Big Data and Analytics In Healthcare Overview

Fueling the Journey Toward Better Outcomes

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Healthcare & Life Sciences
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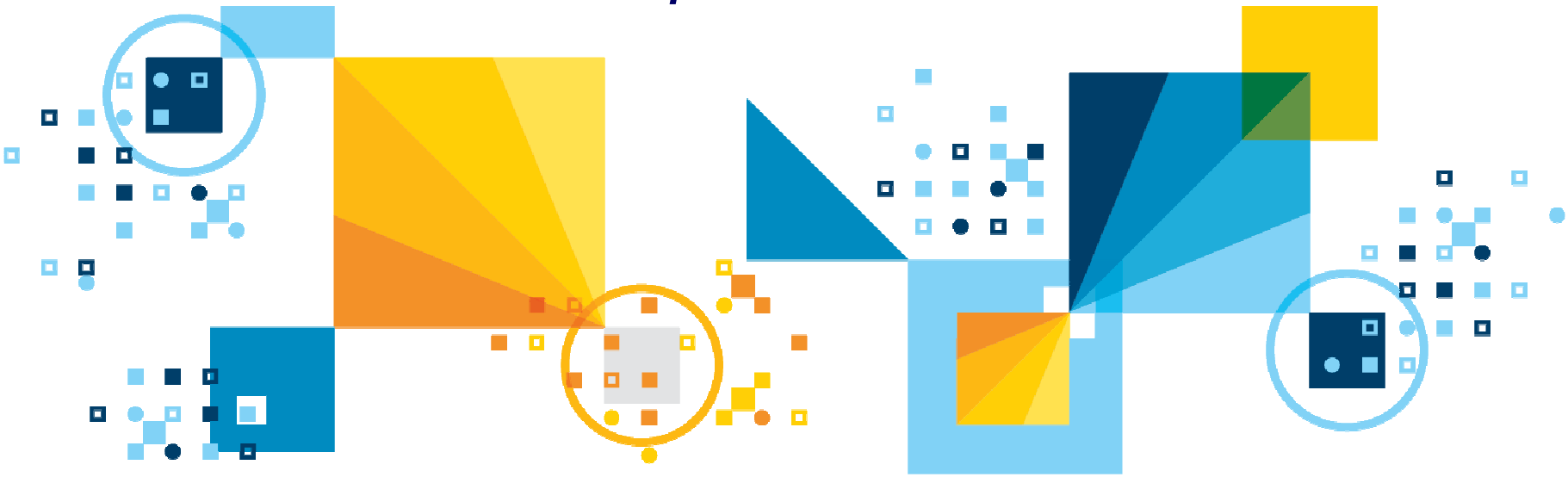


Market forces Changing Care Delivery

Care delivery evolution

Buyers of care expect greater value, improved quality and better outcomes – at a more affordable cost

17.6%

of U.S. GDP consumed by healthcare spending

4X more

people over 60 will be unable to care for themselves by 2050

Focus on the individual

Access to unprecedented amounts of data creates an opportunity for deeper insight, earlier intervention and engagement

50 million

individuals entering health insurance market by 2017

1 billion

health-related apps will be downloaded by the year 2016

Business model convergence

Increasing demand to connect healthcare and social services is driving formation of new partnerships

1/2 trillion **$**

avoidable costs with medication adherence

9 million

of 36 million deaths attributed to preventable NCDs*

*non-communicable disease

IBM's involvement in Healthcare

Buyer/Consumer of Healthcare

- 450,000 lives; $1.8B in investment
- Partner to promote innovation and value

Change agent

- Advocate for medical homes and founder of Patient Centered Primary Care Collaboration
- Healthcare standards leadership and participation in HL7 / IHE, Continua, CDISC, DICOM, ISO, OHT, OASIS, and CAQH-CORE
- Influencer to national level reform and eHealth
- IBM Research -- 600+ patents, systems thinking, Watson in Healthcare

Solution provider across the continuum

- Intersection of business and technology for Payers / Providers / Life Sciences / Devices
- Business services, process and workflow integration
- Big Data, information management and analytics
- Security, Mobility and Cloud
- Infrastructure build and optimization

Using analytics to drive consumer-centric value-based care

Healthcare Transformation

Disconnected communication among providers fuels uncertainty and imprudent behavior

A patient-centric experience drives an improved outlook and adherence to treatment

Big Data Phenomenon in Healthcare

Transactional & Application Data

Volume

- EMRs
- PACS
- Labs

Device/App Data

Velocity

- Remote Patient Monitoring
- Telemedicine
- eICU
- Quantified Self

Social Data

Variety

- Patient/Member conversations
- Health Community Blogs
- Social Media

Publications and Research

Variety

- Research Papers
- Omics analysis

Big Data offers great opportunity to better insights

With Big Data…

Hospitals

We identified & vaccinated patients at risk for meningitis within hours of the outbreak.

Finance

We reduced readmission rates by assigning a care manager to heart patients with no emergency contact on file.

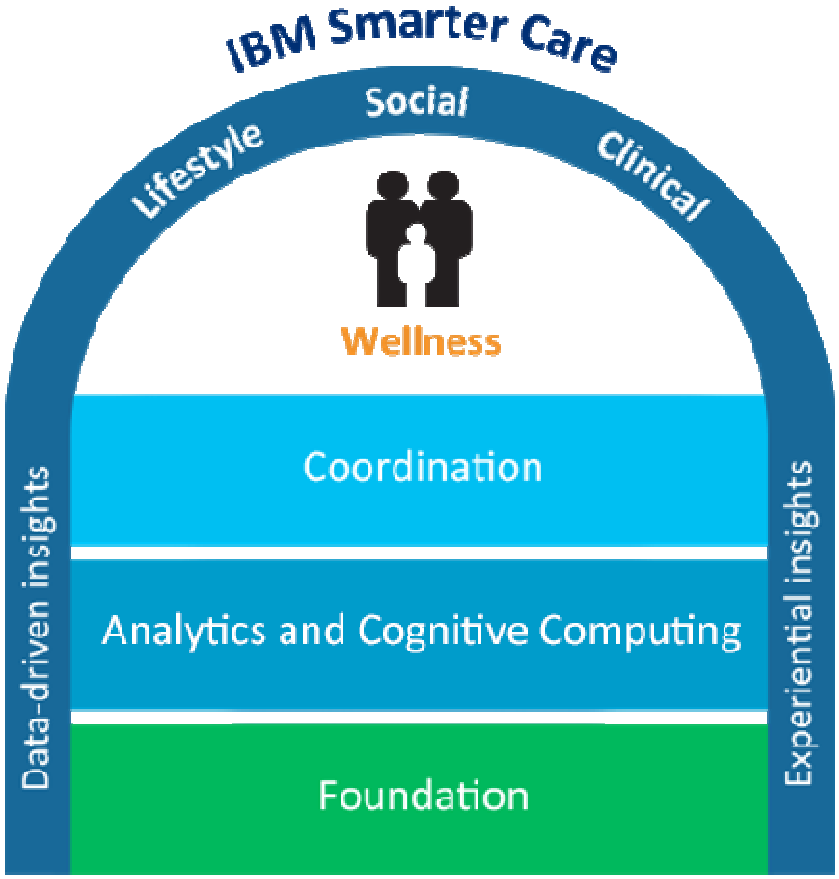
Doctors and patients

My patient's BP and sugar levels spiked, I need to get her in as soon as possible.

Hospitals & Payers

My reports show a decline in satisfaction based on sentiments expressed on our member portals.
I need to maintain a balanced member portfolio as I attract, retain and lose members over time

IBM Smarter Care uncovers valuable insights into **lifestyle choices, social determinants, clinical and financial factors** that effect the overall health of an individual …



Lifestyle

Choices have direct impact on an individual's mental and physical wellness.

Social

Demographic determinants such as where one is born, grows, lives, works and ages have direct impact on an individual's overall health, mental health and well-being.

Clinical

Factors such as specific medical symptoms, history, medications, diagnoses, etc are indicators of an individual's health.

Financial

Costs, insurance, reimbursement, incentive to modify behavior, new payment models, co-pays, etc. will pay a significant role.

IBM Smarter Care - Integrated portfolio of capabilities

Coordination

- Care identification
- Care planning
- Care collaboration
- Outcome evaluation

Analytics and Cognitive Computing

- Population analytics
- Diagnostic support
- Care pathways
- Operational reporting

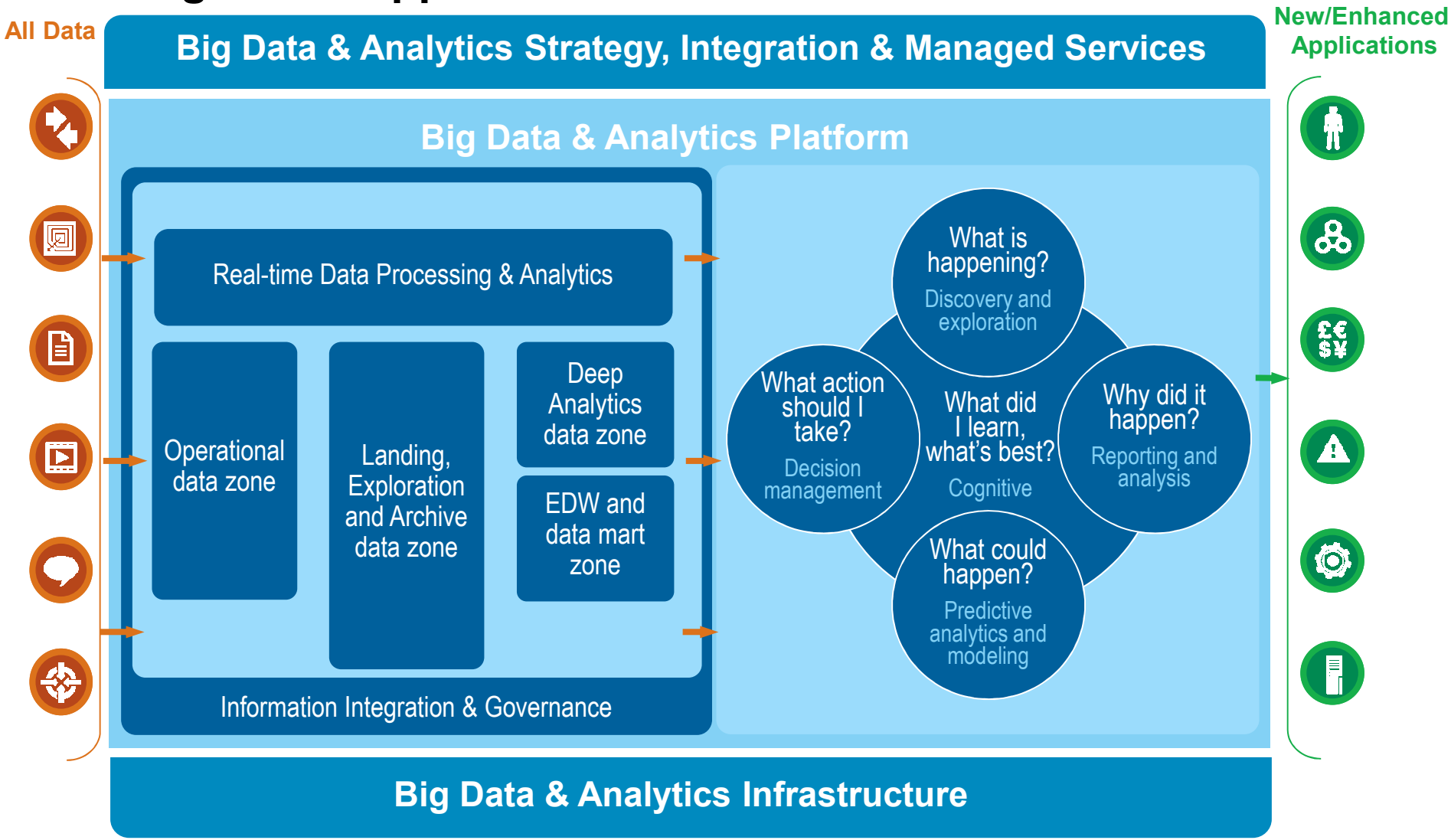
Cognitive computing

Foundation

- Data warehouse, data models, and BI platform (report & predictive)
- "Single view" customer EMPI (MDM)
- Translational Medicine
- Portals, mobile and collaboration
- Remote monitoring and medical device connectivity
- Paper and Fax capture, conversion and extraction

Comprehensive global consulting, technology, infrastructure and managed services

Big Data & Analytics capabilities required to address the challenges and opportunities

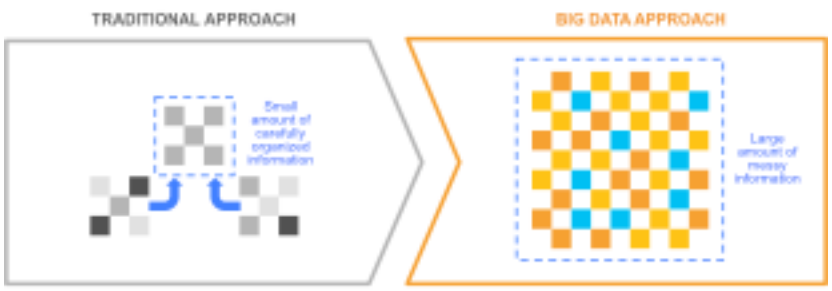


Big data creates a challenge – and an opportunity

The bigger the haystack, the clearer the needle

Look At All The Data

Look At Even Dirty Data



Let Data Lead the Way

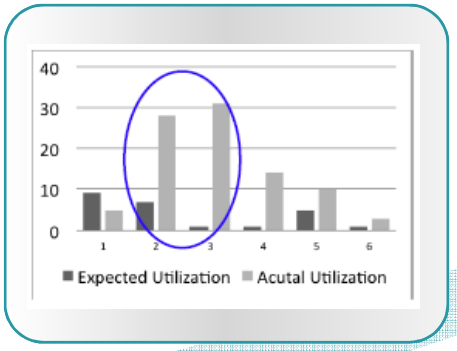
Leverage Data as it is Captured

Typical Analytic Journey

Foundational

- What happened?
- When and where?
- How much?

Advanced, Predictive



- What will happen?
- What will be the impact?

Prescriptive

- What are potential scenarios?
- What is the best course?
- How can we pre-empt and mitigate the crisis?

BI Reporting

- **Dashboards**
- **Clinical data repositories**
- **Departmental data marts**
- **Enterprise data warehouse**

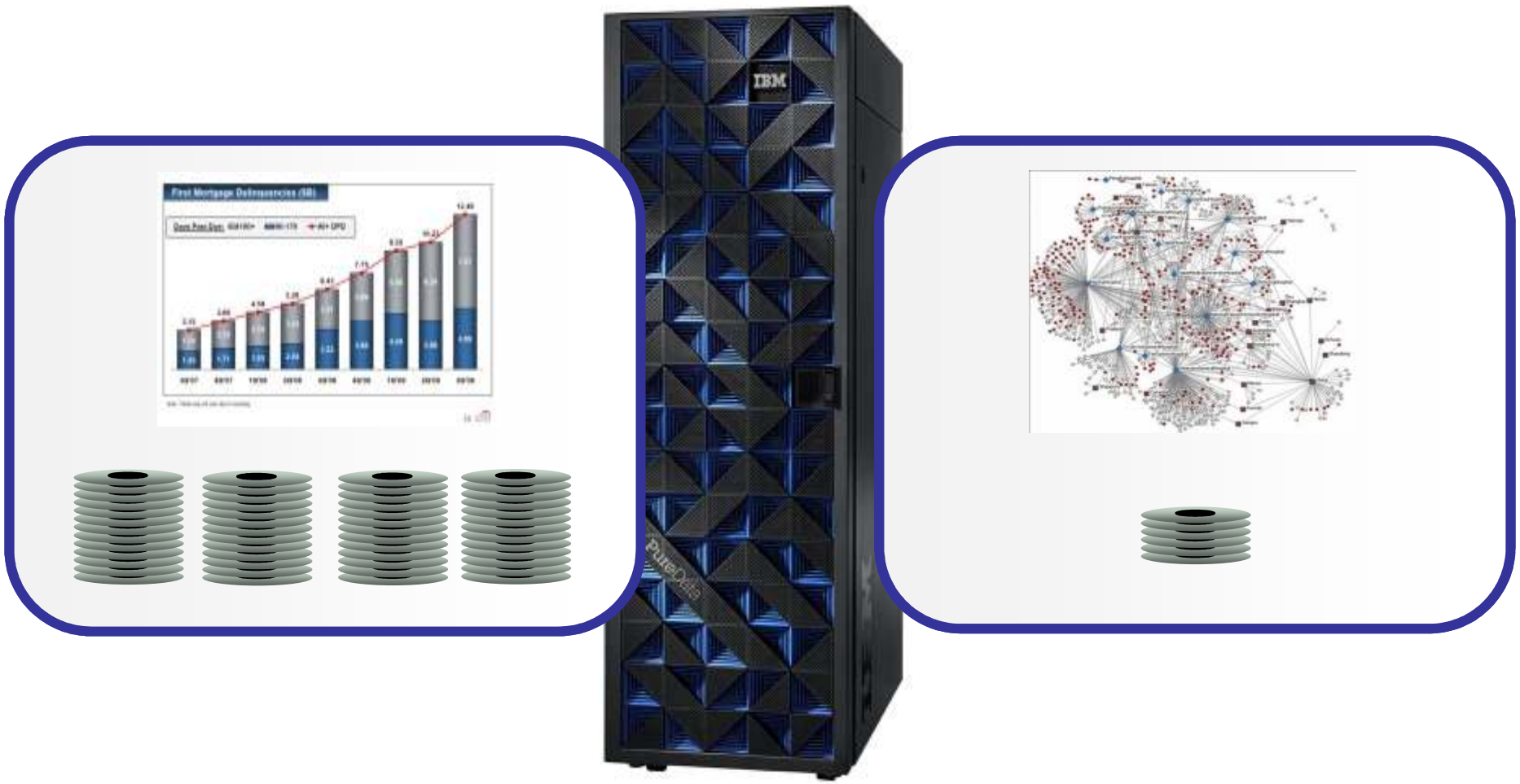
Population Analytics

- **Enterprise analytics**
- **Unstructured content analytics**
- **Outcomes analytics**
- **Evidence-based medicine**

Care Optimization

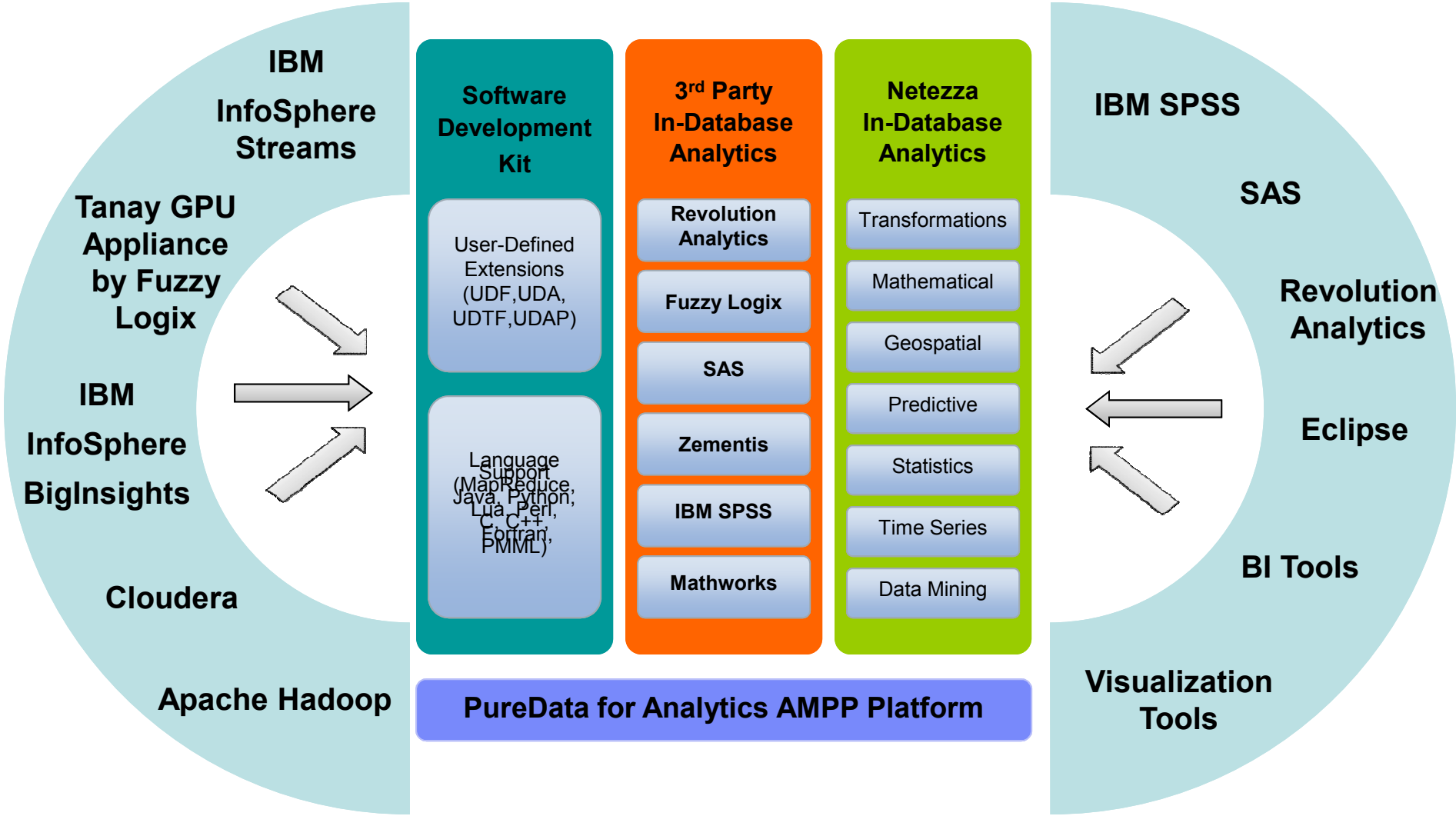
- **Streaming analytics**
- **Similarity analytics**
- **Personalized healthcare**
- **Consumer engagement**
- **Cognitive Computing**

Big Data Meets Big Math

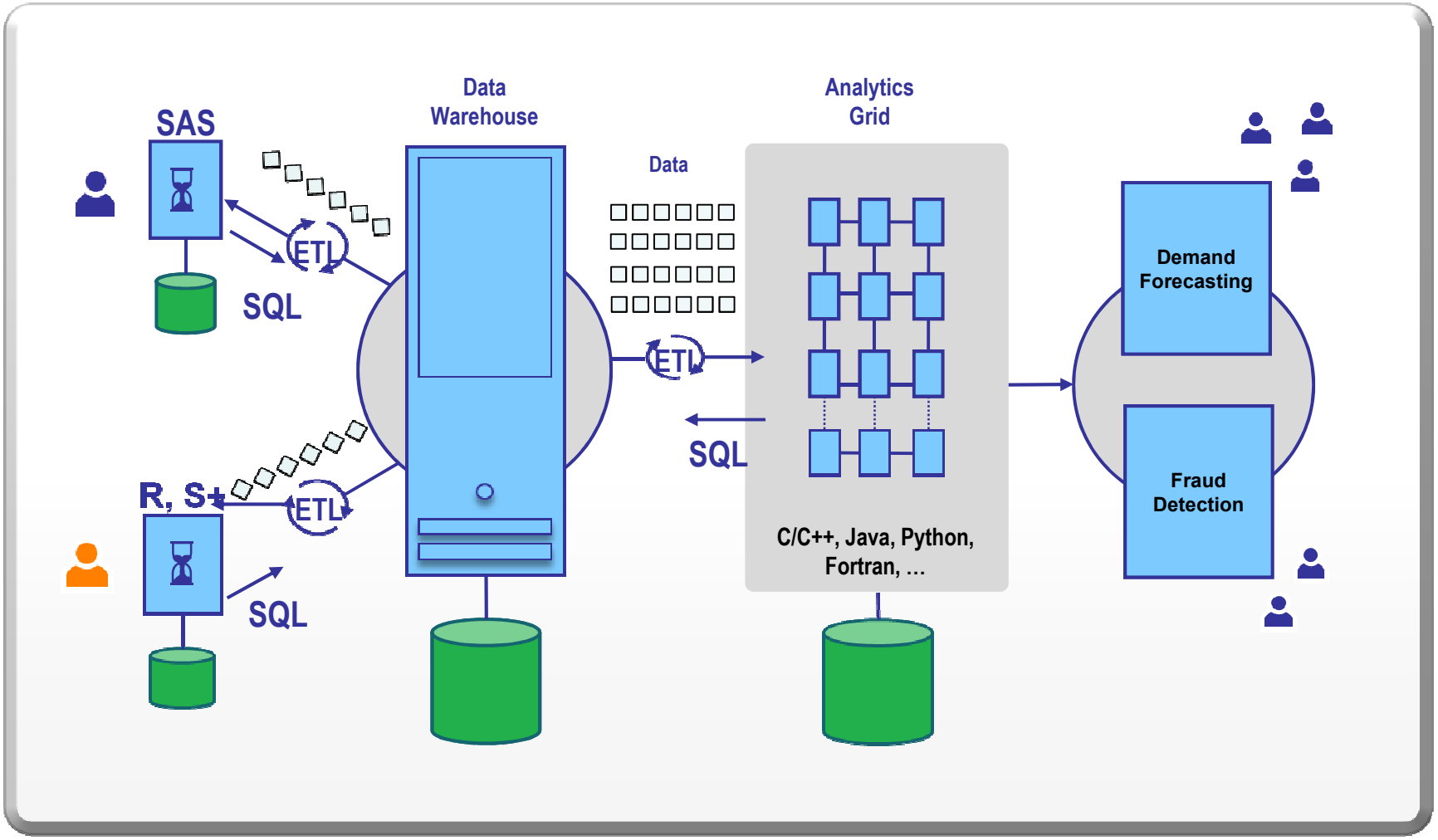


Analytics without constraint

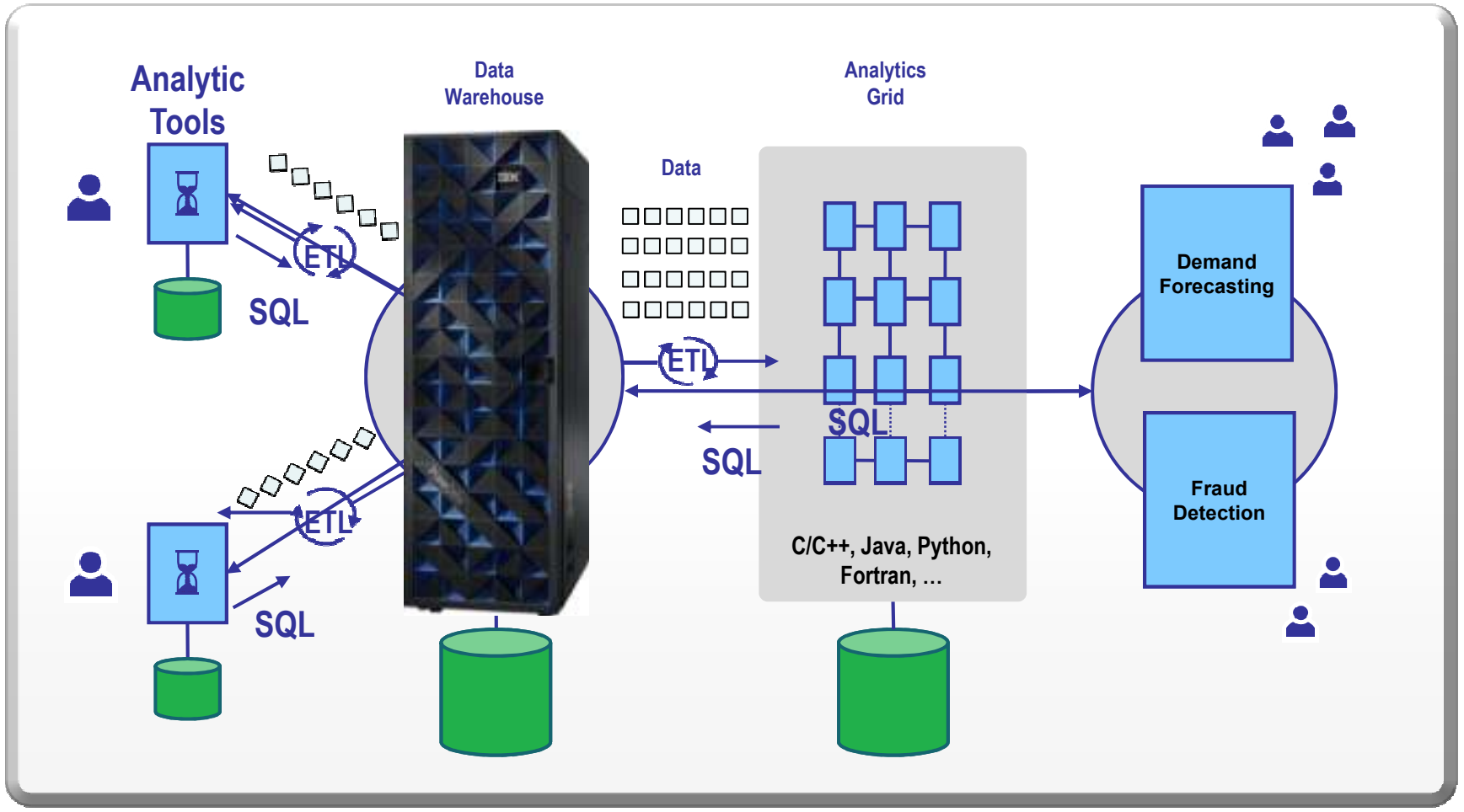
IBM PureData Analytics – Going beyond SQL



Advanced Analytics – the Traditional Way



IBM PureData For Analytics – Simplifying Serious Analytics



Key healthcare use cases for Big Data & Analytics

Health Monitoring & Intervention

How can I monitor vital changes and raise alerts for proactive intervention at the bedside and at home?

Population Health Management

How can I make targeted decisions to improve care and outcomes on my chronically ill patient population?

Consumer Insight & Engagement

How can I create a customer-focused view to enable personalized marketing and engagement strategies?

Translational Research

How can I identify the genetic basis for diseases to help clinicians provide personalized medicine?

Analytics for Care Mgmt & Transitions

How can I improve transitions of care by identifying high-risk patients and informing an alternative care plan?

Biomedical Insights, Search & Discovery

How can I accelerate data sharing in support of research, new product development and clinical trials?

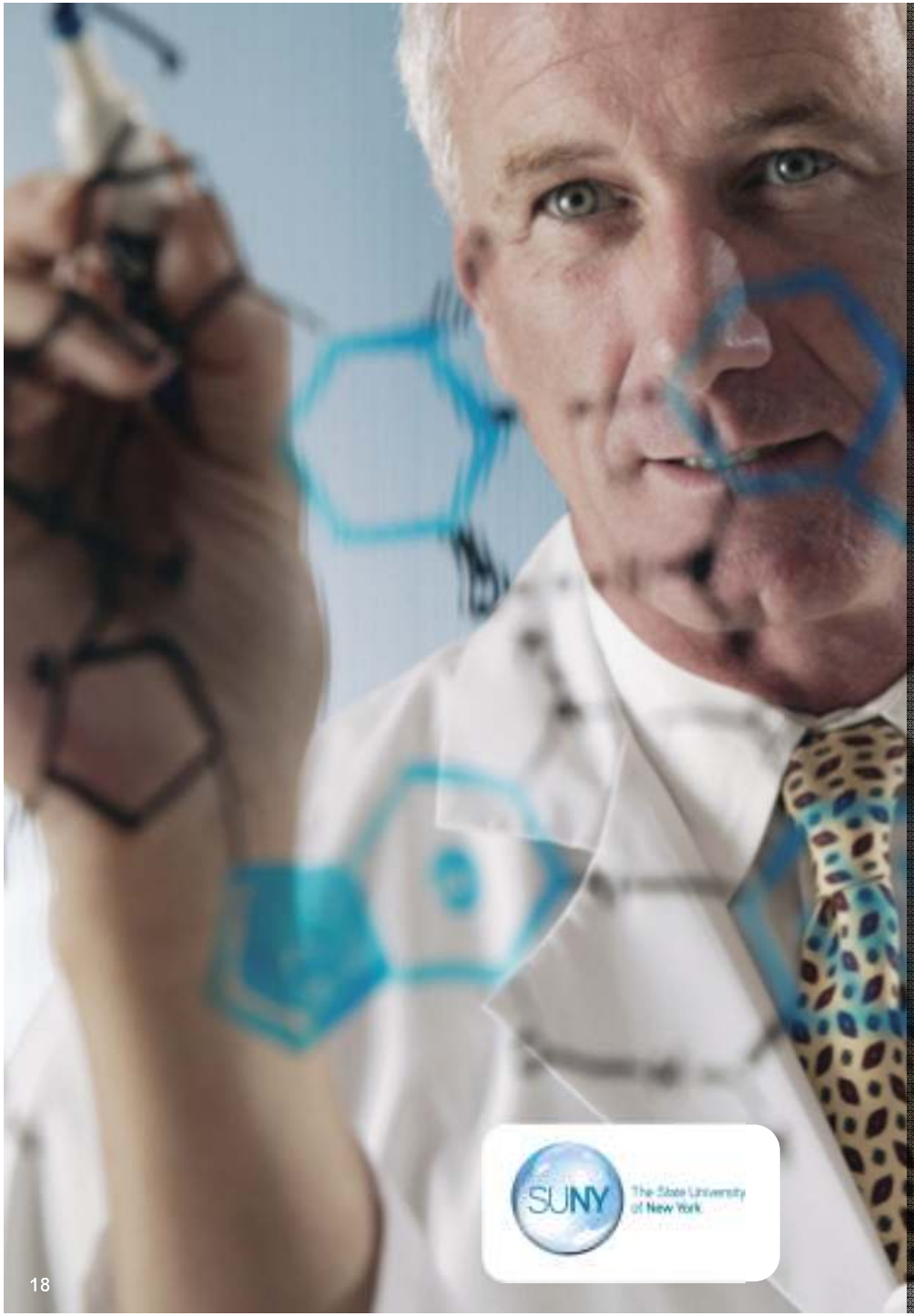
A national health insurer gives providers insight on the natural history of disease and intervention

Need

- Identify pre-diabetics and “hidden diabetics” and enable wellness companies to intervene in early stages

Benefits

- Set the standard for comprehensive disease modeling
- Identify patients 6 months to 2 years earlier by understanding physiological changes in gastrin and C-reactive proteins
- Enable targeted, early intervention programs and develop evidence-based care pathways



The State University of New York (SUNY) at Buffalo gains insights from big data to slow progression of multiple sclerosis

Need

- Researchers needed to quickly build models using a range of variable types and run them on a high-performing environment on huge data sets spanning more than 2,000 genetic and environmental factors that may contribute to multiple sclerosis (MS) symptoms

Benefits

- Able to reduce the time required to conduct analysis from 27.2 hours to 11.7 minutes
- Researchers are empowered to look for potential factors contributing to the risk of developing MS
- Read Forbes Article on this. Click here

Medical research hospital discovering connections between drugs, disease, and genetics to provide better care

Need

- Analytics platform to accelerate breakthrough translational discoveries
- Get beyond simple correlations based on diagnosis codes and SNPs
- Analytics platform to analyze large data sets of concepts vs. concepts, such as lab results, genotypes, medications, diagnosis codes, phenotypes

Benefits

- Connect genetic and phenotypic markers to health outcomes
- Understand genetic basis for disease and drug response to prevent adverse effects
- Query clinical and DNA data from 2.2M patients over 30 years from a single system

www.flickr.com/photos/agecombahia/6283387806

University of Ontario Institute of Technology (UOIT) uses big data to improve quality of care for neonatal babies

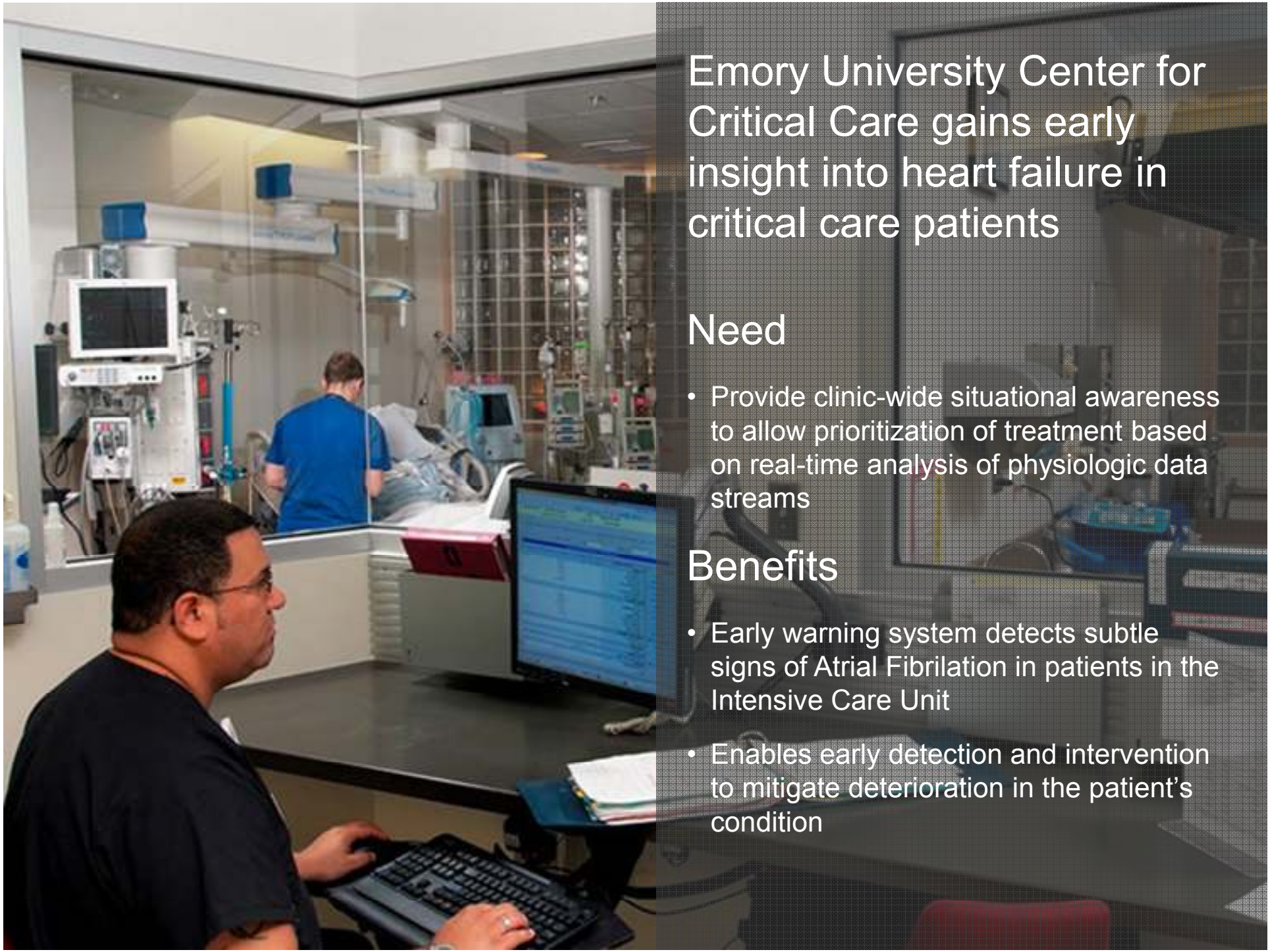
Need

- Performing real-time analytics using physiological data from neonatal babies
- Continuously correlates data from medical monitors to detect subtle changes and alert hospital staff sooner
- Early warning gives caregivers the ability to proactively deal with complications

Benefits

- Detecting life threatening conditions 24 hours sooner than symptoms exhibited
- Lower morbidity and improved patient care

UOIT
CHALLENGE INNOVATE CONNECT



Emory University Center for Critical Care gains early insight into heart failure in critical care patients

Need

- Provide clinic-wide situational awareness to allow prioritization of treatment based on real-time analysis of physiologic data streams

Benefits

- Early warning system detects subtle signs of Atrial Fibrilation in patients in the Intensive Care Unit
- Enables early detection and intervention to mitigate deterioration in the patient's condition

Healthcare provider uses PureData System for Analytics and IBM Healthcare Provider Data Model to identify gaps in care with population care management

Need

- **Risk stratify patients utilizing financial (claims), clinical (Epic and other) and other domain data to address gaps in patient care and move from fee-for-service to value based outcomes**

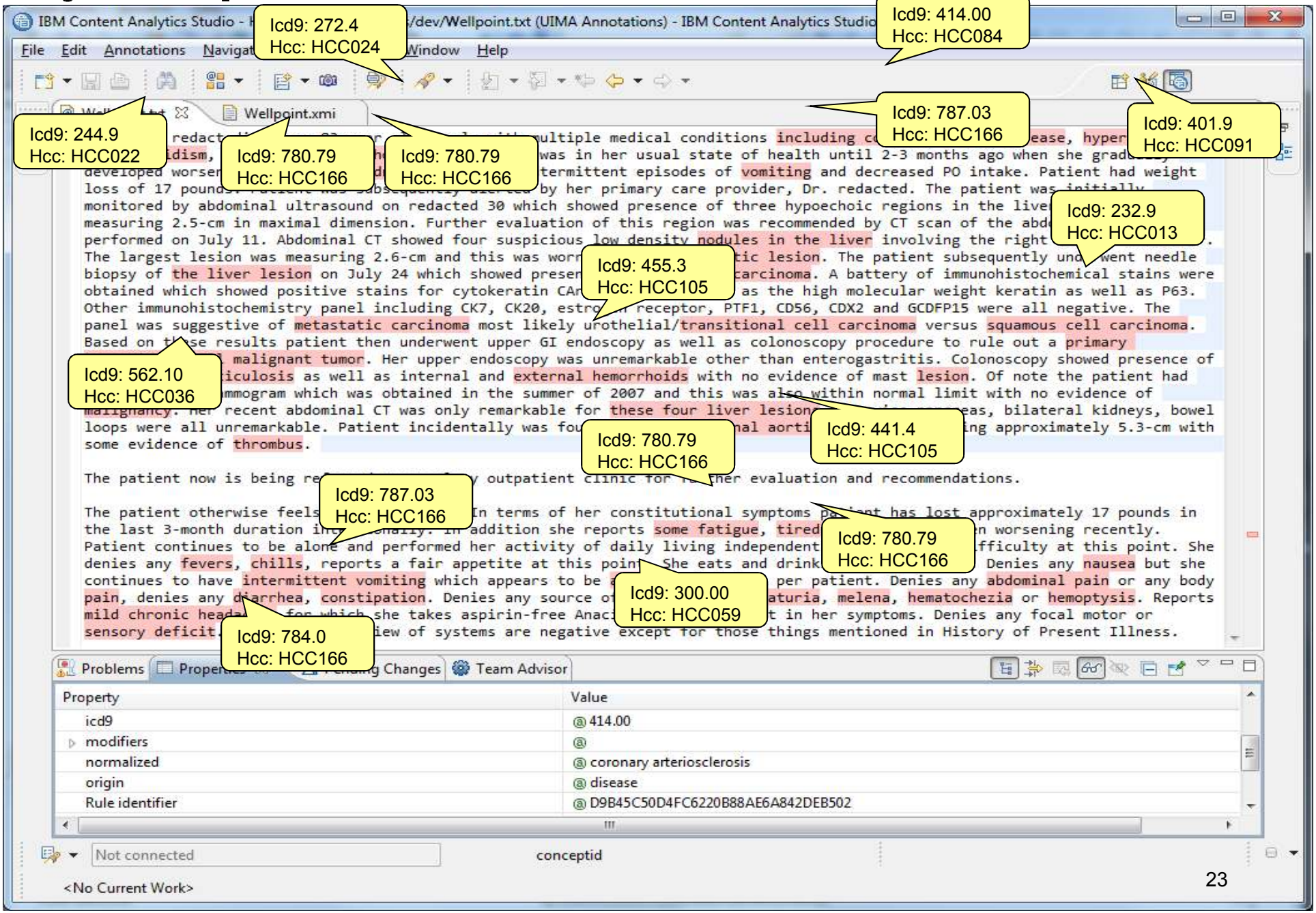
Benefits

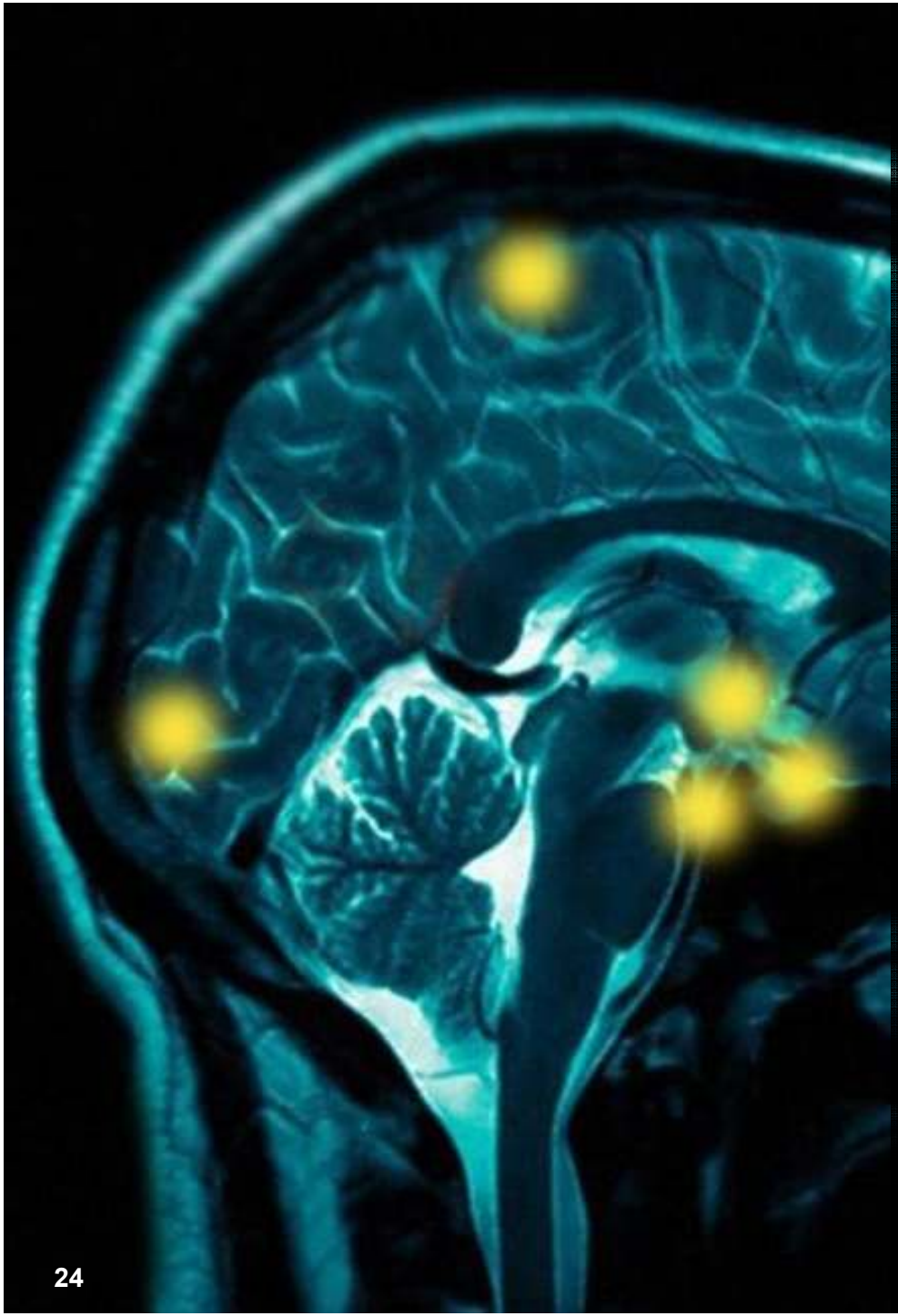
- **Provide analytics and reporting data for at-risk populations with clinical decision in batch (retrospective) and real time**
- **Perform predictive modeling to enable proactive interventions.**
- **Provide a secure, encrypted data connection to accept the minimum data transmission necessary to accomplish the request**

NLP enhancing Risk Adjusted Scoring for Medicare Advantage

Big Data & Analytics

IBM





A university medical center in the U.S. detects severe complications in brain injured patients

Capabilities Utilized

Stream Computing, IBM Research

- Collecting and analyzing more than 200 structured and unstructured data variables including EEG, blood pressure, temperature readings as well as persistent data such as lab results and patient histories
- Uncovering hidden patterns in test results that are difficult to correlate without analytics

Results

- Expects to help medical professionals detect symptoms of

Improving Cost Of Care

Goal

Proactive care-gap identification and risk stratifying population to enable providers to intervene

Challenge

- Disconnected data silos, growing data volumes
- Increasingly complex business rules making timely analysis impossible
- Time-to-action w/ 20-30 day lag delivering insights to downstream care decision support systems

Solution

- Integrated and Established unified analytic platform optimized for hypothesis driven data analytics and mixed workload
- Embedded all business rules 5K ~ 20K within big data platform as in-database routines to prevent data copying & movement (20% rules integrated in 2 weeks)
- Shifted many of the data processing steps to run within the platform including SAS data preparation steps

Benefits

- Dynamic rescoring of member population based of varying conditions and co-morbidities.
- Helping identifying and running various models for optimal “care steps” at the right price point
- MHA member search, member treatment history analysis - 500X faster
- Summarizing claims at member visit level and all claims categories – 16 hours to 2 minutes - 480X faster
- SAS process 1 hour then takes 3m23seconds - 20X faster
- Projected Claim volumes 30X scanning 11M records - 170X faster

Thank You!

For more information:

www.ibm.com/big-data/healthcare

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