

The Role of Data and Artificial Intelligence in Improving Health

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“eHealth – Transforming Healthcare in Disruptive Times”



Cognitive System Attributes

Understanding

Measured by the ability to interpret and derive actionable information and knowledge

Reasoning

Ability to link together data and knowledge elements, draw connections from information resources and solve problems using the information

Learning

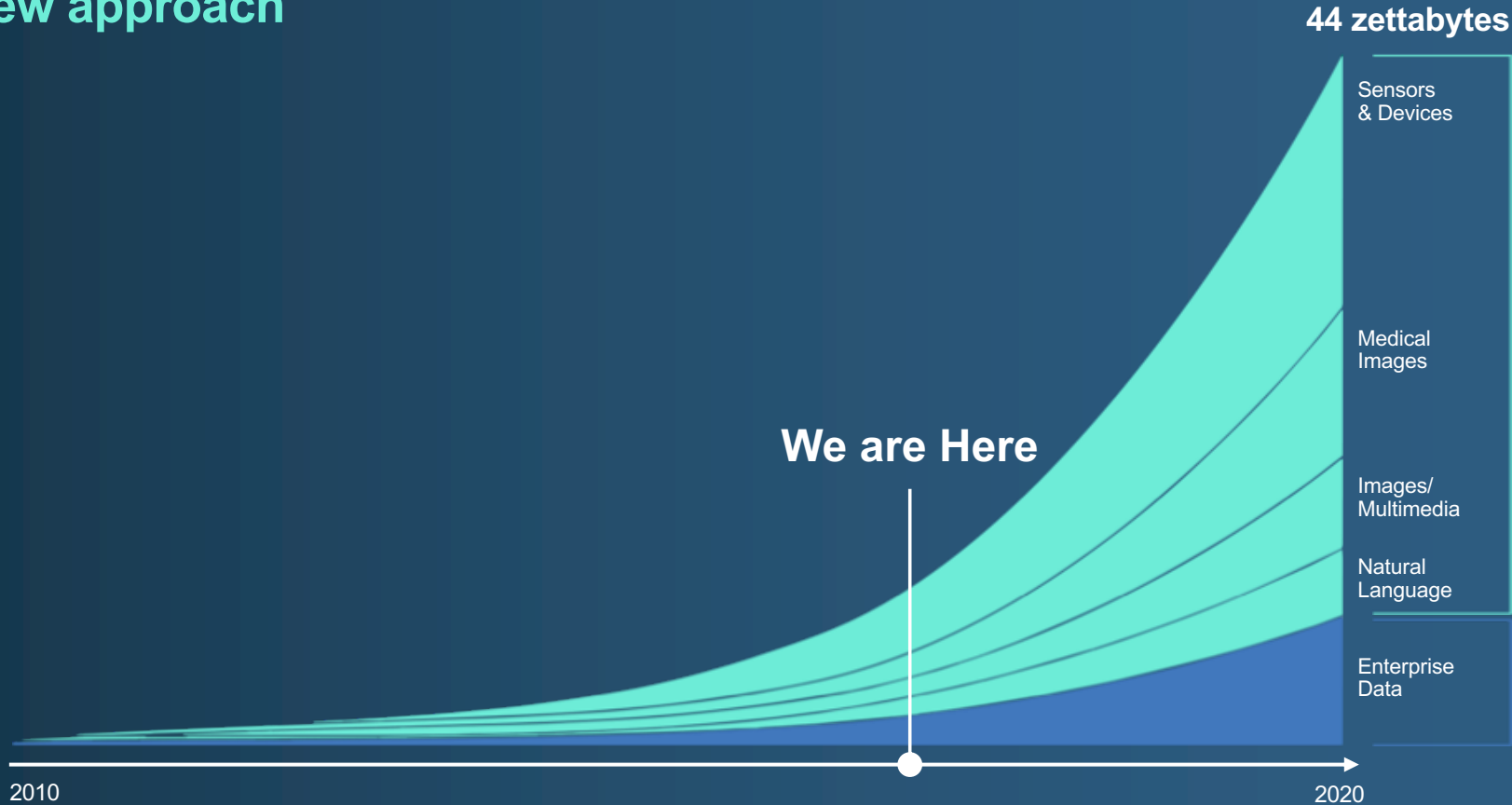
Extent the system improves over time with exposure to new data

Interacting

Recognition of and leveraging available content to fit naturally in workflow and provide interactions that work best for users



Growing data volume and complexity demands a new approach



Data Explosion and Industry Challenges Creating Opportunities for AI

Data Explosion

Medical data is expected to **double every 73 days** by 2020¹

300M books

How much health-related data each person will generate in a lifetime²

Physician shortage and burnout rising

12.9M

Expected global shortage of healthcare workers by 2035³

½ of the workday

Primary care physicians spend nearly 6 hours interacting with EHR's during and after clinic hours⁴

Medical images growing and taking valuable time

60 billion

Medical images generated in the US in 2015⁵

64 percent

Time radiologists spend on non interpretive tasks⁶

Managing vulnerable populations is essential

2 billion

The number of people over the age of 60 by 2050⁷

80 percent

Medicare beneficiaries have at least one chronic illness, with 20 percent of them having four or more⁸

Sources: 1. IBM 2 IBM. 3. WHO 4. Tethered to the EHR: Primary Care Physician Work- load Assessment Using EHR Event Log Data and Time- Motion Observations 5. Health Affairs 6. Journal of the American College of Radiology 7. WHO 8. National Center for Biotechnology Information

Our Approach: Turning Data into Actionable Insights

Data
(Public, Private, Partner)



Robust
Data
Ingestion

Unified Data
Model for
Healthcare

Reporting
Framework

Data
Publishing

Cognitive
and API
Services

Clean,
Curated
Data

Flexible
Analytics

Actionable
Insights

30+ years

healthcare information experience in making the data analytic ready

Our Approach: Leveraging the IBM Cloud for Health

Industry and process specialization



Depth of Ecosystem Collaboration



Built for Security

Enterprise Scale Cognitive Platform

Public, Private, Multimodel



Our Approach: The most AI Services in Healthcare

Applications

Annotator for Clinical Data (ACD) Evaluation Tool
Web based tool for evaluating the output of ACD annotators against sample text.
Demo | WPHN_CognitiveService

Insights for Patient Data (IPD) Demo Application
Interact with the output of the service in a visual manner with pre-loaded de-identified patient records.
Demo | WPHN_CognitiveService

Medical Insights
Medical Insights allows you to discover content which may or may not be found using a traditional keyword search. It uses a context based approach.
Prototype | WPHN_CognitiveService

Annotator for Clinical Data

Insights for Patient Data

Patient Similarity

Medical Insights

Insights for Patient Data (IPD) service APIs (sandbox)
Interact directly with the IPD service by making your own API calls to build a prototype.
Experimental | Macro | Platform | WPHN_CognitiveService

Watson™ Platform for Health service for creating and managing encryption keys to provide secure access to Watson Health Core solutions.
WPHN | WPHN_Std_Ed

The Medical Insights service provides APIs that enable you to derive insights from a corpus of medical documents. For example, the U.S. Food and Drug Administration (FDA) uses this service to identify potential drug-drug interactions.
Experimental | Macro | Platform | WPHN_CognitiveService

Terminology service 1.1
Watson™ Platform for Health service that provides translation of text into a standard healthcare terminology code.
WPHN | WPHN_Std_Ed

User Management service (UMS)
Watson™ Platform for Health service for authenticating users to the Watson Health Core and authorizing access to solutions.
WPHN | WPHN_Std_Ed

Watson Health for ResearchKit
Watson™ Platform for Health service for providing researchers with a HIPAA-enabled cloud platform for storing and managing research data.
WPHN | WPHN_Std_Ed

Tooling

File Encryption service
Watson™ Platform for Health service for encrypting and decrypting files and databases.
Foundational | WPHN | WPHN_Std_Ed


Logging, Monitoring, and Alerting service
Watson™ Platform for Health service to manage the logging, monitoring, and alerting functions for Watson Health solutions.
Foundational | WPHN | WPHN_Std_Ed

Operational Dashboard (Control Desk service)
The Watson™ Platform for Health control center UI for interacting with Watson Health Core resources.
Foundational | WPHN | WPHN_Std_Ed

Watson Platform for Health DevOps services
Service for enabling continuous delivery, and accelerating the development, testing, and deployment process.
Foundational | WPHN | WPHN_Std_Ed

Our Approach: Creating Innovative Cognitive Solutions with Watson

 <p>ONCOLOGY & GENOMICS</p>	 <p>LIFE SCIENCES</p>	 <p>GOVERNMENT HEALTH AND HUMAN SERVICES</p>	 <p>IMAGING</p>	 <p>VALUE-BASED CARE</p>
Watson for Oncology	Watson for Drug Discovery	Watson Care Manager*	Watson for Clinical Imaging	Flexible Analytics**
Watson for Genomics	Marketscan CED	Social Program Management	Patient Synopsis	Watson for Benefits
Watson for Clinical Trial Matching	IBM Clinical Development	Next Generation Program Integrity	Care Advisor	Project Gemstone
	Watson for Patient Safety			

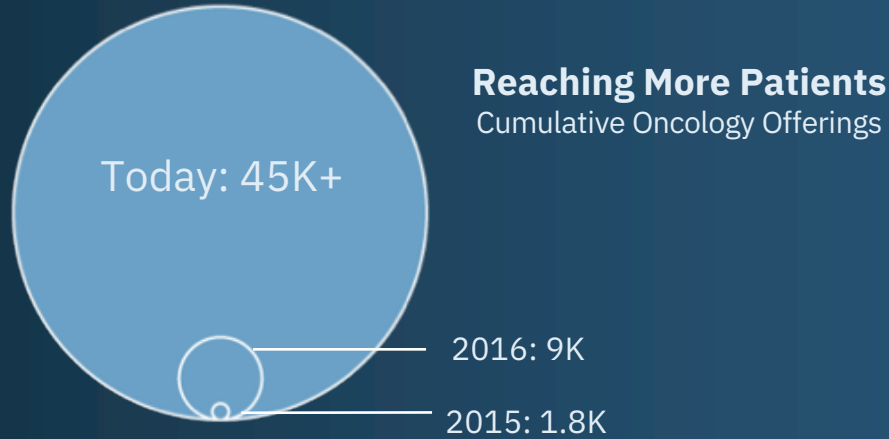
 Offerings currently available

 Offerings in development

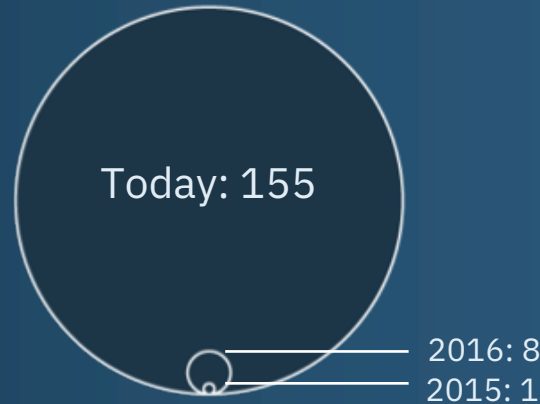
*Formerly Health and Human Services **Formerly Next Generation Payor/Provider

All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represents goals and objections only.

The Evolution of Watson in Oncology



Increased Deployment in Hospitals and Health Organizations
Cumulative Oncology Offerings



Additional Cancers Trained
Watson for Clinical Trial Matching (CTM) and Watson for Oncology (WfO)

	Breast
	Lung
	Colon
	Rectal
	Gastric
	Cervical
	Ovarian
	Prostate
	Bladder
Breast	Liver
Lung	Esophageal
Colon	Thyroid
Rectal	Endometrial

2016

Today

WFO/CTM

WFO Only

Clinical Evidence: Concordance with Watson for Oncology

The *Annals of Oncology* published a full study led by oncologists at Manipal Hospitals in India studying **Watson for Oncology's** concordance in breast cancer cases

Manipal's multidisciplinary tumor board found Watson for Oncology was concordant with their own treatment decisions in 93% of 638 breast cancer cases



93%

Treatment concordance with Manipal Hospital's multidisciplinary tumor board for breast cancer patients

S P Somashekhar, M -J Sepúlveda, S Puglielli, A D Norden, E H Shortliffe, C Rohit Kumar, A Rauthan, N Arun Kumar, P Patil, K Rhee, Y Ramya; Watson for Oncology and breast cancer treatment recommendations: agreement with an expert multidisciplinary tumor board, *Annals of Oncology*, mdx781, <https://doi.org/10.1093/annonc/mdx781>

Clinical Evidence: Operational Efficiency with Clinical Trial Matching

During a 16-week trial period, data from 2,620 visits by lung and breast care patients were processed in the **Clinical Trial Matching (CTM)** system

Watson for Clinical Trial Matching successfully demonstrated the ability to expedite patient screening for clinical trial eligibility, reducing processing time from 1 hour and 50 minutes to 24 minutes

2017 ASCO Annual Meeting. Cognitive technology addressing optimal cancer clinical trial matching and protocol feasibility in a community cancer practice. DOI: 10.1200/JCO.2017.35.15_suppl.6501 Journal of Clinical Oncology 35, no. 15_suppl (May 2017) 6501-6501. Accessed at: http://ascopubs.org/doi/abs/10.1200/JCO.2017.35.15_suppl.6501#affiliationsContainer

Increased efficiency

(Compared to manual work by a clinical trial coordinator at Highlands Oncology Group)



78%

Reduced pre-screening
wait time



94%

Omitted 94% of non-matching
patients automatically

Clinical Evidence: Concordance & Additional Treatment Recommendations with Watson for Genomics

Published in *The Oncologist*, a case study with UNC Lineberger Comprehensive Cancer Center compared the human tumor board and **Watson for Genomics'** analysis of tumor sequencing data:

1,018
patients
analyzed

Watson was
>99% accurate
in identifying tumor
board findings

Watson identified
additional options in
324 patients
(33%) of the patients

96 of whom were not
previously identified as
having an actionable
mutation¹

1: Cancer Diagnostics and Molecular Pathology: Enhancing Next-Generation Sequencing-Guided Cancer Care Through Cognitive Computing. *The Oncologist* first published on November 20, 2017; doi:10.1634/theoncologist.2017-0170. Accessed at: <http://theoncologist.alphamedpress.org/content/early/2017/11/20/theoncologist.2017-0170.full.pdf+html?sid=0703cdfd-db36-45fb-b561-a81544688384>



IBM's Data Principles

Purpose

“AI” is for augmenting intelligence, giving insights and supporting what humans do, not replacing them

Transparency

Your data is your data; transparency about how our systems are trained and the data & knowledge used to train them

Skills

AI systems are trained by humans and support human professionals, leading to “new skills” and “new collar” jobs

***“In the not too distant future not
using AI or a Decision Support
Systems will amount to
medical negligence!”***

*Demis Hassabis
Google DeepMind Founder*

Our Mission

To improve lives and give hope by delivering innovation to address the world's most pressing health challenges through data and cognitive insights



IBM

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