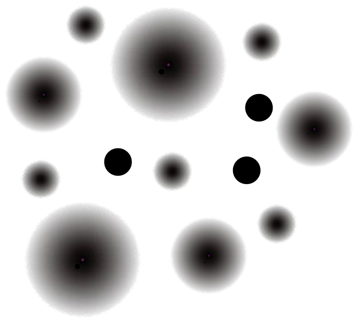
Variety



Data in Many Forms

Structured, unstructured, text, multimedia

Veracity



Data in Doubt

Data inconsistency & incompleteness, ambiguities, latency, deception, model approximations

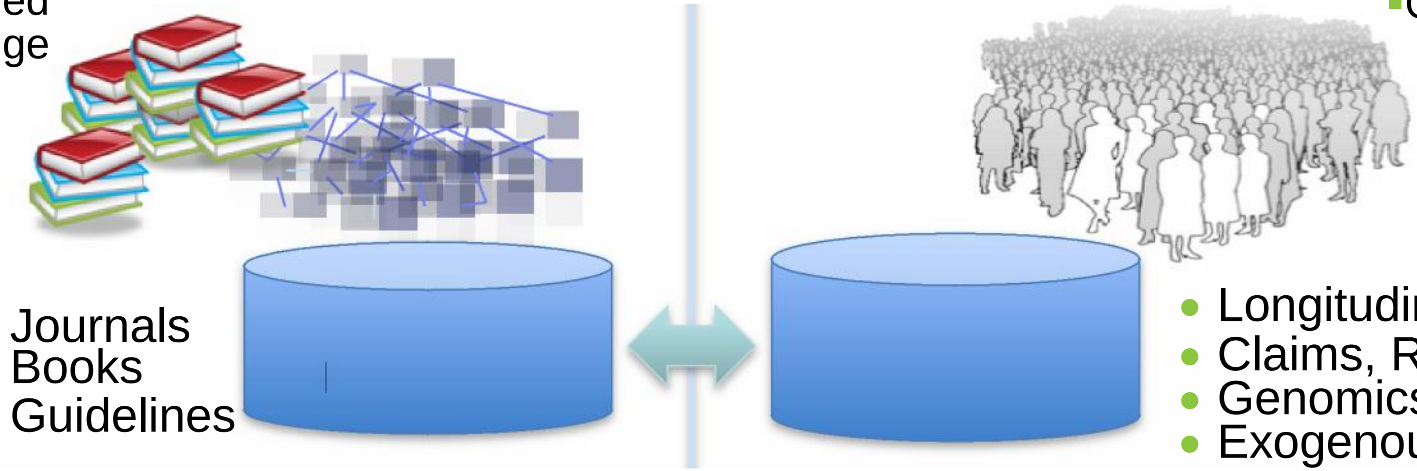
Agenda

- Shifting Sands – Healthcare and Big Data
- Knowledge and Data-driven Analytics
- Watson and Emergence of Cognitive Computing
- Discussion

Systems of Insight have the potential to redefine clinical decision support in the context of both Knowledge-driven and Data-driven Analytics.

Knowledge-Driven

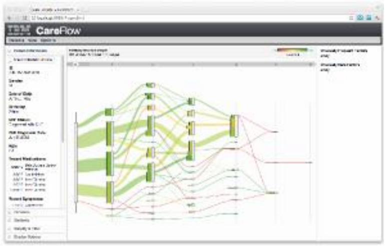
Data-Driven



- Published Knowledge
  - Journals
  - Books
  - Guidelines

- Observational Data
  - Longitudinal records
  - Claims, Rx, Labs
  - Genomics
  - Exogenous

- Discovery Advisor
- Oncology Advisor
- Engagement Advisor
- Clinical Trials Matching
- EMR Assist
- Genomics Advisor



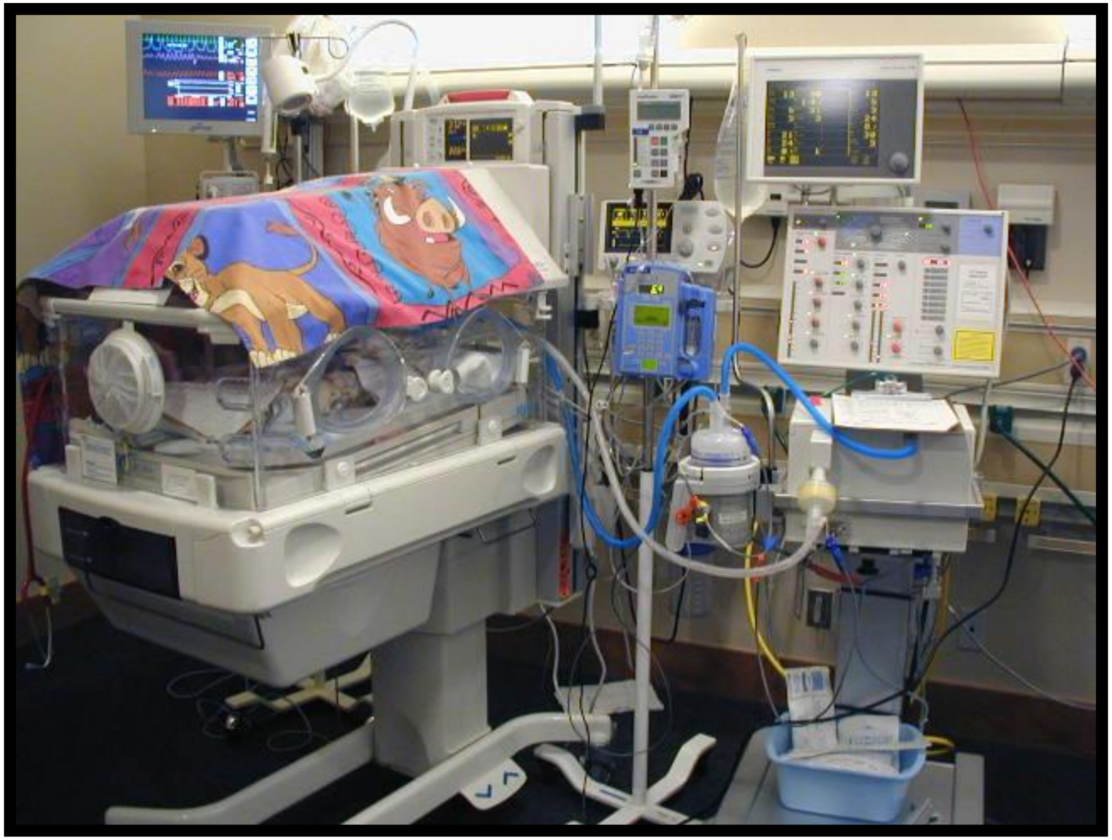
- Patient similarity
- Predictive modeling
- Real World Evidence
- Genomics
- Visual analytics

Insights also means moving from retrospective to predictive – e.g. monitoring of premature infants - predicting onset 24 hrs in advance.

- Research Project between University of Ontario Institute of Technology (UOIT) & IBM Research - Monitors infants in the Hospital for Sick Children NICU

- Manages 100’s data values per second – applies context and evidence-based rules

- Measures trends in multiple readings and based on combination of subtle changes, predicts adverse event 24 hours before onset.



Insight means leveraging clinical notes - extraction of ‘data’ from non-structured text to structured factors via Watson NLP.

Watson’s Text Analytics Natural Language Processing

- Manages abbreviation, negation, ambiguous phrases
  - **“55%” = LVEF**
  - **“Patient does not show signs” = Negative Symptom**

+

Pre-built Watson Annotators for Care Management

- Infer meaning from non-contextual content
  - **“Cut back from two packs to one per day” = Smoker**
- Identify, normalize, and code medical and social facts in unstructured content including:
  - Diagnosis, procedure, allergy, medication, labs, lifestyle

A **42-year** **old** **male** presents for a physical. He lives **alone** and recently cut back from **2 packs to 1 pack** per day. He recently had a right **hemicolectomy** invasive grade 2 (of 4) adenocarcinoma in the ilocecal valve was found and excised. At the same time he had an **appendectomy**. The appendix showed no diagnostic abnormality.

→

Patient	Age: **42** Gender: **Male** Smoker: **Yes** Living Arrangements: **Alone**
Hx Procedure	hemicolectomy diagnosis: **invasive adenocarcinoma** anatomical site: **ileocecal valve** grade: **2 (of 4)**
Hx Procedure	appendectomy diagnosis: **normal** anatomical site: **appendix**

For example, using both structured and non-structured data, a predictive model identifies patients at risk for developing CHF.

9000 patients
identified for at-risk care management program

Improves
patient satisfaction and delays or prevents chronic disease onset

Reduces
Costs of care management through prioritization of resources

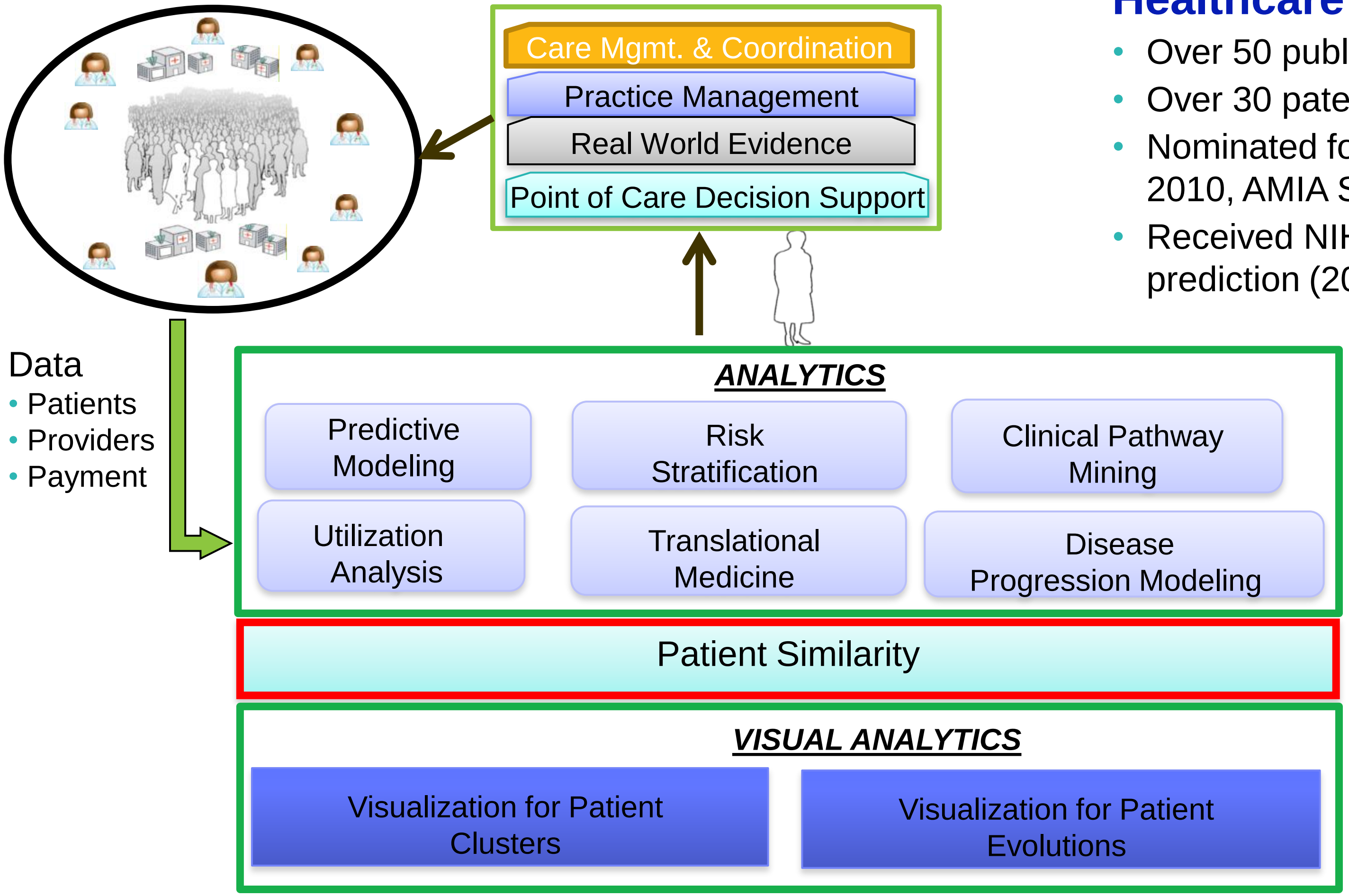
Business Challenge: The problem is identifying those patients at risk before the onset of the disease and before diagnosis so that preventative steps can be taken.

The Smarter Solution: IBM built and deployed a predictive model that achieved an accuracy score of 85% in its ability to identify those patients at risk for developing CHF in a 1 year timeframe.

The model leveraged structured data from the EPIC EMR system and also incorporated unstructured clinical notes that helped the model better identify patients with the condition, increasing its accuracy

Systems of Insight and Data-driven Healthcare Analytics means Building Capabilities.

Data Driven Healthcare Analytics Framework



Care Mgmt. & Coordination

Practice Management

Real World Evidence

Point of Care Decision Support

Data
- Patients
- Providers
- Payment

ANALYTICS

Predictive Modeling

Risk Stratification

Clinical Pathway Mining

Utilization Analysis

Translational Medicine

Disease Progression Modeling

Patient Similarity

VISUAL ANALYTICS

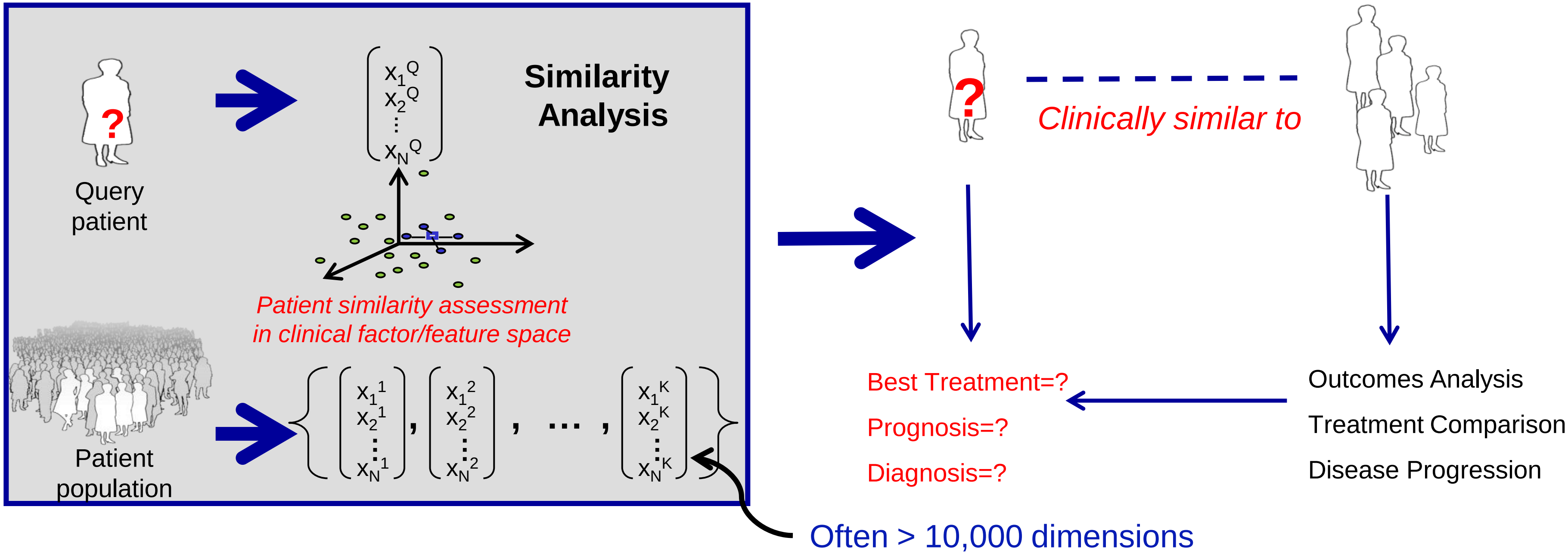
Visualization for Patient Clusters

Visualization for Patient Evolutions

IBM's Track Record in Healthcare Analytics

- Over 50 publications in 4 years
- Over 30 patents filed
- Nominated for best paper: AMIA 2010, AMIA Summit 2014
- Received NIH grant for CHF prediction (2013 – 2016)

Large Scale Patient Similarity Analysis



Query patient

$\begin{pmatrix} x_1^Q \\ x_2^Q \\ \vdots \\ x_N^Q \end{pmatrix}$

Similarity Analysis

Patient similarity assessment in clinical factor/feature space

Patient population

$\left\{ \begin{pmatrix} x_1^1 \\ x_2^1 \\ \vdots \\ x_N^1 \end{pmatrix}, \begin{pmatrix} x_1^2 \\ x_2^2 \\ \vdots \\ x_N^2 \end{pmatrix}, \ldots, \begin{pmatrix} x_1^K \\ x_2^K \\ \vdots \\ x_N^K \end{pmatrix} \right\}$

Often > 10,000 dimensions

Clinically similar to

Best Treatment=?

Prognosis=?

Diagnosis=?

Outcomes Analysis

Treatment Comparison

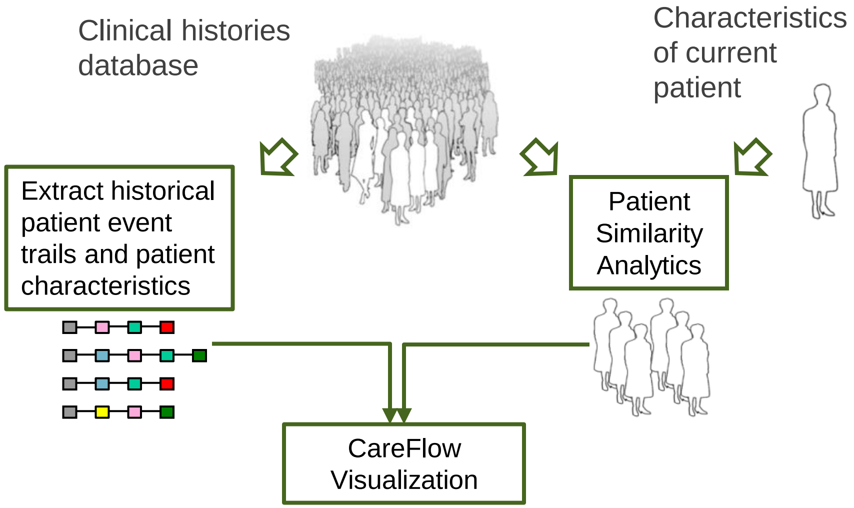
Disease Progression

Challenge: identify the measure of clinical similarity between patients

Approach: machine learning algorithms to automatically learn the best metric from observational data and labels provided by experts or derived from data

IBM Research has evolved a Decision Support Tool for Clinical Care – visualizes what happened to patients “just like yours”

- **Key capabilities**
  - Uses Patient Similarity Analytics to find clinically similar patients.
  - Extracts historical event trails and patient characteristics relevant to the condition targeted
  - Provides a Visual Summary of the evolution of clinical pathways of the similar patients, based on relevant to events
  - Relates outcomes to pathways, to help identifies most desirable and most problematic pathways to inform clinical decisions



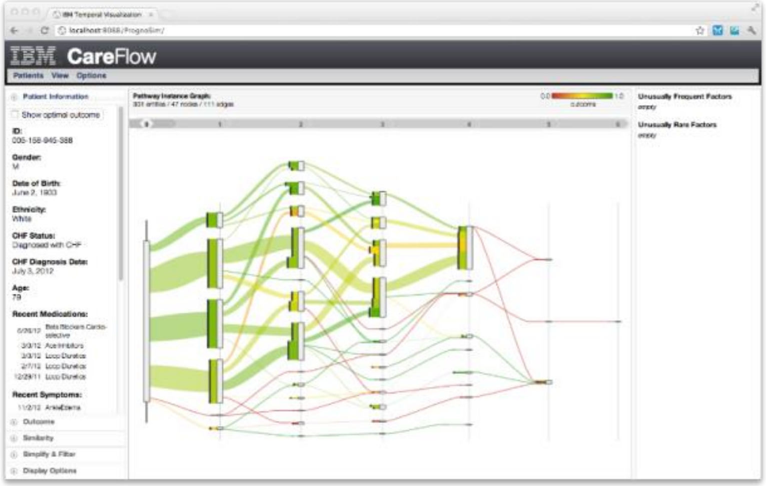
Clinical histories database

Characteristics of current patient

Extract historical patient event trails and patient characteristics

Patient Similarity Analytics

CareFlow Visualization



IBM Temporal Visualization
localhost:8088/PrognoSim/
IBM CareFlow
Patients
View
Options
Patient Information
☐ Show optimal outcome
Pathway Instance Graph:
931 entities / 47 nodes / 111 edges
0.0
1.0
outcome
0
1
2
3
4
5
6
Unusually Frequent Factors
empty
Unusually Rare Factors
empty
Outcome
Similarity
Simplify & Filter
Display Options

ID:
006-158-945-388

Gender:
M

Date of Birth:
June 2, 1933

Ethnicity:
White

CHF Status:
Diagnosed with CHF

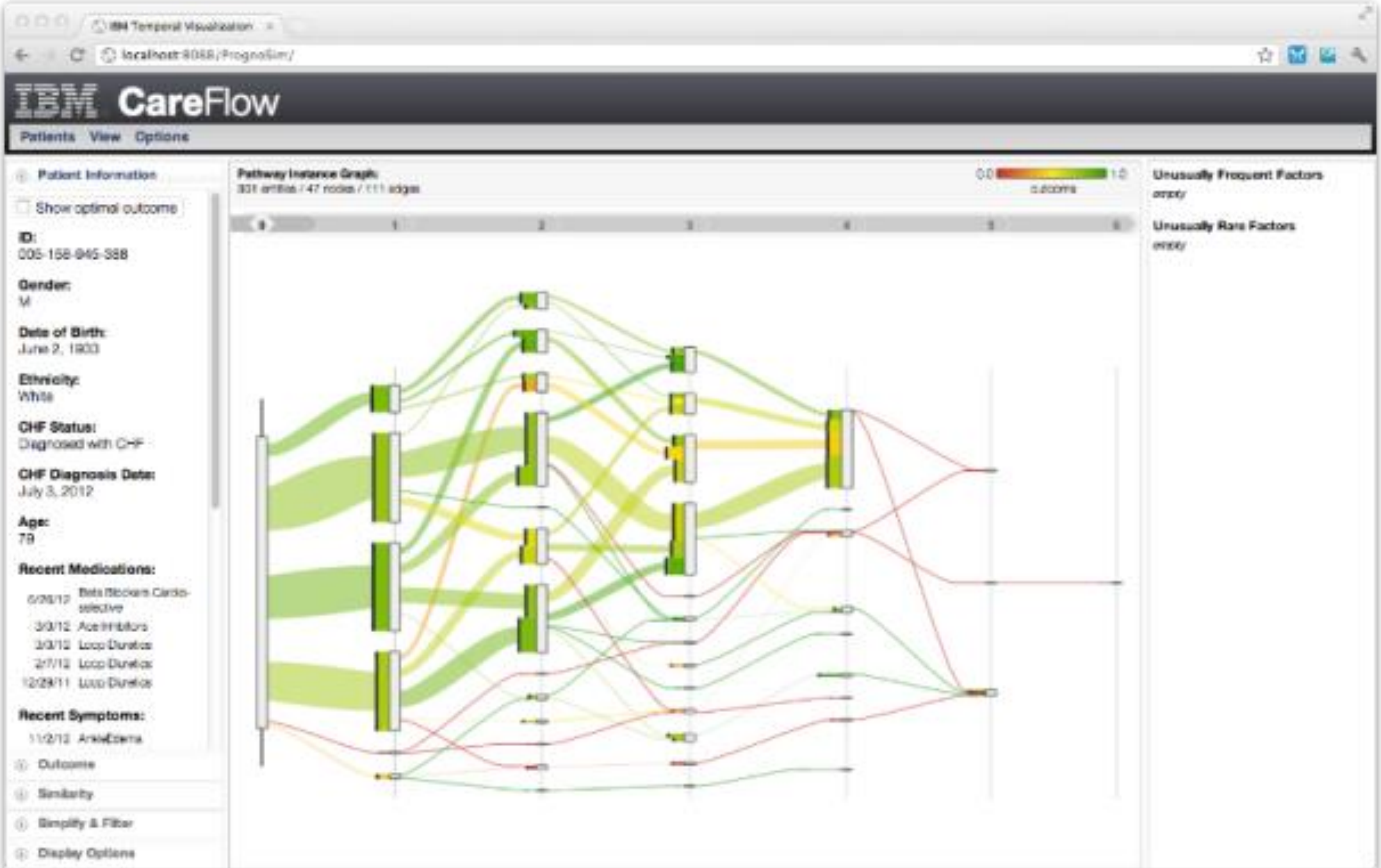
CHF Diagnosis Date:
July 3, 2012

Age:
79

Recent Medications:
6/26/12 Beta Blockers Cardio-selective
3/3/12 Ace Inhibitors
3/3/12 Loop Diuretics
2/7/12 Loop Diuretics
12/29/11 Loop Diuretics

Recent Symptoms:
11/2/12 AnkleEdema

IBM Research has evolved a Decision Support Tool for Clinical Care – visualizes what happened to patients “just like yours”


IBM Temporal Visualization
localhost:8088/PrognoSim/
IBM CareFlow
Patients
View
Options
Patient Information
Pathway Instance Graph:
0.0
1.0
outcome
0
1
2
3
4
5
6
Outcome
Similarity
Simplify & Filter
Display Options

☐ Show optimal outcome

ID:
005-158-945-388

Gender:
M

Date of Birth:
June 2, 1933

Ethnicity:
White

CHF Status:
Diagnosed with CHF

CHF Diagnosis Date:
July 3, 2012

Age:
79

Recent Medications:

6/26/12	Beta Blockers Cardio-selective
3/3/12	Ace Inhibitors
3/3/12	Loop Diuretics
2/7/12	Loop Diuretics
12/29/11	Loop Diuretics

Recent Symptoms:

11/2/12	AnkleEdema

331 entities / 47 nodes / 111 edges

Unusually Frequent Factors
empty

Unusually Rare Factors
empty

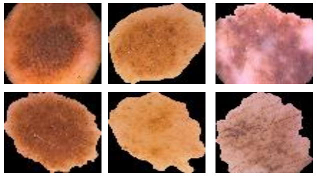
Transforming Skin Cancer Detection using Data-Driven Learning

Today

Diagnosis

Manual Inspection

ABCDE
Asymmetry
Borders
Color
Diameter
Evolution



Unknown Images

- **Inaccurate Diagnoses from Limited Samples and Modalities**
- **Subjective Evaluation**

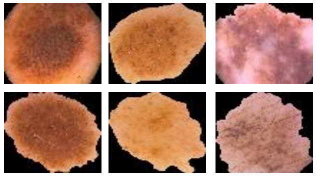
Transformation 1 (Current)

Computer Assisted Diagnosis

Computer Analysis

Ensemble Classification

Segmentation and Visual Feature Extraction



Unknown Images

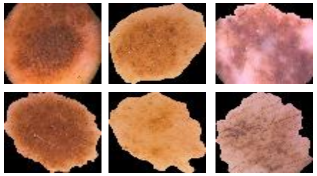
- **Higher Accuracy (1K's training)**
- **Improved Consistency**
- **More Contextual Data (modalities)**

Transformation 2 (Future)

Diagnosis and Continuous Learning

Deep Learning

Convolutional Neural Network (CNN) Discrimination and Feature Learning

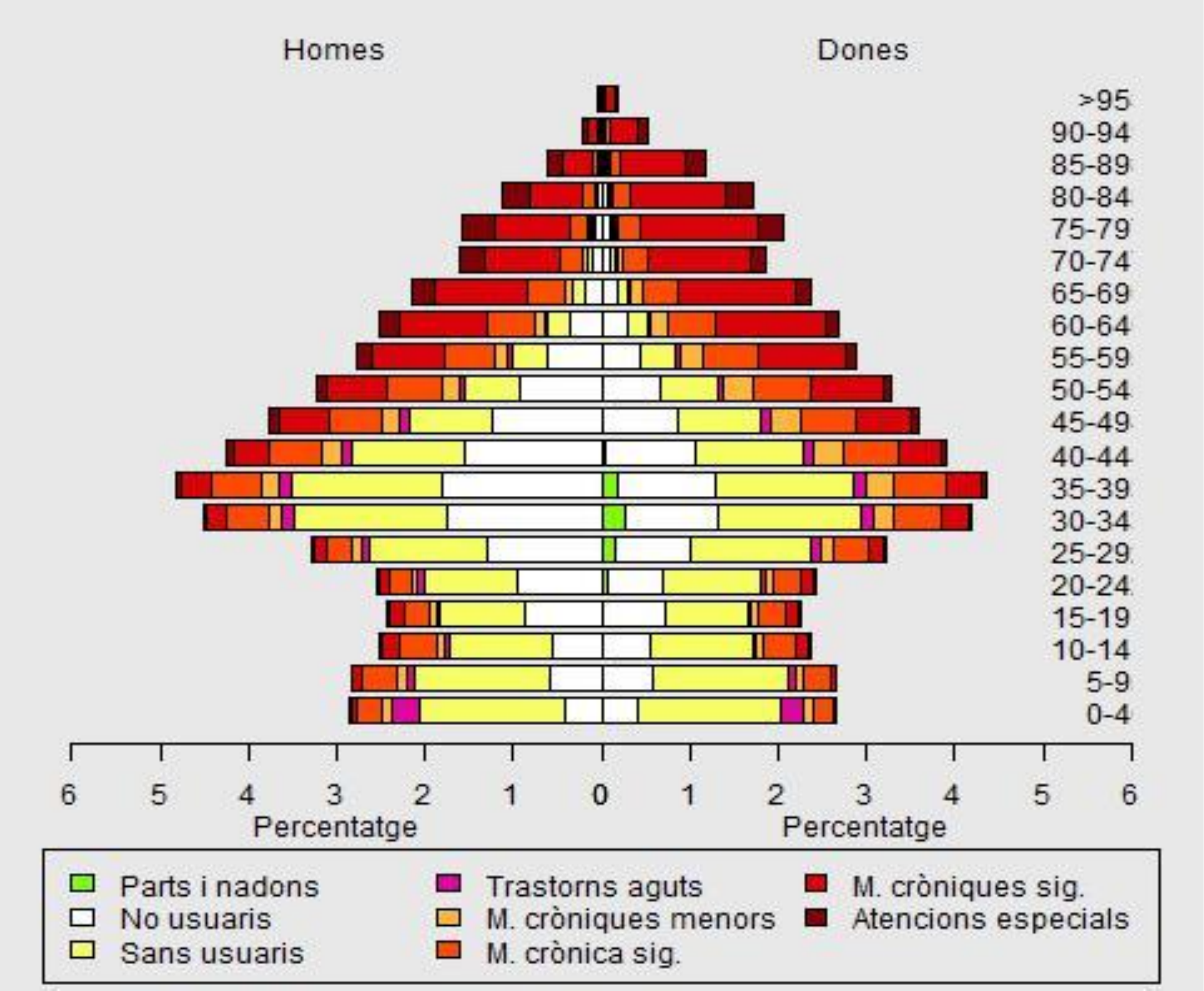


Unknown Images

- **Highly Accurate (1M's training)**
- **Continuous Learning from Data**
- **High Density Samples (space/time)**

🟥 **Manual** 🟩 **Data-Driven**

Using Systems of Insight to “know your customers” – segment patients – similar to Catalunya, Spain who have risk profiled based on 8 Clinical Risk Groups.

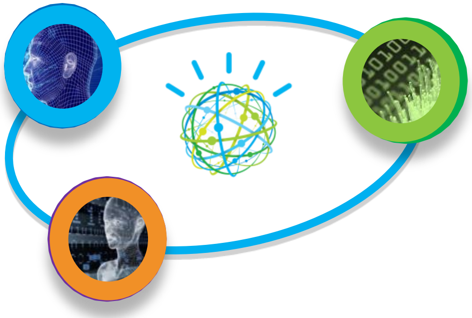


Agenda

- **Shifting Sands – Healthcare and Analytics**
- **Knowledge and Data-driven Analytics**
- **Watson and Emergence of Cognitive Computing**
- **Discussion**

Knowledge-driven Analytics – and emergence of Cognitive Computing – Learning Systems - to address the challenges of healthcare

- Watson focuses on “Knowledge Management”
  - EMR investments focus on record management
- 800,000 publications per year catalogued by the US Library of Medicine



Medical info is doubling every 5 years

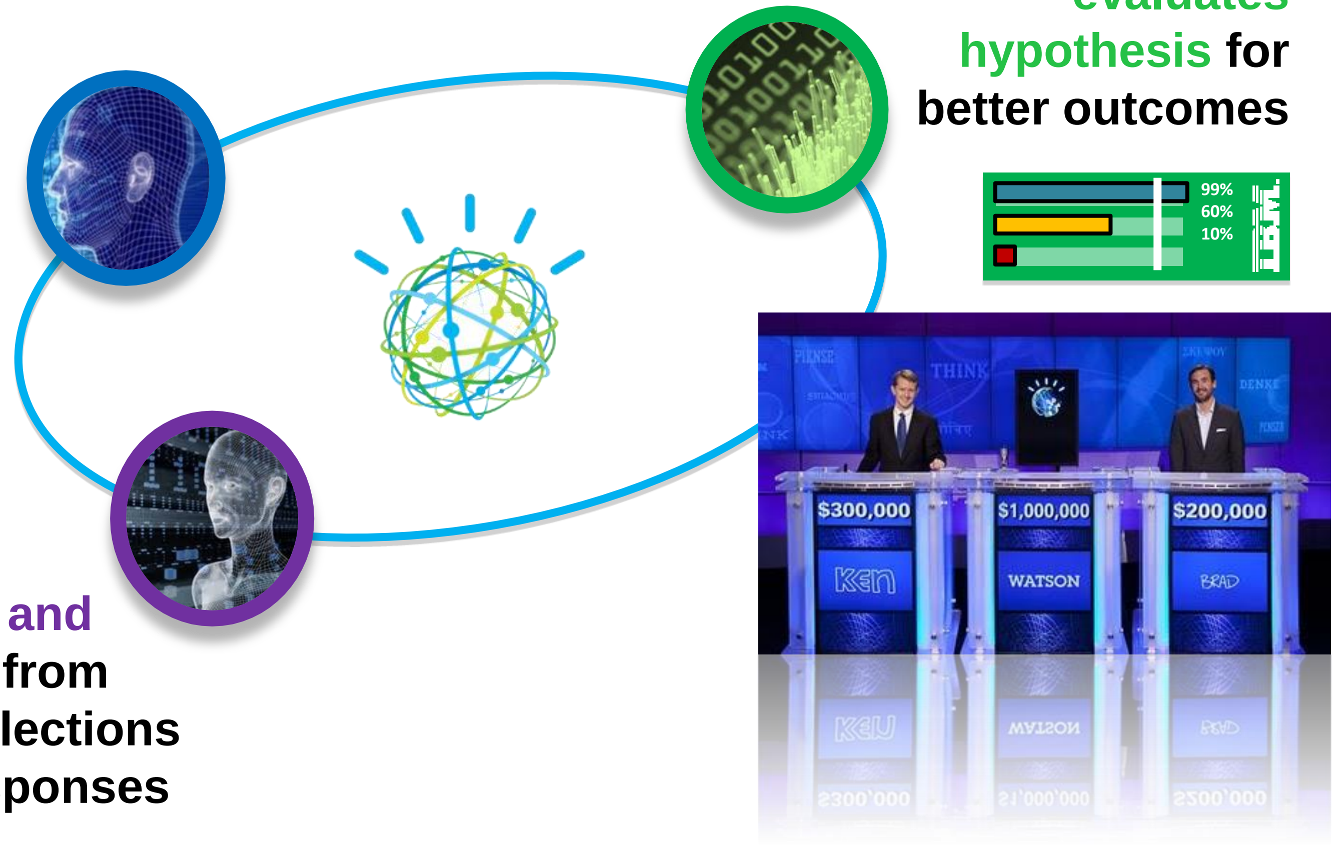
81% of physicians spend < 5 hrs / month reading medical journals

1.5M errors in the way medications are prescribed, delivered and taken

$750B, or 30 cents of every dollar, is wasted in US alone

Starting in 2006, our investments have led to Watson for Healthcare - integration of knowledge with data to drive better decisions and outcomes.

1 Understands natural language and human speech


99%
60%
10%
IBM
THINK
$300,000
$1,000,000
$200,000
Ken
WATSON
BRAD

2 Generates and evaluates hypothesis for better outcomes

3 Adapts and Learns from user selections and responses

Watson's Cognitive Computing capabilities allows you to Ask, Discover, and Decide.

ASK

Watson Engagement Advisor
to transform interactions and experiences with consumers and patients

Emerging Technologies
Watson Paths

DISCOVER

Watson Discovery Advisor

Watson Analytics
Watson Explorer

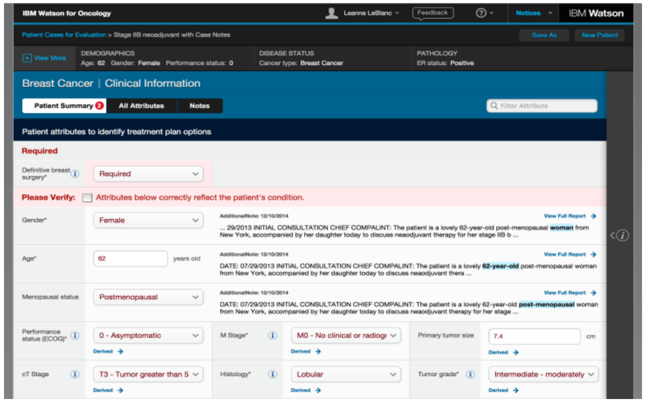
Emerging Technologies
Watson EMR Assistant

DECIDE

Watson Oncology
to assist in identifying individualized treatment plans and clinical trials..

IBM Watson for Oncology
Trained by Memorial Sloan Kettering

Memorial Sloan Kettering Cancer Center™


IBM Watson for Oncology
Leanne LeBlanc
Feedback
Notices
IBM Watson
Save As
New Patient
View More
Patient Summary 2
All Attributes
Notes
Filter Attribute
View Full Report
Derived

Patient Cases for Evaluation > Stage IIB neoadjuvant with Case Notes

DEMOGRAPHICS Age: 62 Gender: Female Performance status: 0

DISEASE STATUS Cancer type: Breast Cancer

PATHOLOGY ER status: Positive

Breast Cancer | Clinical Information

Patient attributes to identify treatment plan options

Required

Definitive breast surgery*: Required

Please Verify: ☐ Attributes below correctly reflect the patient's condition.

Gender*: Female

AdditionalNote: 12/10/2014
... 29/2013 INITIAL CONSULTATION CHIEF COMPALINT: The patient is a lovely 62-year-old post-menopausal **woman** from New York, accompanied by her daughter today to discuss neaodjuvant therapy for her stage IIB b ...

Age*: 62 years old

AdditionalNote: 12/10/2014
DATE: 07/29/2013 INITIAL CONSULTATION CHIEF COMPALINT: The patient is a lovely **62-year-old** post-menopausal woman from New York, accompanied by her daughter today to discuss neaodjuvant thera ...

Menopausal status: Postmenopausal

AdditionalNote: 12/10/2014
DATE: 07/29/2013 INITIAL CONSULTATION CHIEF COMPALINT: The patient is a lovely 62-year-old **post-menopausal** woman from New York, accompanied by her daughter today to discuss neaodjuvant therapy for her stage ...

Performance status (ECOG)*: 0 - Asymptomatic

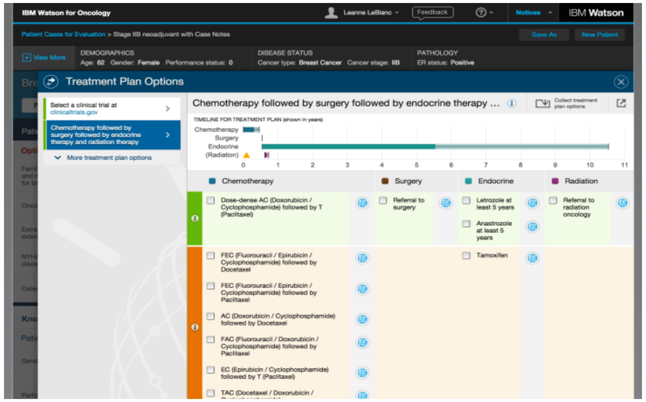
M Stage*: M0 - No clinical or radiogr

Primary tumor size: 7.4 cm

cT Stage: T3 - Tumor greater than 5

Histology*: Lobular

Tumor grade*: Intermediate - moderately


IBM Watson for Oncology
Leanne LeBlanc
Feedback
Notices
IBM Watson
Save As
New Patient
View More
Collect treatment plan options
TIMELINE FOR TREATMENT PLAN (shown in years)
Chemotherapy
Surgery
Endocrine
(Radiation)
0
1
2
3
4
5
6
7
8
9
10
11

Patient Cases for Evaluation > Stage IIB neoadjuvant with Case Notes

DEMOGRAPHICS Age: 62 Gender: Female Performance status: 0

DISEASE STATUS Cancer type: Breast Cancer Cancer stage: IIB

PATHOLOGY ER status: Positive

Treatment Plan Options

Select a clinical trial at clinicaltrials.gov

Chemotherapy followed by surgery followed by endocrine therapy and radiation therapy

More treatment plan options

Chemotherapy followed by surgery followed by endocrine therapy ...

Chemotherapy	Surgery	Endocrine	Radiation
☐ Dose-dense AC (Doxorubicin / Cyclophosphamide) followed by T (Paclitaxel)	☐ Referral to surgery	☐ Letrozole at least 5 years ☐ Anastrozole at least 5 years	☐ Referral to radiation oncology
☐ FEC (Fluorouracil / Epirubicin / Cyclophosphamide) followed by Docetaxel ☐ FEC (Fluorouracil / Epirubicin / Cyclophosphamide) followed by Paclitaxel ☐ AC (Doxorubicin / Cyclophosphamide) followed by Docetaxel ☐ FAC (Fluorouracil / Doxorubicin / Cyclophosphamide) followed by Paclitaxel ☐ EC (Epirubicin / Cyclophosphamide) followed by T (Paclitaxel) ☐ TAC (Docetaxel / Doxorubicin /		☐ Tamoxifen	

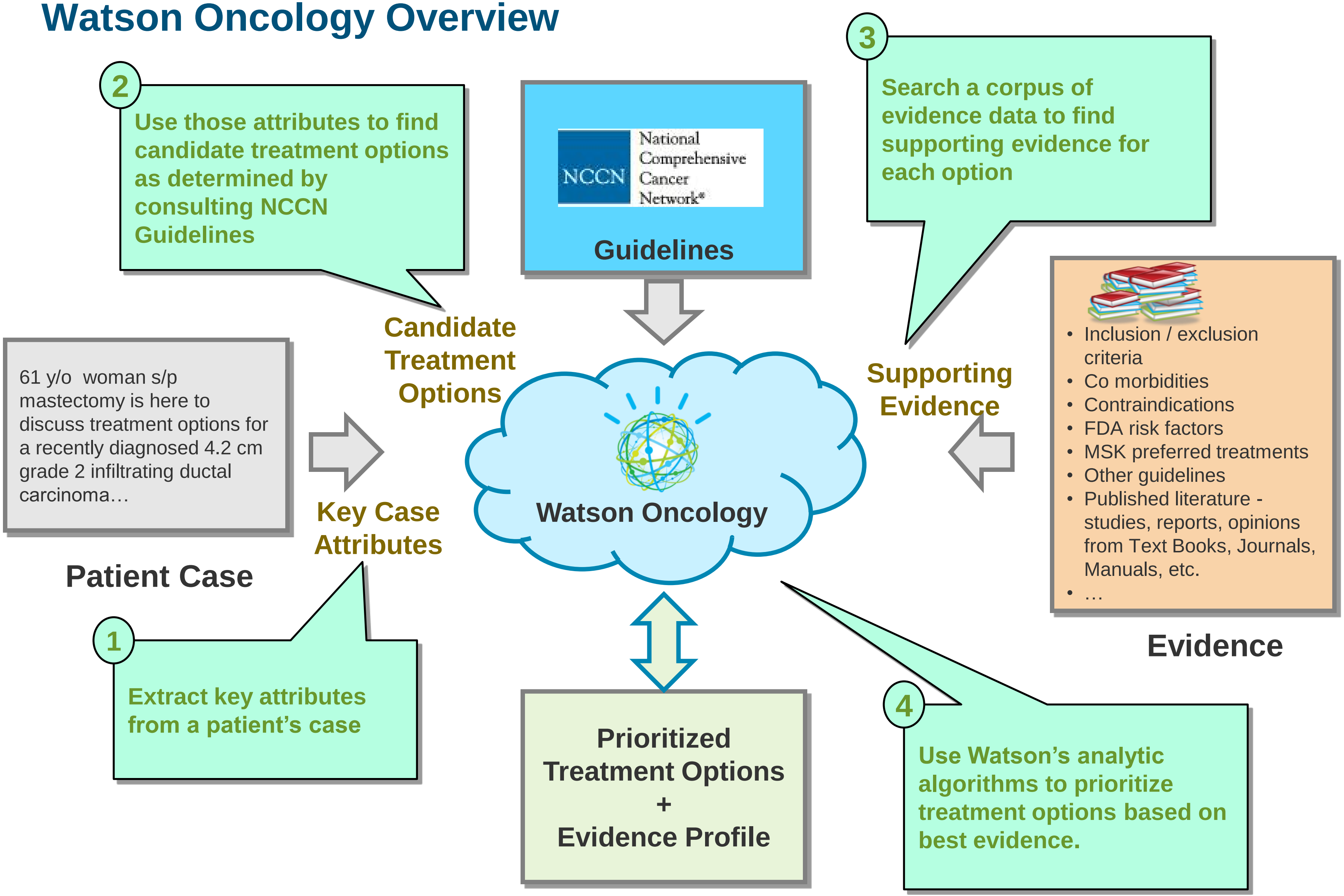
Business challenge:

- Ability to assess quickly the best treatments for an individual patient based on latest evidence and clinical guidelines

Watson solution:

- A tool to assist physicians make personalized treatment decisions
  - Analyzes patient data against thousands of historical cases and trained through thousands of Memorial Sloan Kettering MD and analyst hours
  - Suggestions to help inform oncologists’ decisions based on over 290 medical journals, over 200 textbooks, and 12M pages of text
  - Evolves with the fast-changing field
  - Currently supports first line treatment (Breast, Lung, Colorectal cancers)

Watson Oncology Overview



1

Extract key attributes from a patient's case

61 y/o woman s/p mastectomy is here to discuss treatment options for a recently diagnosed 4.2 cm grade 2 infiltrating ductal carcinoma…

Patient Case

Key Case Attributes

2

Use those attributes to find candidate treatment options as determined by consulting NCCN Guidelines

Candidate Treatment Options

NCCN National Comprehensive Cancer Network®

Guidelines

3

Search a corpus of evidence data to find supporting evidence for each option

Supporting Evidence

- Inclusion / exclusion criteria
- Co morbidities
- Contraindications
- FDA risk factors
- MSK preferred treatments
- Other guidelines
- Published literature - studies, reports, opinions from Text Books, Journals, Manuals, etc.
- …

Evidence

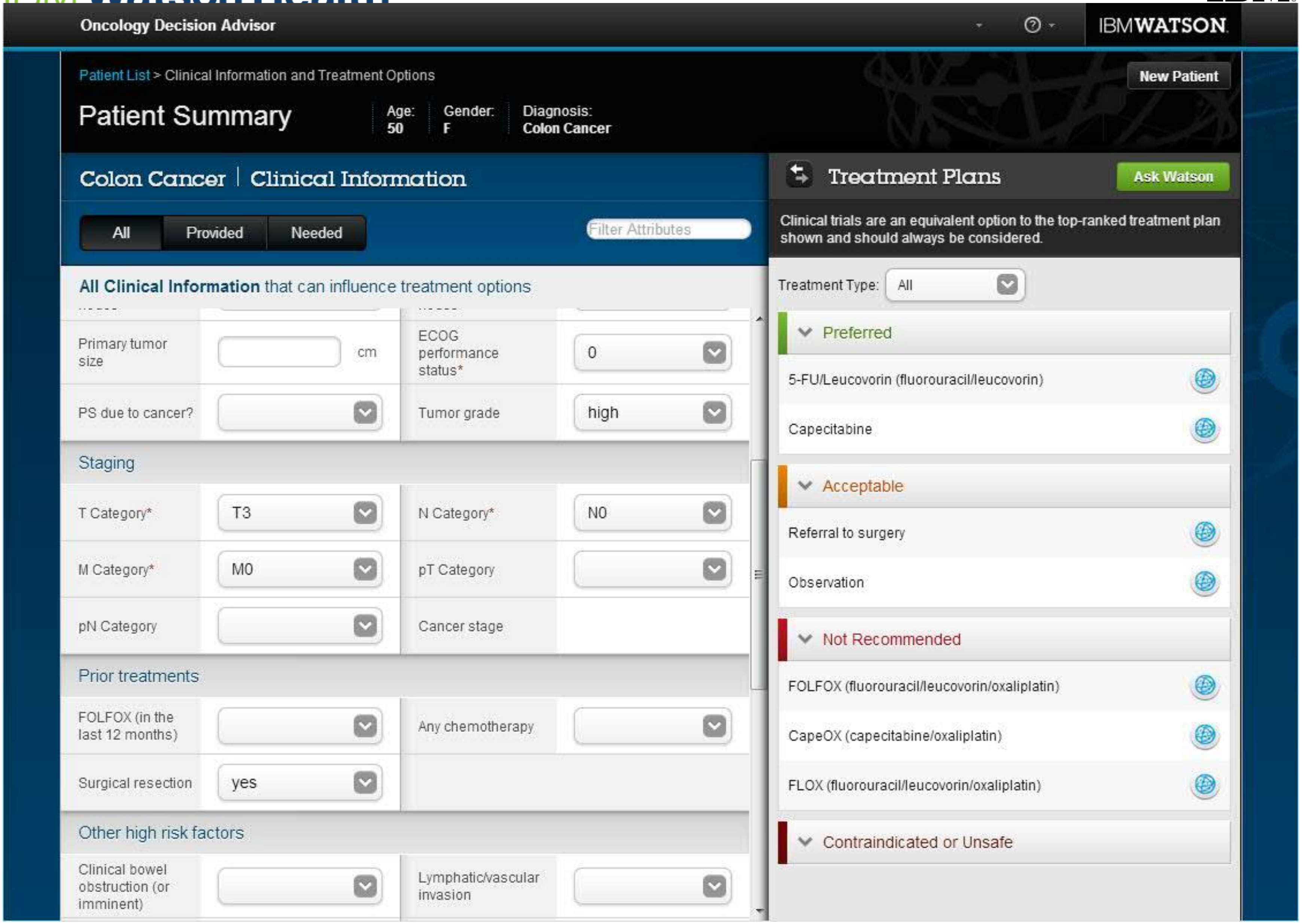
Watson Oncology

Prioritized Treatment Options + Evidence Profile

4

Use Watson's analytic algorithms to prioritize treatment options based on best evidence.

IBM Watson Health



Patient List > Clinical Information and Treatment Options

Patient Summary

Age: 50
Gender: F
Diagnosis: Colon Cancer

Colon Cancer | Clinical Information

All Clinical Information that can influence treatment options

Primary tumor size	cm	ECOG performance status*	0
PS due to cancer?		Tumor grade	high

Staging

T Category*	T3	N Category*	N0
M Category*	M0	pT Category	
pN Category		Cancer stage	

Prior treatments

FOLFOX (in the last 12 months)		Any chemotherapy	
Surgical resection	yes		

Other high risk factors

Clinical bowel obstruction (or imminent)		Lymphatic/vascular invasion	

Treatment Plans

Clinical trials are an equivalent option to the top-ranked treatment plan shown and should always be considered.

Treatment Type: All

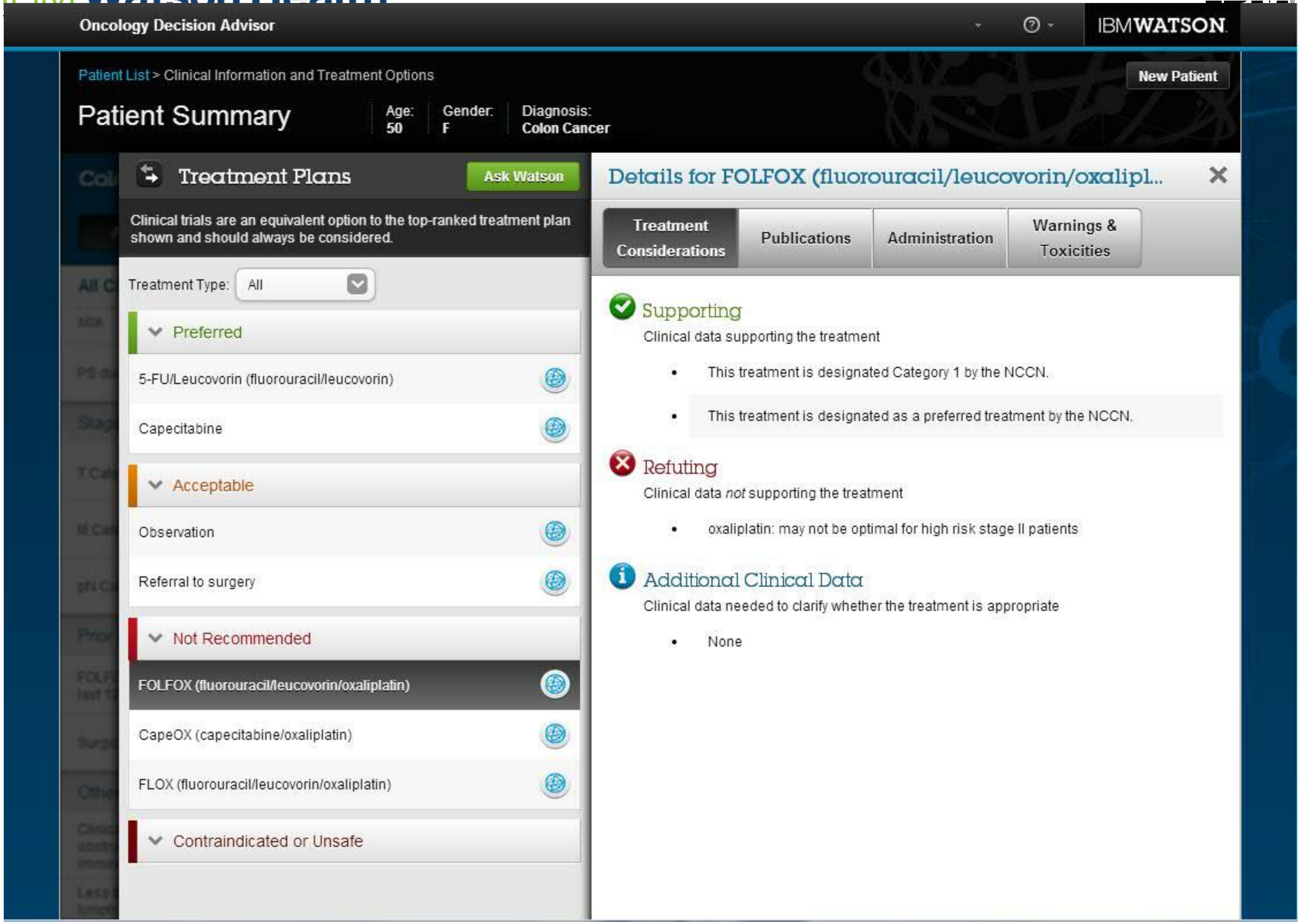
Preferred
- 5-FU/Leucovorin (fluorouracil/leucovorin)
- Capecitabine

Acceptable
- Referral to surgery
- Observation

Not Recommended
- FOLFOX (fluorouracil/leucovorin/oxaliplatin)
- CapeOX (capecitabine/oxaliplatin)
- FLOX (fluorouracil/leucovorin/oxaliplatin)

Contraindicated or Unsafe

IBM Watson Health



Oncology Decision Advisor
IBM WATSON
New Patient
Ask Watson
Treatment Considerations
Publications
Administration
Warnings & Toxicities

Patient List > Clinical Information and Treatment Options

Patient Summary

Age: 50

Gender: F

Diagnosis: Colon Cancer

Treatment Plans

Clinical trials are an equivalent option to the top-ranked treatment plan shown and should always be considered.

Treatment Type: All

Preferred

- 5-FU/Leucovorin (fluorouracil/leucovorin)
- Capecitabine

Acceptable

- Observation
- Referral to surgery

Not Recommended

- FOLFOX (fluorouracil/leucovorin/oxaliplatin)
- CapeOX (capecitabine/oxaliplatin)
- FLOX (fluorouracil/leucovorin/oxaliplatin)

Contraindicated or Unsafe

Details for FOLFOX (fluorouracil/leucovorin/oxalipl...

✓ **Supporting**

Clinical data supporting the treatment

- This treatment is designated Category 1 by the NCCN.
- This treatment is designated as a preferred treatment by the NCCN.

☒ **Refuting**

Clinical data *not* supporting the treatment

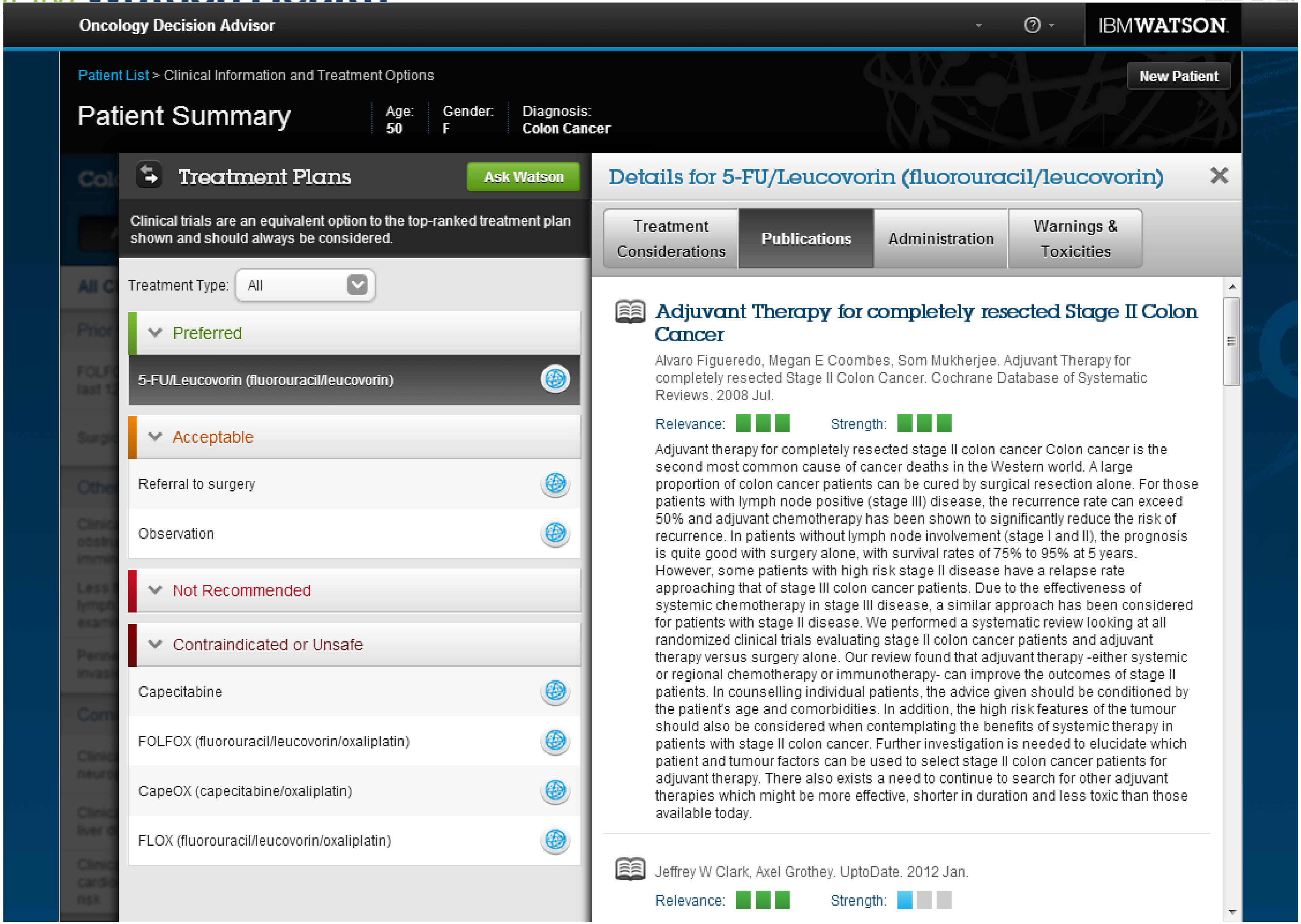
- oxaliplatin: may not be optimal for high risk stage II patients

ⓘ **Additional Clinical Data**

Clinical data needed to clarify whether the treatment is appropriate

- None

IBM Watson Health



Patient List > Clinical Information and Treatment Options

Patient Summary

Age: 50

Gender: F

Diagnosis: Colon Cancer

Treatment Plans

Clinical trials are an equivalent option to the top-ranked treatment plan shown and should always be considered.

Treatment Type: All

- Preferred
  - 5-FU/Leucovorin (fluorouracil/leucovorin)
- Acceptable
  - Referral to surgery
  - Observation
- Not Recommended
- Contraindicated or Unsafe
  - Capecitabine
  - FOLFOX (fluorouracil/leucovorin/oxaliplatin)
  - CapeOX (capecitabine/oxaliplatin)
  - FLOX (fluorouracil/leucovorin/oxaliplatin)

Details for 5-FU/Leucovorin (fluorouracil/leucovorin)

Adjuvant Therapy for completely resected Stage II Colon Cancer

Alvaro Figueredo, Megan E Coombes, Som Mukherjee. Adjuvant Therapy for completely resected Stage II Colon Cancer. Cochrane Database of Systematic Reviews. 2008 Jul.

Relevance: 🟩🟩🟩 Strength: 🟩🟩🟩

Adjuvant therapy for completely resected stage II colon cancer Colon cancer is the second most common cause of cancer deaths in the Western world. A large proportion of colon cancer patients can be cured by surgical resection alone. For those patients with lymph node positive (stage III) disease, the recurrence rate can exceed 50% and adjuvant chemotherapy has been shown to significantly reduce the risk of recurrence. In patients without lymph node involvement (stage I and II), the prognosis is quite good with surgery alone, with survival rates of 75% to 95% at 5 years. However, some patients with high risk stage II disease have a relapse rate approaching that of stage III colon cancer patients. Due to the effectiveness of systemic chemotherapy in stage III disease, a similar approach has been considered for patients with stage II disease. We performed a systematic review looking at all randomized clinical trials evaluating stage II colon cancer patients and adjuvant therapy versus surgery alone. Our review found that adjuvant therapy -either systemic or regional chemotherapy or immunotherapy- can improve the outcomes of stage II patients. In counselling individual patients, the advice given should be conditioned by the patient's age and comorbidities. In addition, the high risk features of the tumour should also be considered when contemplating the benefits of systemic therapy in patients with stage II colon cancer. Further investigation is needed to elucidate which patient and tumour factors can be used to select stage II colon cancer patients for adjuvant therapy. There also exists a need to continue to search for other adjuvant therapies which might be more effective, shorter in duration and less toxic than those available today.

Jeffrey W Clark, Axel Grothey. UptoDate. 2012 Jan.

Relevance: 🟩🟩🟩 Strength: 🟦⬜⬜

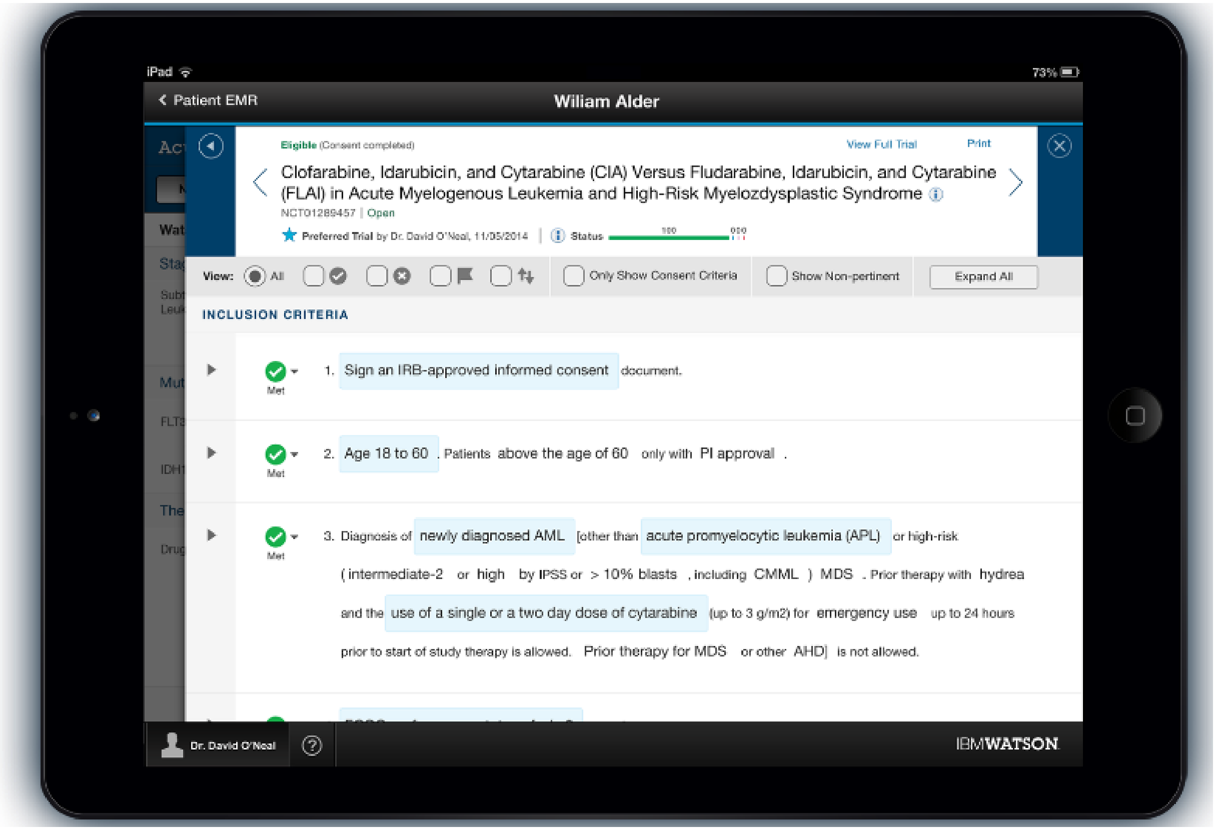
Clinical Trial Matching is being used by The Mayo Clinic to increase participation rates in clinical trials.

Business challenge:

- Clinicians have **no easy way to search across eligibility criteria** of relevant clinical trials for their patient;
- 30% of sites for clinical trials fail in enrolling even a single patient

Watson solution:

- Use patient data to **instantly check eligibility** across all relevant clinical trials


iPad
73%
Patient EMR
Wiliam Alder
Eligible (Consent completed)
View Full Trial
Print
View:
All
Only Show Consent Criteria
Show Non-pertinent
Expand All
Met
Met
Met
Dr. David O'Neal
IBMWATSON

Clofarabine, Idarubicin, and Cytarabine (CIA) Versus Fludarabine, Idarubicin, and Cytarabine (FLAI) in Acute Myelogenous Leukemia and High-Risk Myelozdysplastic Syndrome

NCT01289457 | Open

Preferred Trial by Dr. David O'Neal, 11/05/2014 | Status

INCLUSION CRITERIA

1. Sign an IRB-approved informed consent document.
2. Age 18 to 60 . Patients above the age of 60 only with PI approval .
3. Diagnosis of newly diagnosed AML [other than acute promyelocytic leukemia (APL) or high-risk (intermediate-2 or high by IPSS or > 10% blasts , including CMML) MDS . Prior therapy with hydrea and the use of a single or a two day dose of cytarabine (up to 3 g/m2) for emergency use up to 24 hours prior to start of study therapy is allowed. Prior therapy for MDS or other AHD] is not allowed.

Department of Veterans Affairs will assess Watson technology in pilot study that could benefit 8.3 million veterans requiring care each year

Challenges

- The amount of medical data doubles every three years
- Size and complexity associated with patient data in EMRs is overwhelming
- The potential of EMRs has not been realized given the discrepancies of how the data is recorded, collected and organized across healthcare systems

Success Value

Watson will make it possible for VHA physicians to interact with medical data in natural language, process millions of pages of patient information and medical literature to uncover patterns and insights, and learn from each interaction. By sifting through reams of clinical data, Watson is able to distill evidence and knowledge within seconds.

During the pilot, Watson will base clinical decisions on realistic simulations of patient encounters – pre-visit, visit and post-visit situations.

“Physicians can save valuable time finding the right information needed to care for their patients with Watson technology…A tool that can help a clinician quickly collect, combine and present information will allow them to spend more time listening and interacting with the Veteran.” –Carolyn Clancy - Interim Undersecretary for Health - VA

New York Genome Center and IBM Watson launched an initiative to accelerate a new era of genomic medicine

Challenges

As the cost of Next Generation Sequencing decreases, there will be an increase in tumor genome sequencing resulting in massive quantities of genetic data to analyze	It can take on an average from 4-6 weeks to analyze and interpret genetic data manually	Complexity of matching genetic mutations of individual's tumor with molecular targeted therapies using multiple data sources

Success Value

"With this [genomics] knowledge, doctors will be able to attack cancer and other devastating diseases with treatments that are tailored to the patient's and disease's own DNA profiles. This is a major transformation that can help improve the lives of millions of patients around the world."
– Dr. John E. Kelly, Senior Vice President, Solutions Portfolio & Research

Secured Beta testing relationships with 13 Cancer and Academic medical centers

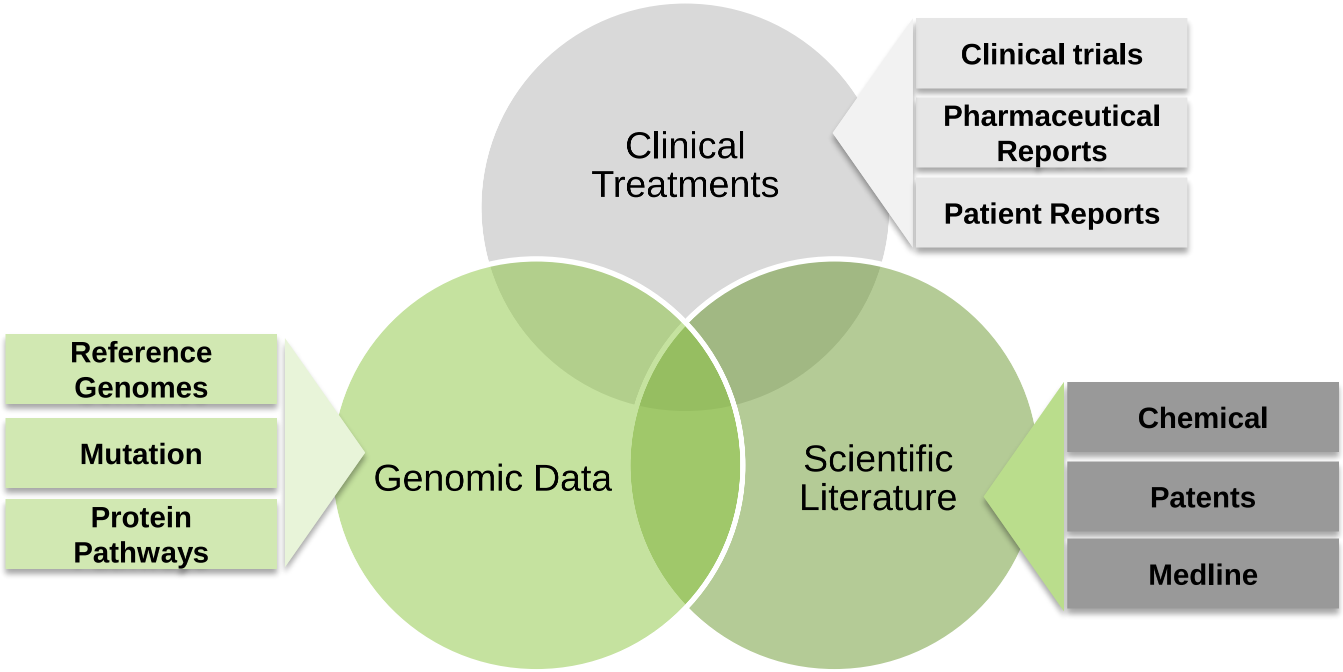
"Applying the cognitive computing power of Watson is going to revolutionize genomics and accelerate the opportunity to improve outcomes for patients with deadly diseases by providing personalized treatment."
– Robert Darnell, M.D., Ph.D., CEO, President and Scientific Director of the New York Genome Center

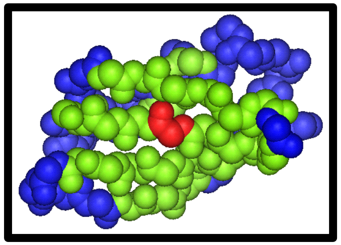
Continued growth in the amount and complexity of medical knowledge – leverage Watson to **scale expertise.**

Ingest

Learn

Test

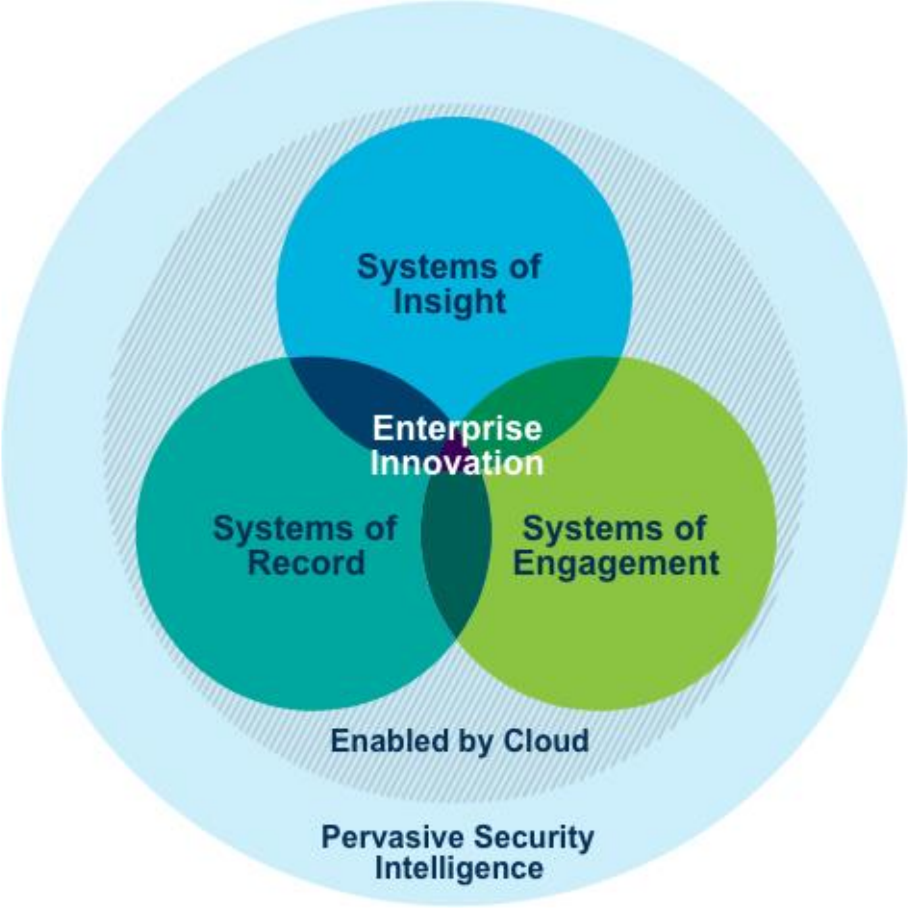

Clinical Treatments
Clinical trials
Pharmaceutical Reports
Patient Reports
Reference Genomes
Mutation
Protein Pathways
Genomic Data
Scientific Literature
Chemical
Patents
Medline



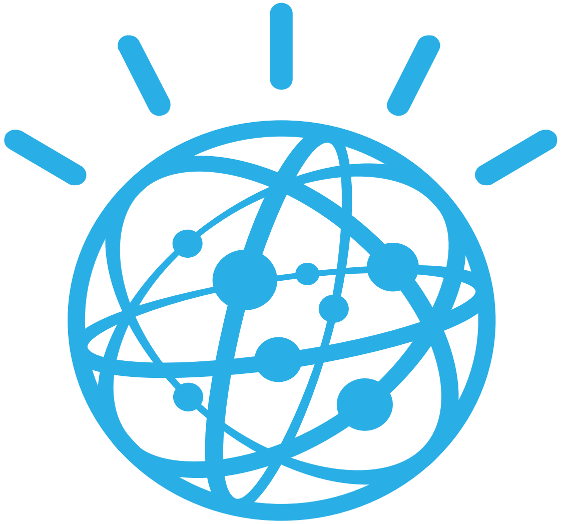
Dysfunctional Proteins &Targeted Treatments

Recap: Systems of Insight – Knowledge-driven and Data-driven – shifting clinical decision support.

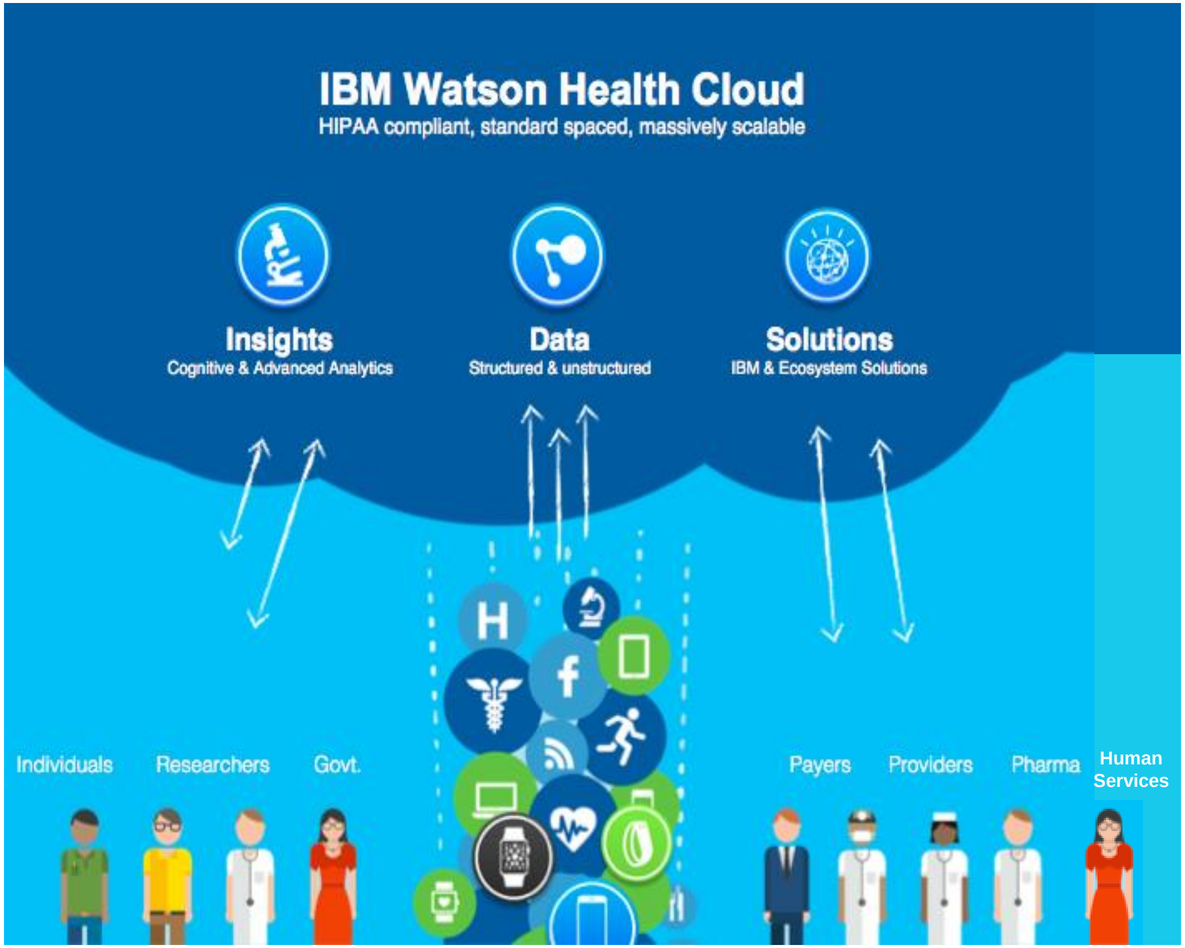
- EMR summary of Risks
- Suggestions / Actions – “doing the right things”
- EMR summary of what is missing
- Real-time best evidence
- Democratization of Knowledge
- Cognitive Computing


Systems of Insight
Enterprise Innovation
Systems of Record
Systems of Engagement
Enabled by Cloud
Pervasive Security Intelligence

Discussion



Together with our Cloud investments, we were positioned to enable IBM Watson Health

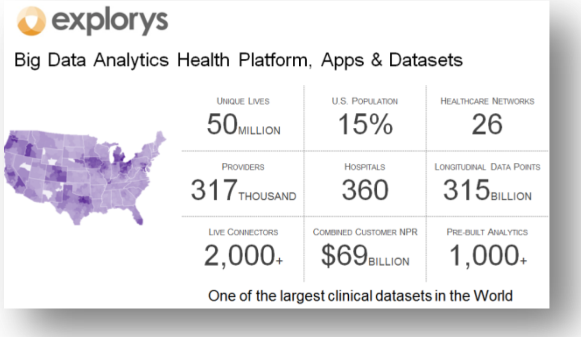

IBM Watson Health Cloud
HIPAA compliant, standard spaced, massively scalable
Insights
Cognitive & Advanced Analytics
Data
Structured & unstructured
Solutions
IBM & Ecosystem Solutions
Individuals
Researchers
Govt.
Payers
Providers
Pharma
Human Services

Health | Smarter Care | Social Programs

1. **Data** - HIPAA-enabled, standards-based, massively scalable, open repository of data on all dimensions of health
2. **Insights as a Service** providing knowledge and actionable information through advanced analytics and cognitive capabilities
3. **Solutions** from IBM and ecosystem partners improves the overall experience and increases the quality of outcomes -- where it matters and when it matters

IBM Watson Health consists of

Acquisitions

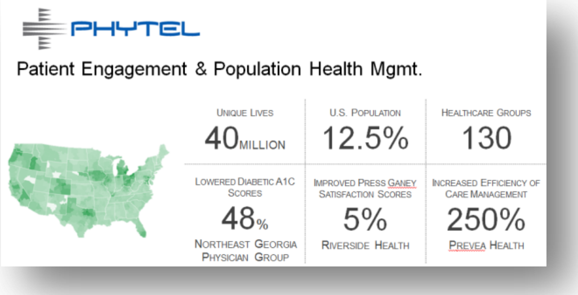


explorys

Big Data Analytics Health Platform, Apps & Datasets

UNIQUE LIVES	U.S. POPULATION	HEALTHCARE NETWORKS
50 MILLION	15%	26
PROVIDERS	HOSPITALS	LONGITUDINAL DATA POINTS
317 THOUSAND	360	315 BILLION
LIVE CONNECTORS	COMBINED CUSTOMER NPR	PRE-BUILT ANALYTICS
2,000+	$69 BILLION	1,000+

One of the largest clinical datasets in the World



PHYTEL

Patient Engagement & Population Health Mgmt.

UNIQUE LIVES	U.S. POPULATION	HEALTHCARE GROUPS
40 MILLION	12.5%	130
LOWERED DIABETIC A1C SCORES	IMPROVED PRESS GANEY SATISFACTION SCORES	INCREASED EFFICIENCY OF CARE MANAGEMENT
48%	5%	250%
NORTHEAST GEORGIA PHYSICIAN GROUP	RIVERSIDE HEALTH	PREVEA HEALTH

Partnerships

Medtronic

Johnson & Johnson

IBM organic innovation

IBM Cúram
- Smarter Care
- Social Programs

IBM Research
- Assets

Data and solutions
- Massive big data management
- Solutions for population health and patient engagement

Insights
- Population health
- Patient engagement

Insights and solutions
- Care management
- Human services delivery