
ORACLE®

ORACLE

Virtualization of R&D – How should IT and Service Vendors Respond?

Neil de Crescenzo, SVP and GM, Oracle Health Sciences

Presentation for The PRISME Forum Special Interest Group

October 17, 2011

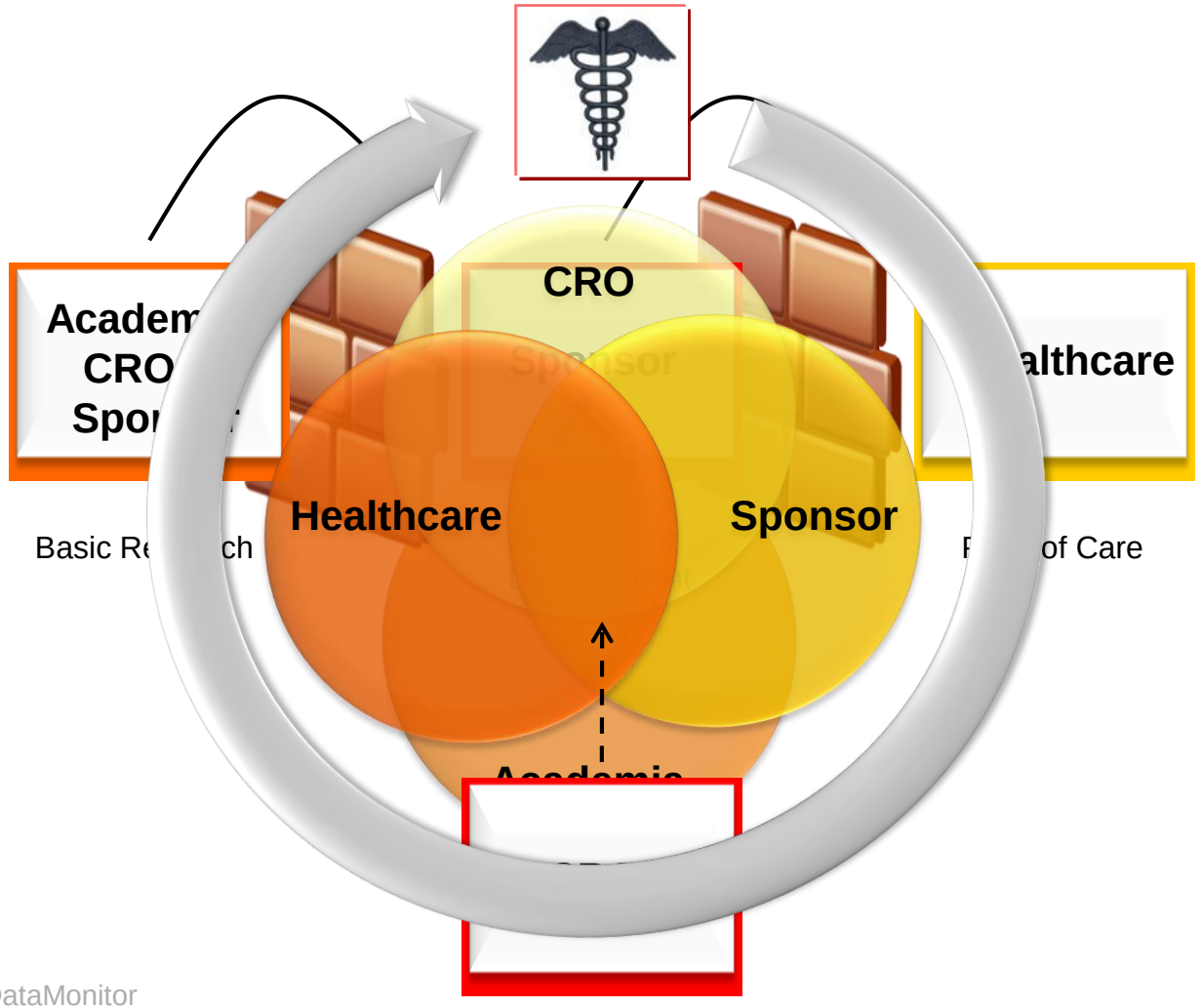
Safe Harbor Statement

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions.
The development, release, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.

Oracle co-wrote a thought leadership series on life sciences trends in 2009

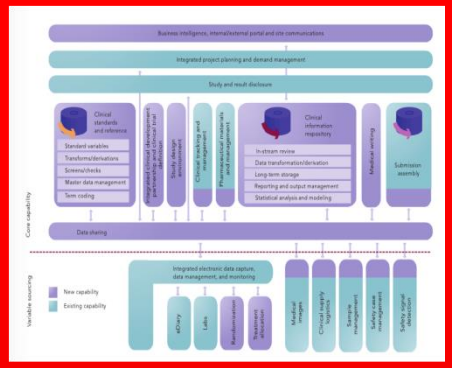
http://www.touchbriefings.com/ebooks/A1p3ok/oracle-virtual/resources/

Evolving to a networked model of clinical development and translational research/medicine



Source: adapted from DataMonitor

What should IT and service vendors do to facilitate virtualized R&D?



Build open platforms

Pistoia Alliance

PACeR

BRIDG

Liberate data and insights with open connectivity

facebook

Oracle Enterprise Cloud Summit
Solid foundation. Elastic cloud.

Build on **today's** IT paradigms

Quintiles INFOSARIO™

HCCI

MedTrust ONLINE
The AUTHORITATIVE SOURCE of MEDICAL KNOWLEDGE

These action support the new health sciences paradigm

Integrating the healthcare and life sciences ecosystems

Industry Priorities

Better and Safer Therapies | Better and Safer Care | Better Outcomes and Value | Better Access and Control

R&D Productivity

Translational Medicine

Quality & Safety

Personalized Care

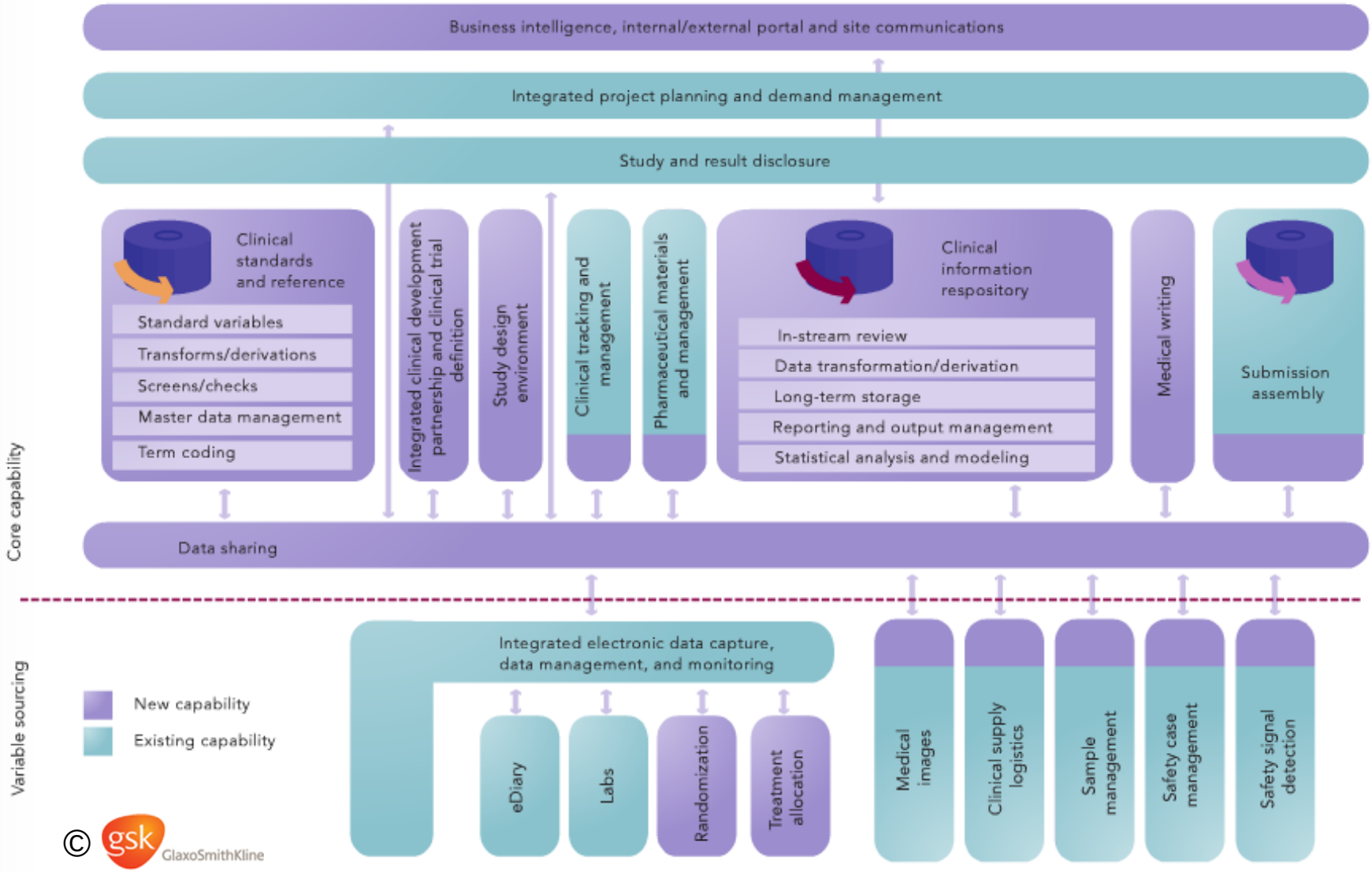
Participatory & Preventive Care

Discovery Research	Diagnostics Pharma/Biotech Medical Device Development	Clinical Research	Care Delivery	Care Management	Population/ Global Health
					

Leading to “value-based” healthcare

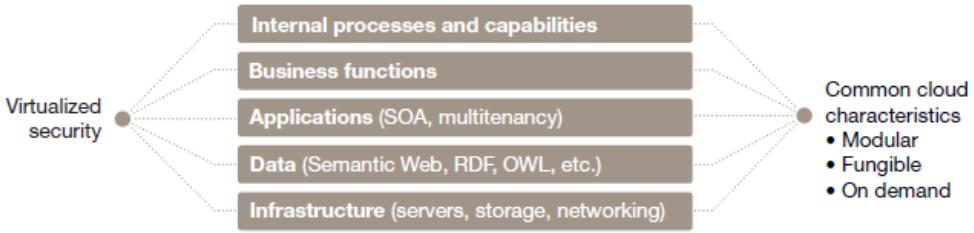
Building an open platform for Clinical Development

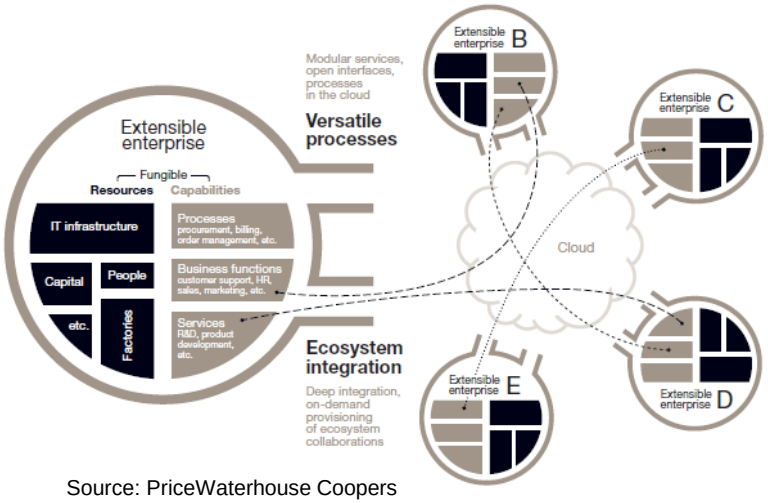
Simplified Clinical Development (SCD) at GSK



Cloud computing supports flexibility and cross-organizational collaboration

- Cloud computing spending to increase from $41 billion in 2011 to $241 billion in 2020 (*Forrester Research)*
- Growth now fueled by outsourcing business services as much as outsourced IT services
- **Moving from data exchange to integrated business processes and workflows**
- **Businesses within an ecosystem collaborate as if organizational boundaries did not exist**





Source: PriceWaterhouse Coopers

"Cloud computing represents the dawn of the extensible enterprise." *PriceWaterhouseCoopers*

Public clouds enable people, applications, and data to collaborate and develop insights

Provision Your Service. Set up a profile, get an Oracle SSO account, and configure service details.

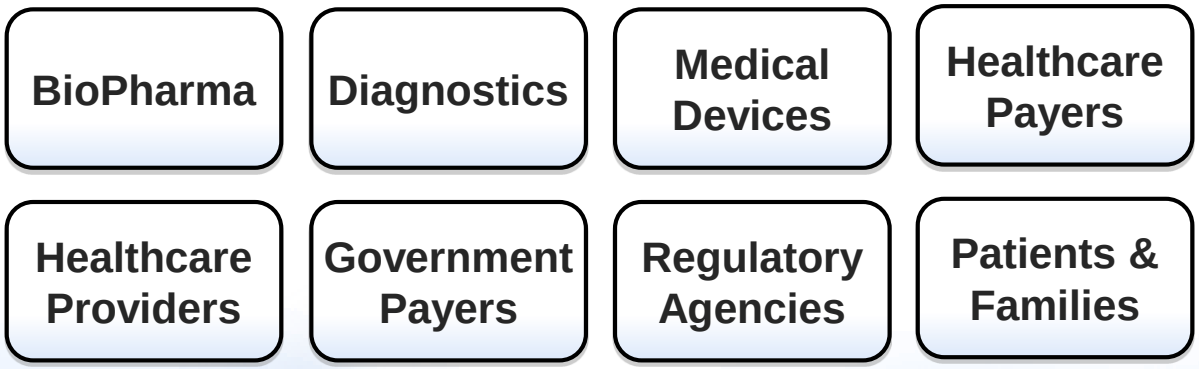
Get a Subscription. Predictable pricing, fixed monthly rates, no term obligation, and no hidden fees.

Add Users. Add administrators, developers, and end users.

Enrich with Content and Packaged Tools. Add third party content and packaged productivity apps.

Operate. Scale, monitor, configure, upgrade, or diagnose. Use our tools or your own.

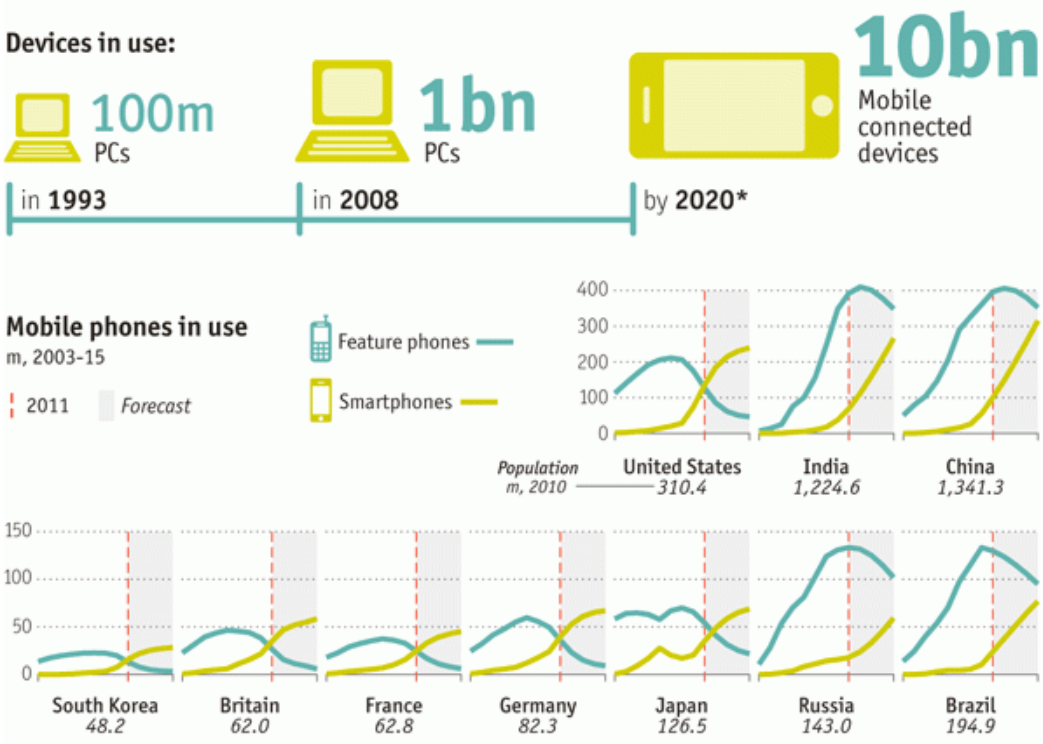
Flex-Deploy. Use a hybrid lifecycle. Your end users and code can deploy on premise or in our cloud.



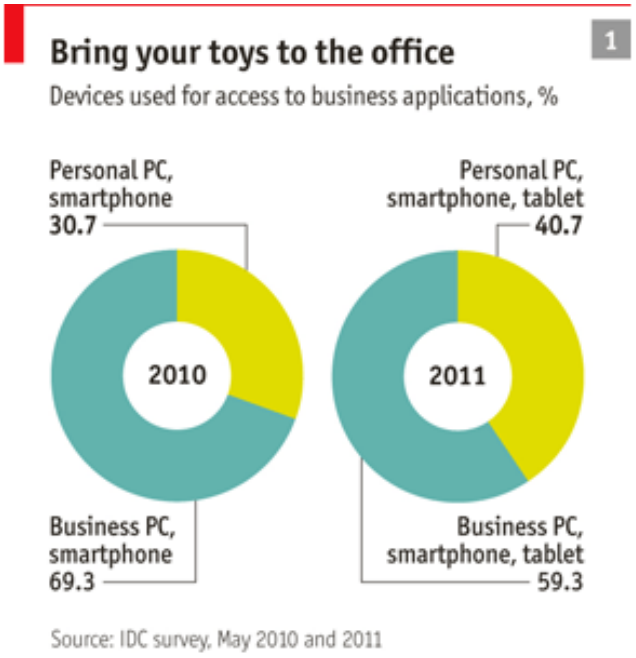
Open, standards based, flexible platforms that connect domain experts, data and applications in a regulatory-compliant framework

Source: http://cloud.oracle.com/mycloud/f?p=service:how_it_works:0

Mobile technologies and apps used “at home” are often replacing “company-approved” approaches



Sources: Cisco; Gartner; Informa Telecoms & Media; KPCB; Morgan Stanley; UN; Yankee Group; *The Economist*

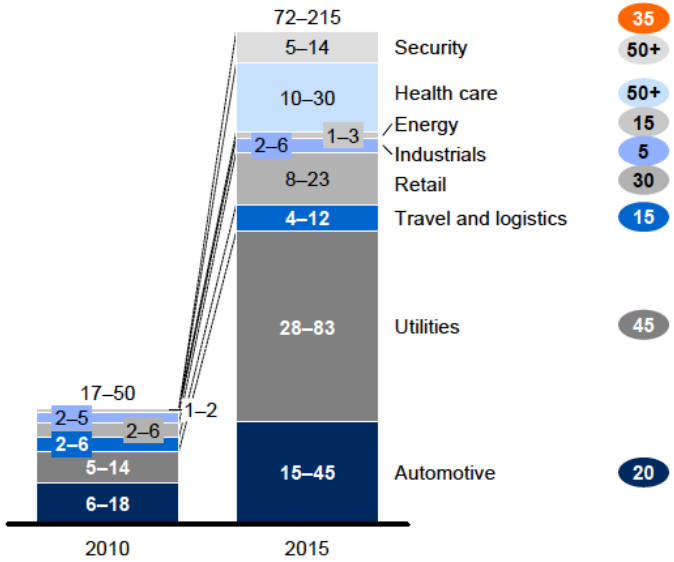


“…IT departments often greatly underestimate how much employees are using their own technology, including social networks and other web services, for work.” – *The Economist, October 8, 2011*

The “Internet of Things” is far more disruptive than just mobile communications (or the iPad)

Data generated from the Internet of Things will grow exponentially as the number of connected nodes increases

Estimated number of connected nodes
Million



Compound annual growth rate 2010–15, %

Security	35
Health care	50+
Energy	50+
Industrials	15
Retail	5
Travel and logistics	30
Utilities	15
Automotive	45
	20

NOTE: Numbers may not sum due to rounding.
SOURCE: Analyst interviews; McKinsey Global Institute analysis

- GSMA estimates 24 billion connected devices in 2020
- Discovery and insights will increasingly be fuelled by “thing-generated” data

Proteus Biomedical

- Proteus ingestible event markers (IEMs) are tiny, digestible sensors made from food ingredients.
- The IEM creates an ultra-low-power, private, digital signal detected by a microelectronic recorder configured as a small bandage style skin-patch.
- The detector date- and time-stamps, decodes, and records information such as type of drug, dose, and place of manufacture, and also measures and reports physiologic parameters such as heart rate, activity, and respiratory rate. Detector data can be combined at the server level with other telemetered parameters such as blood pressure, weight, blood glucose, and patient-generated feedback.

Sources: McKinsey Quarterly, https://www.mckinseyquarterly.com/The_Internet_of_Things_2538; Proteus Biomedical website: http://www.proteusbiomed.com/technology/

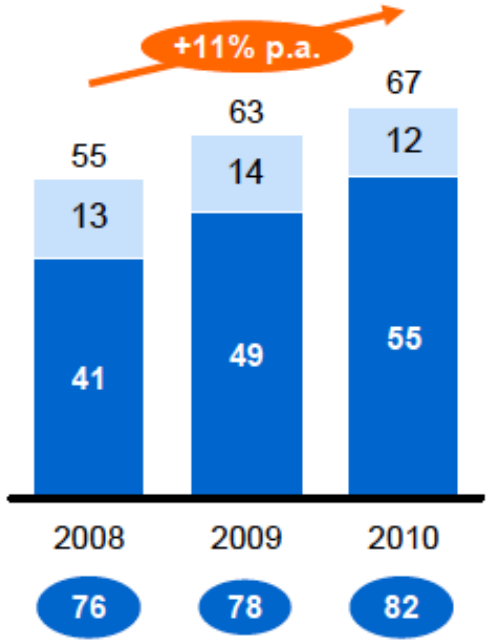
Social networks and the ubiquity of mobile communications create a new usage paradigm

The penetration of social networks is increasing online and on smartphones; frequent users are increasing as a share of total users[1]

Frequent user[2]

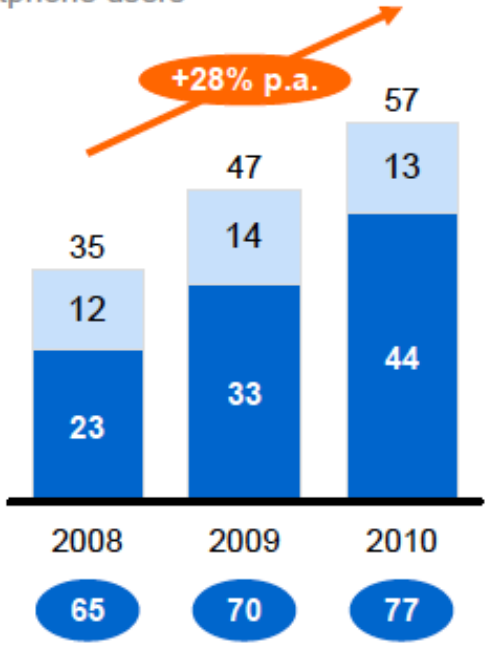
Social networking penetration on the PC is slowing, but frequent users are still increasing

% of respondents



Social networking penetration of smartphones has nearly doubled since 2008

% of smartphone users

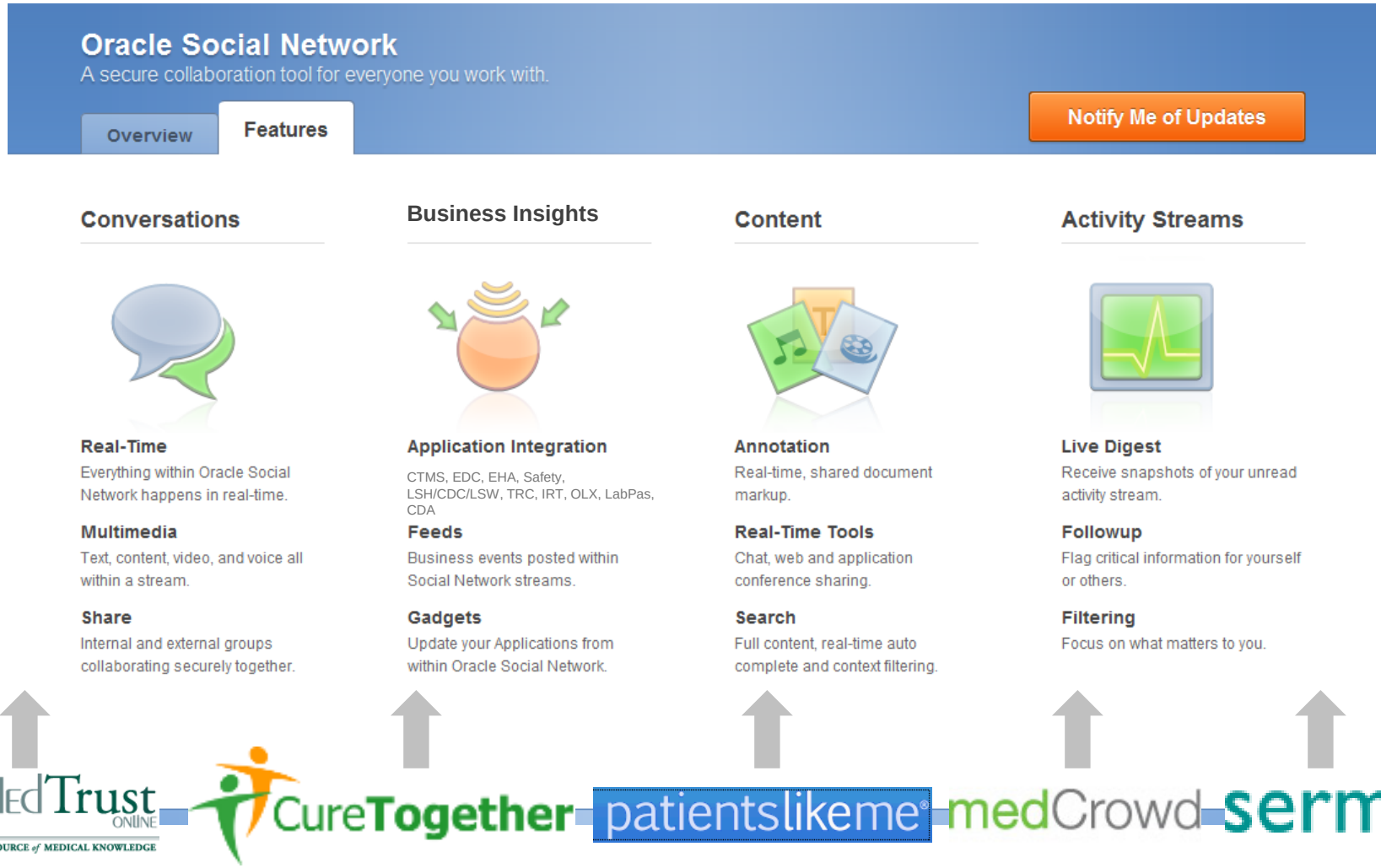


1 Based on penetration of users who browse social network sites. For consistency, we exclude Twitter-specific questions (added to survey in 2009) and location-based mobile social networks (e.g., Foursquare, added to survey in 2010).

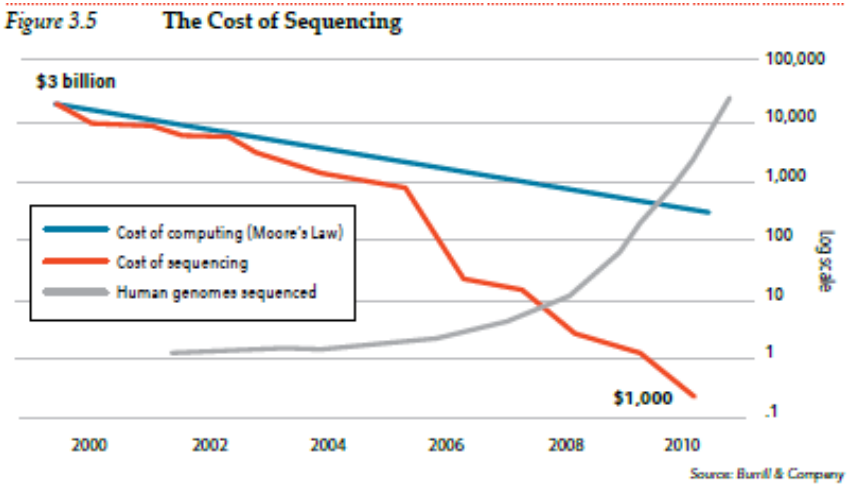
2 Frequent users defined as those that use social networking at least once a week.

SOURCE: McKinsey iConsumer Survey

Social networks will be built for professionals and institutions but connected to outside networks

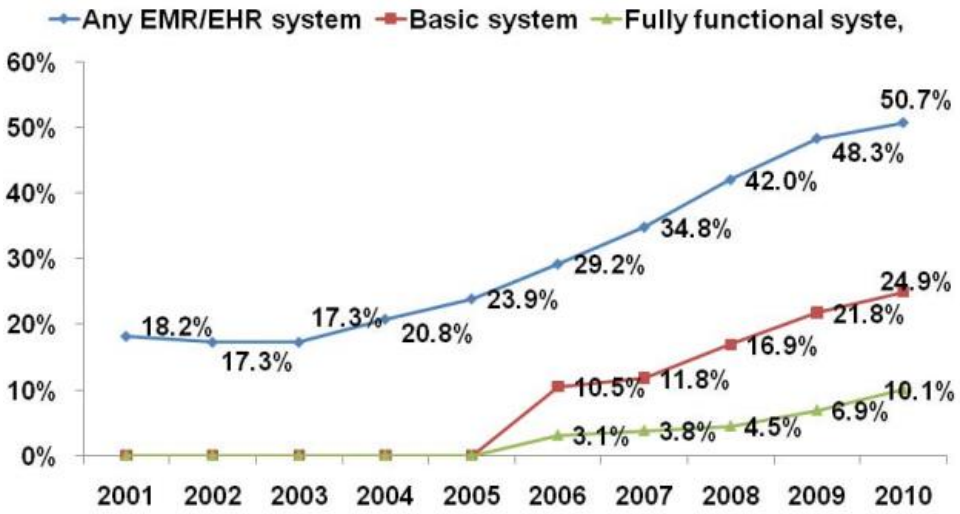


‘Omics, clinical/medical data, and imaging will drive data volumes but more importantly insights



“In the future of Pharma 3.0, data will not be contained in any single company’s central servers – it will be distributed across the ecosystem, often in semantically inconsistent formats. So real-time analytics and integration will be vital. Thoughtful algorithms are a big part of the future, both to make sense of the data and to execute actions derived from these analyses.”

Diego Miralles, Johnson & Johnson



Source: Ernst & Young Progressions 2011 report on Pharma 3.0

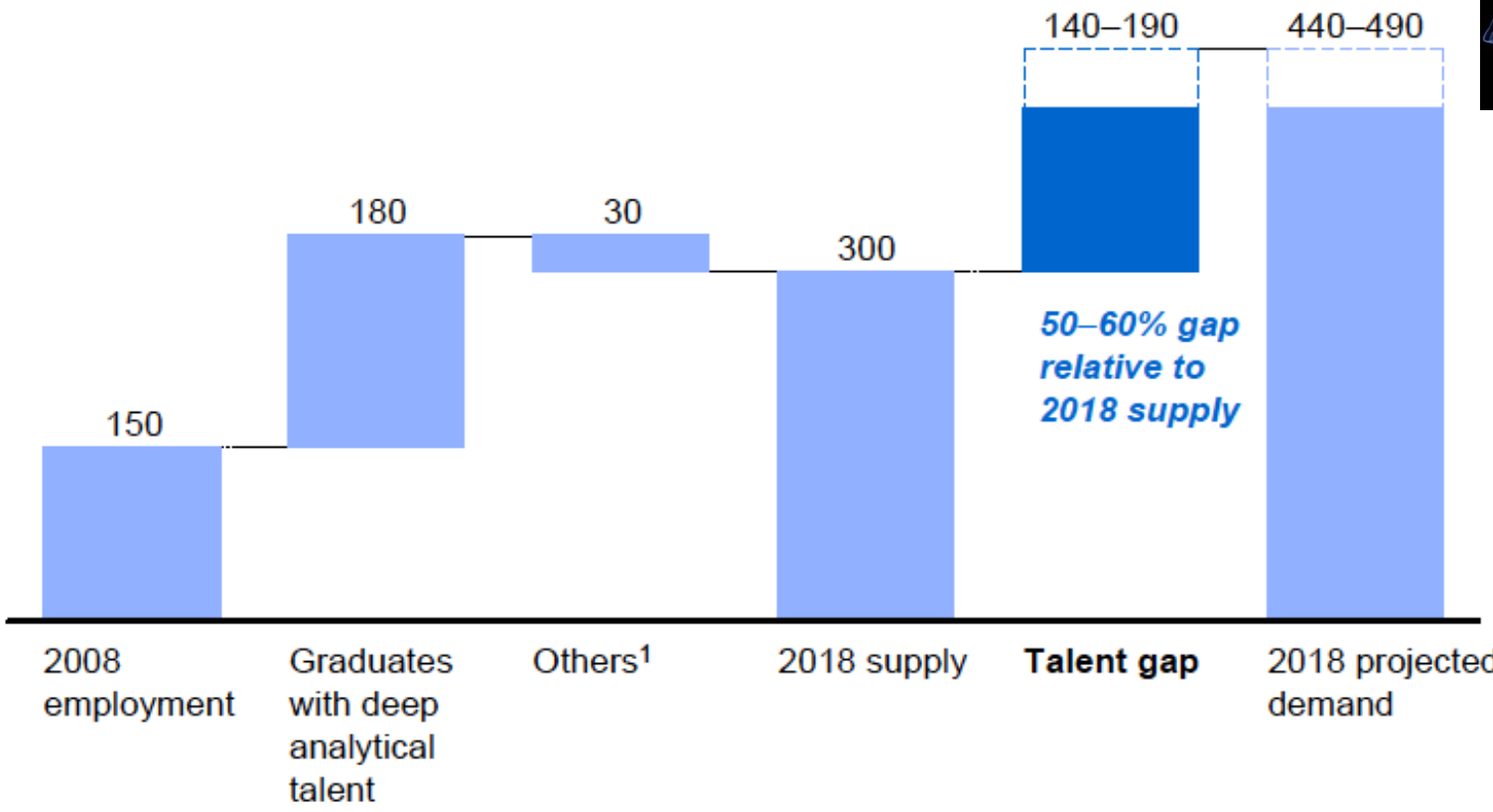
Source: CDC/NCHS – National Ambulatory Medical Care Survey. Published in Electronic Medical Record/ Electronic Health Record Systems of Office-based Physicians: United States. 2009 and Preliminary 2010 State Estimates. December 2010.

Social networks combined with insights driven by analytics will help address the analytics talent gap

Demand for deep analytical talent in the United States could be 50 to 60 percent greater than its projected supply by 2018

Supply and demand of deep analytical talent by 2018

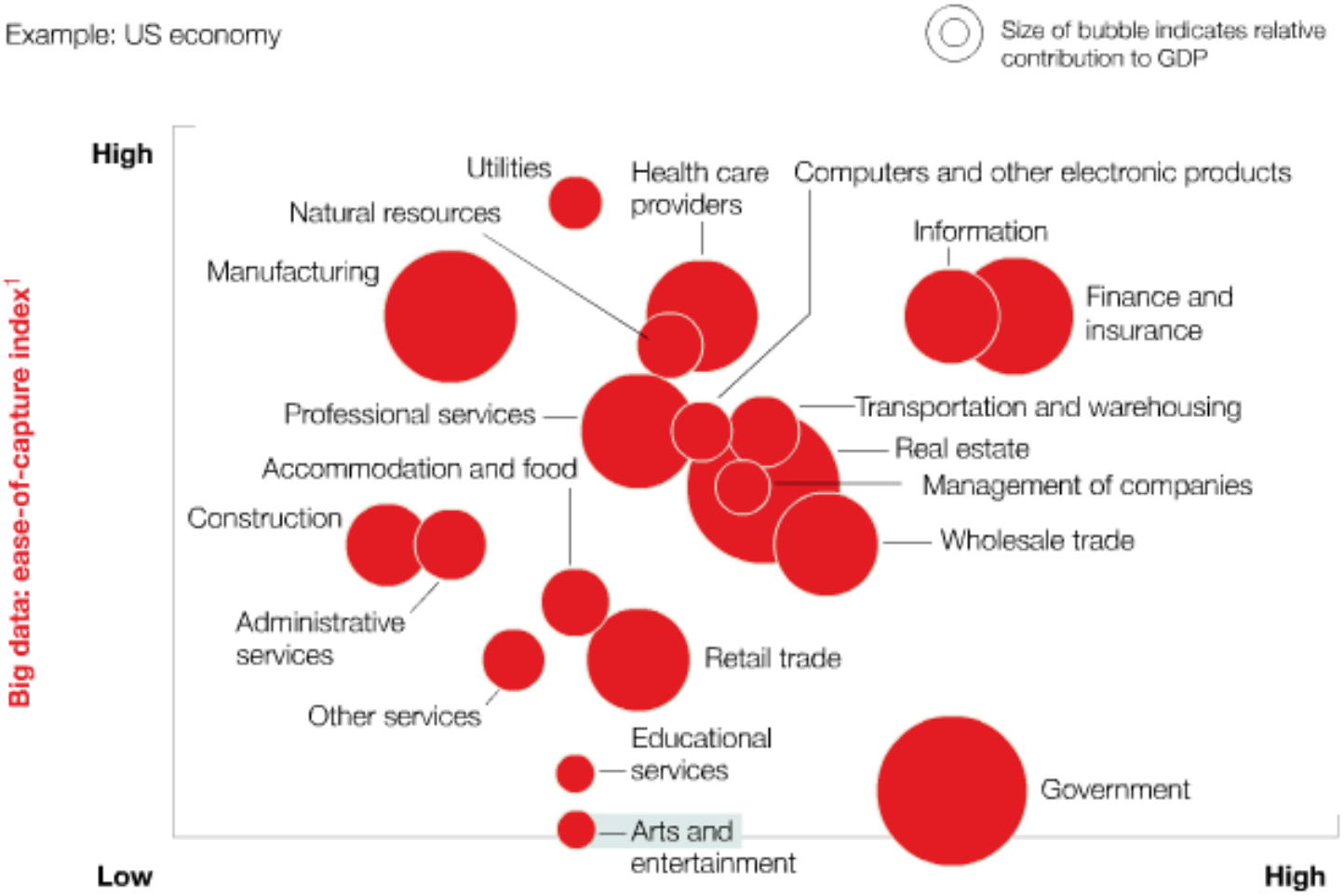
Thousand people



1 Other supply drivers include attrition (-), immigration (+), and reemploying previously unemployed deep analytical talent (+).

SOURCE: US Bureau of Labor Statistics; US Census; Dun & Bradstreet; company interviews; McKinsey Global Institute analysis

The “Internet of Things” plus extreme data volumes and heterogeneity create a “Big Data” challenge…and opportunity



Source: *McKinsey Quarterly*, https://www.mckinseyquarterly.com/Strategy/Innovation/Are_you_ready_for_the_era_of_big_data_2864#sidebar

Four data pools exist in health sciences that can be leveraged within a common data mgt infrastructure

Data pools

Pharmaceutical R&D data
- Owner: Pharmaceutical companies, academia
- Example datasets: clinical trials, high throughput screening (HTS) libraries

Clinical data
- Owners: providers
- Example datasets: electronic medical records, medical images

Integration of data pools required for major opportunities

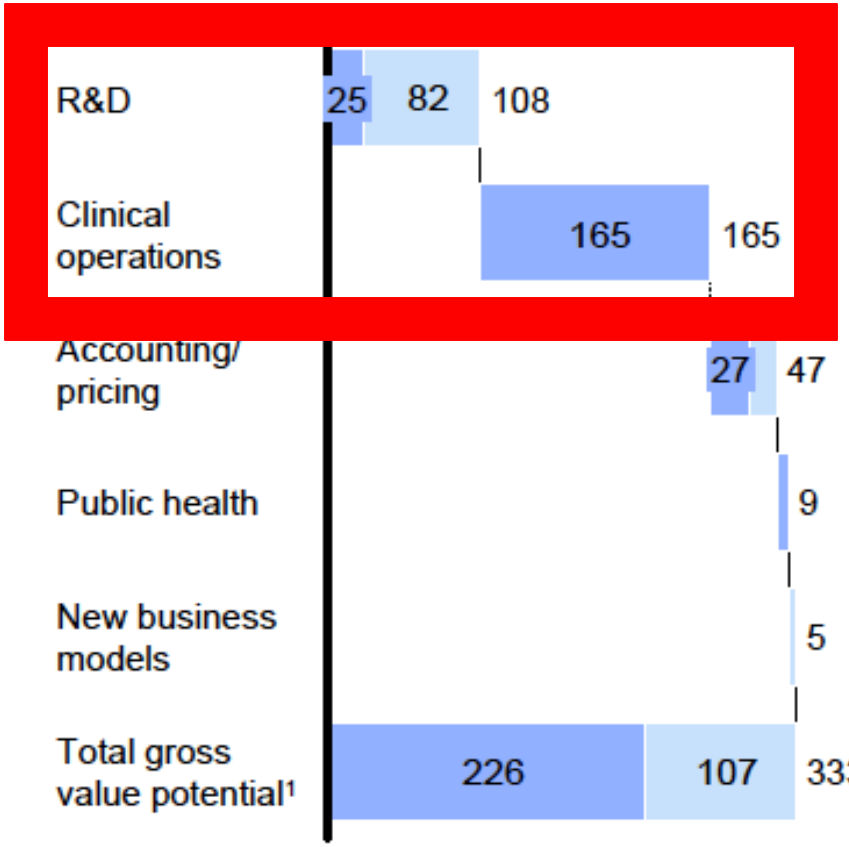
Activity (claims) and cost data
- Owners: payors, providers
- Example datasets: utilization of care, cost estimates

Patient behavior and sentiment data
- Owners: various including consumer and stakeholders outside health care (e.g., retail, apparel)
- Example data sets: patient behaviors and preferences, retail purchase history, exercise data captured in running shoes

SOURCE: McKinsey Global Institute analysis

A data mgt infrastructure across the health sciences ecosystem captures the majority of the ROI

Value potential from use of big data
$ billion per year



Lever examples

Predictive modeling to determine allocation of R&D resources, clinical trial design, and personalized medicine

Comparative effectiveness research (CER), clinical decision support system, and dashboards for transparency into clinical data

Advanced algorithms for fraud detection, performance-based drug pricing

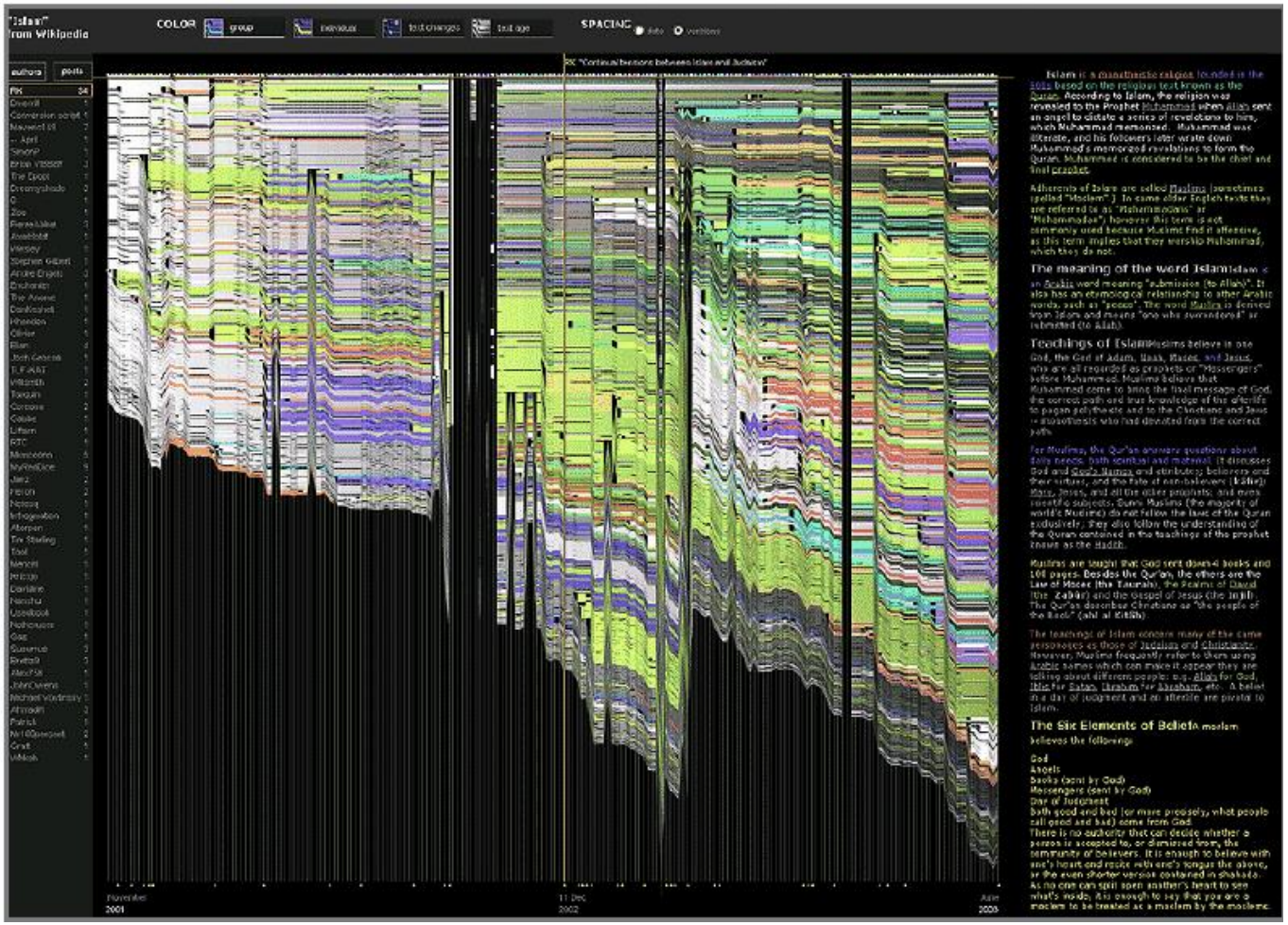
Public health surveillance and response systems

Aggregation of patient records to provide datasets and insights; online platforms and communities

1 Excluding initial IT investments (~$120 billion–$200 billion) and annual operating costs (~$20 billion per annum).

SOURCE: Expert interviews; press and literature search; McKinsey Global Institute analysis

Analytics will move from “reporting” to auto-generating insights – even for protocols…



- “History flow” visualizes the evolution of a document through time and the contribution of multiple authors.
- Time appears on the horizontal axis, while contributions are on the vertical axis; each author has a different color code and the vertical length off a bar indicates the amount of text written by each author.

Source: McKinsey Institute and Fernanda B. Viegas, Martin Wattenberg, and Kushal Dave, *Studying cooperation and conflict between authors with history flow visualizations*, CHI2004 proceedings of the SIGCHI conference on human factors in computing systems, 2004.

Communities can add value for professionals in health sciences and increasingly patients and families

MedTrust ONLINE

The AUTHORITATIVE SOURCE of MEDICAL KNOWLEDGE

- Brings together experts in oncology, information technology, computational biology, pharmaceutical drug development, and personalized medicine
- Captures, organizes, analyzes, integrates and presents most up-to-date medical facts from a vast array of sources
- Currently has a 10,000 oncologist, collaborative network
- Helps enables community physicians to practice more precise medicine for complex conditions
- Provides members with knowledge needed to treat patients with the more accurate, individualized medicine
- Goal is to provide “Knowledge Medicine” for cancer care

facebook

sermo

CureTogether

medCrowd

patientslikeme

pharmawall

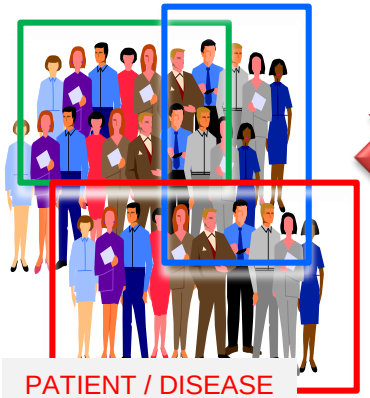
PharmaWall is a fully moderated application that allows companies to engage with Facebook® users in a regulatory-friendly social setting.

Example: Scaling Clinical Research with Oracle's Translational Research Center (TRC)

- Proactive consenting
- Sample data access
- Testing
- Data management
- Analytics/insights

NEW ADMITS

Best-Fit Treatment Options Report



PATIENT / DISEASE STRATIFICATION

PATIENTS

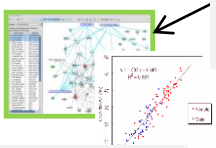
Data & Results

Clinical Data

SAMPLE COLLECTION

Sample Info

Translational Research Center



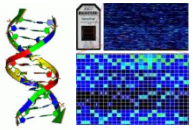
ANALYTICS

Data & Results

Sample Volumes

BIOREPOSITORY

OMICs Data



LABORATORY

Cohort Selection

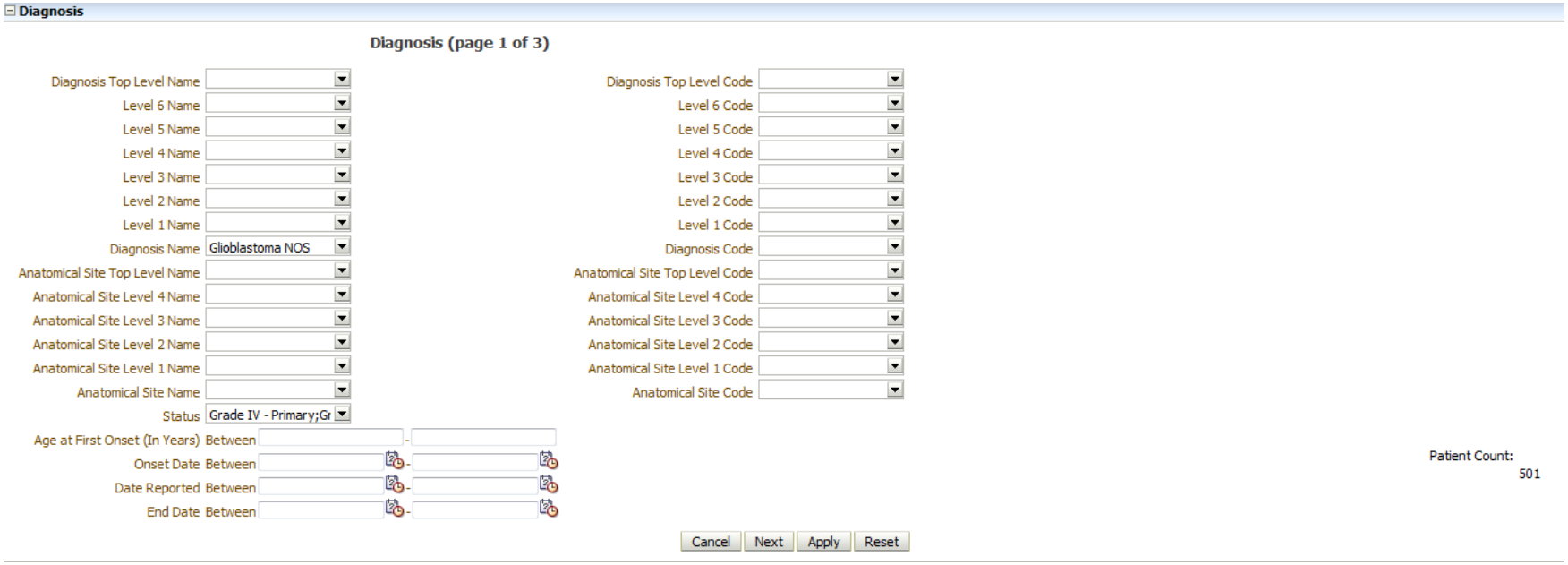
Gene expression profiling of Grade-IV Glioblastoma patients

- Select patients who
  - have consented to Complete Cancer Care (CCC)
  - have diagnosed with Grade-IV Glioblastoma
  - have specimen necrosis < 50%
  - have specimen nuclei > 80%

Cohort Selection

Gene expression profiling of Grade-IV Glioblastoma patients

- Select patients who
  - have consented to Complete Cancer Care (CCC)
  - have diagnosed with Grade-IV Glioblastoma
  - have specimen necrosis < 50%
  - have specimen nuclei > 80%



Cohort Selection

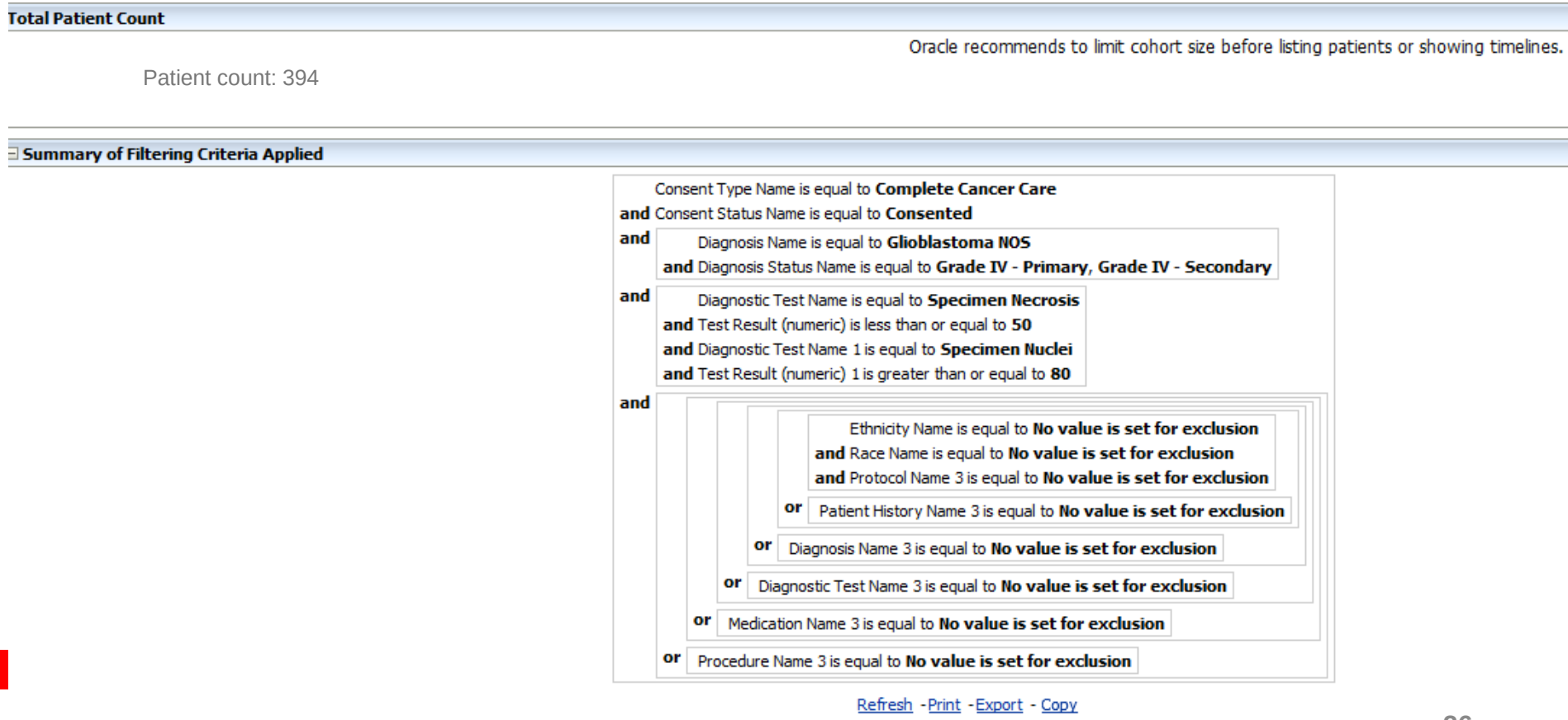
Gene expression profiling of Grade-IV Glioblastoma patients

- Select patients who
  - have consented to Complete Cancer Care (CCC)
  - have diagnosed with Grade-IV Glioblastoma
  - have specimen necrosis < 50%
  - have specimen nuclei > 80%

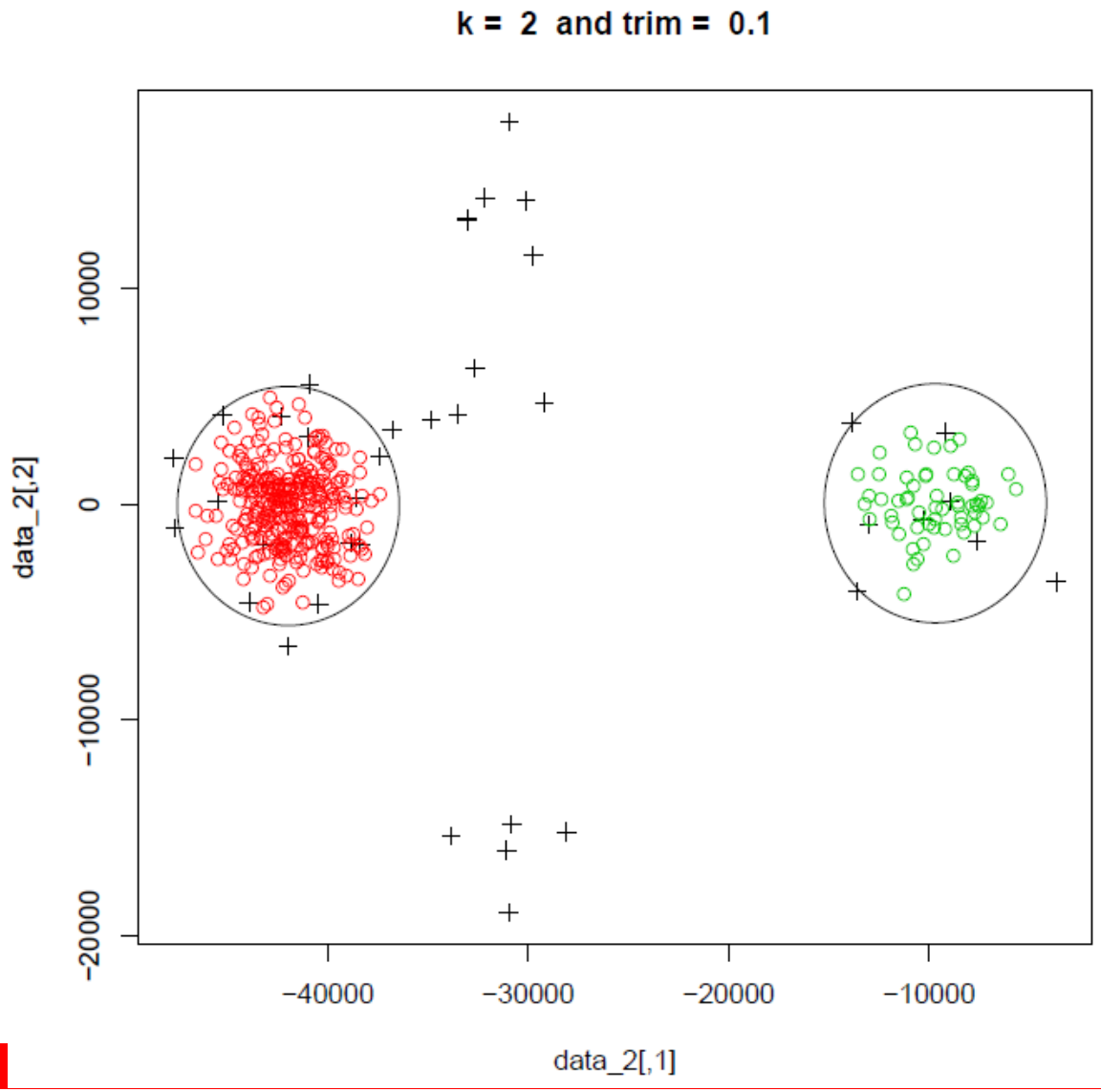
Cohort Selection and Exporting the Results

Gene expression profiling of Grade-IV Glioblastoma patients

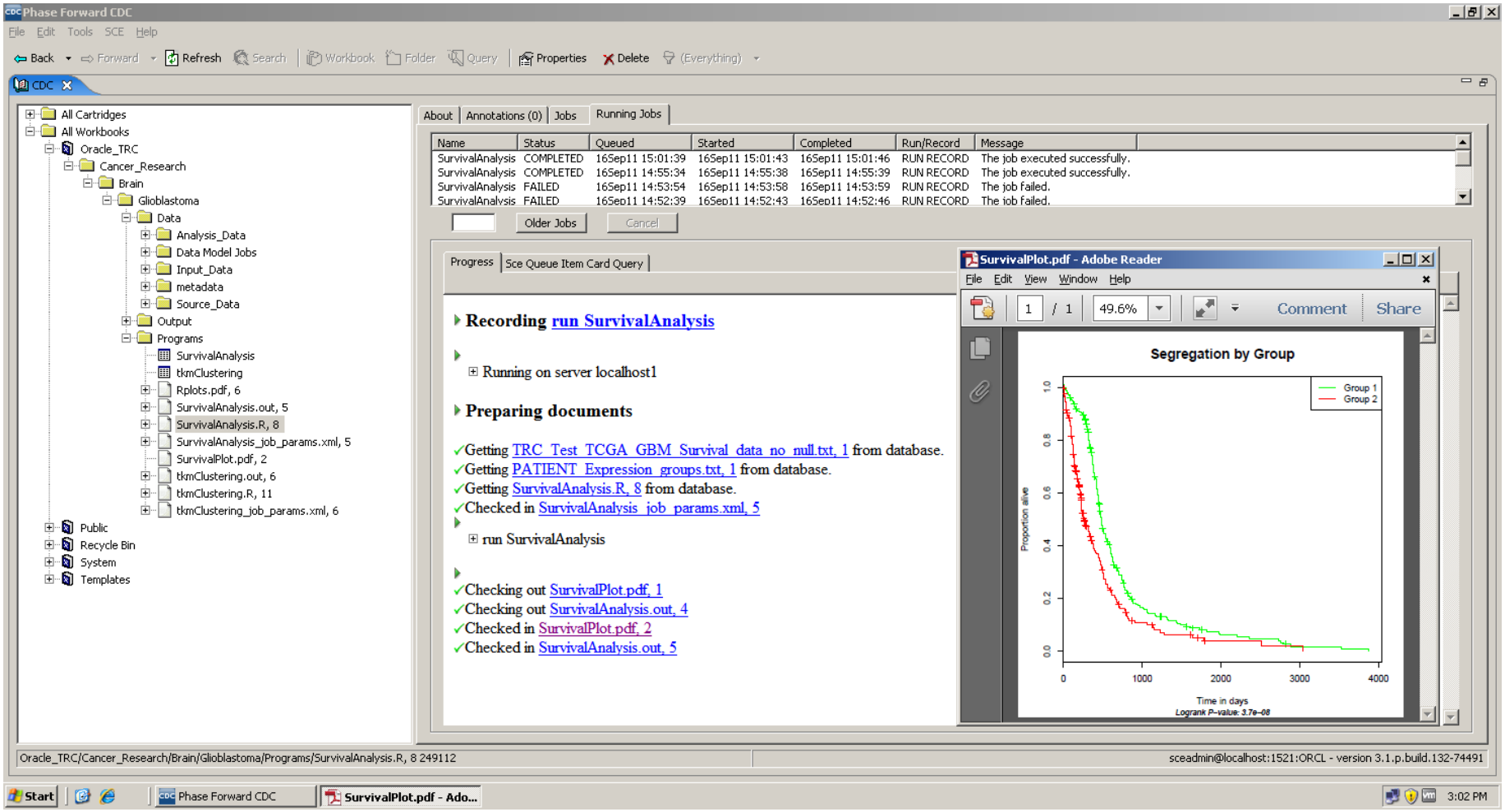
- Select patients who
  - have consented to Complete Cancer Care (CCC)
  - have diagnosed with Grade-IV Glioblastoma
  - have specimen necrosis < 50%
  - have specimen nuclei > 80%



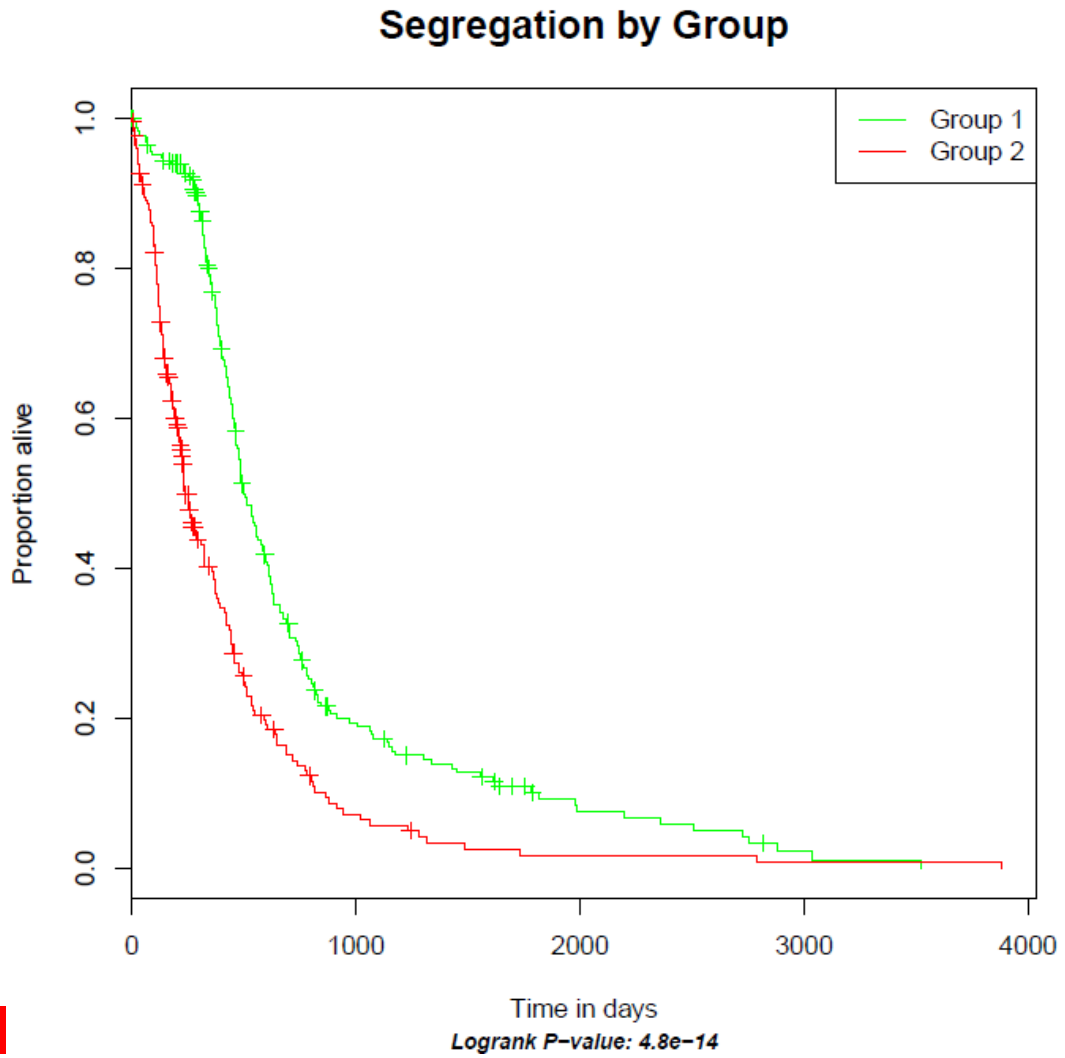
Clustering results based on a subset of genes



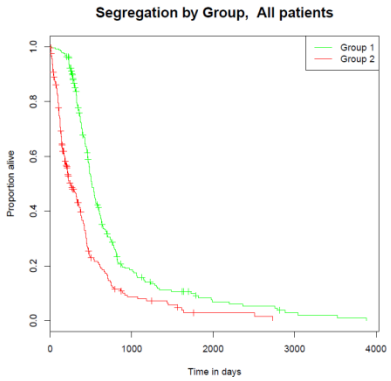
Kaplan-Meier survival analysis of these two groups

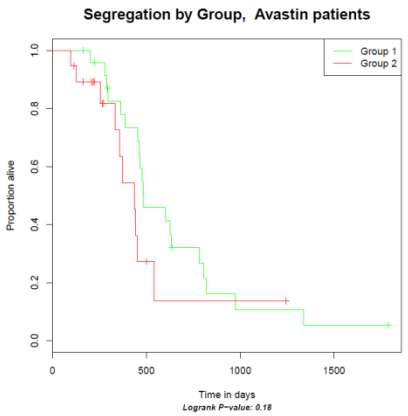


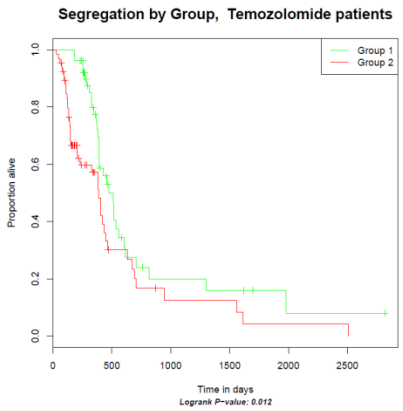
Analysis yields insights on patients survival differences based on molecular signature

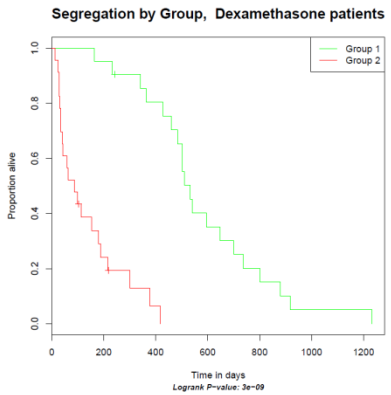


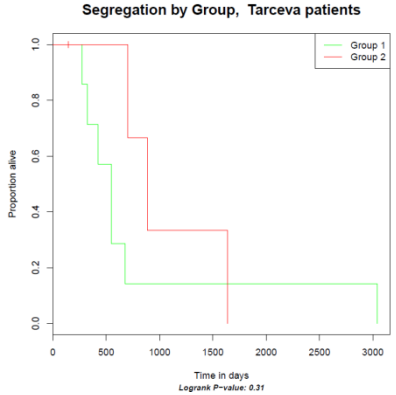
The two groups are further stratified based on medication





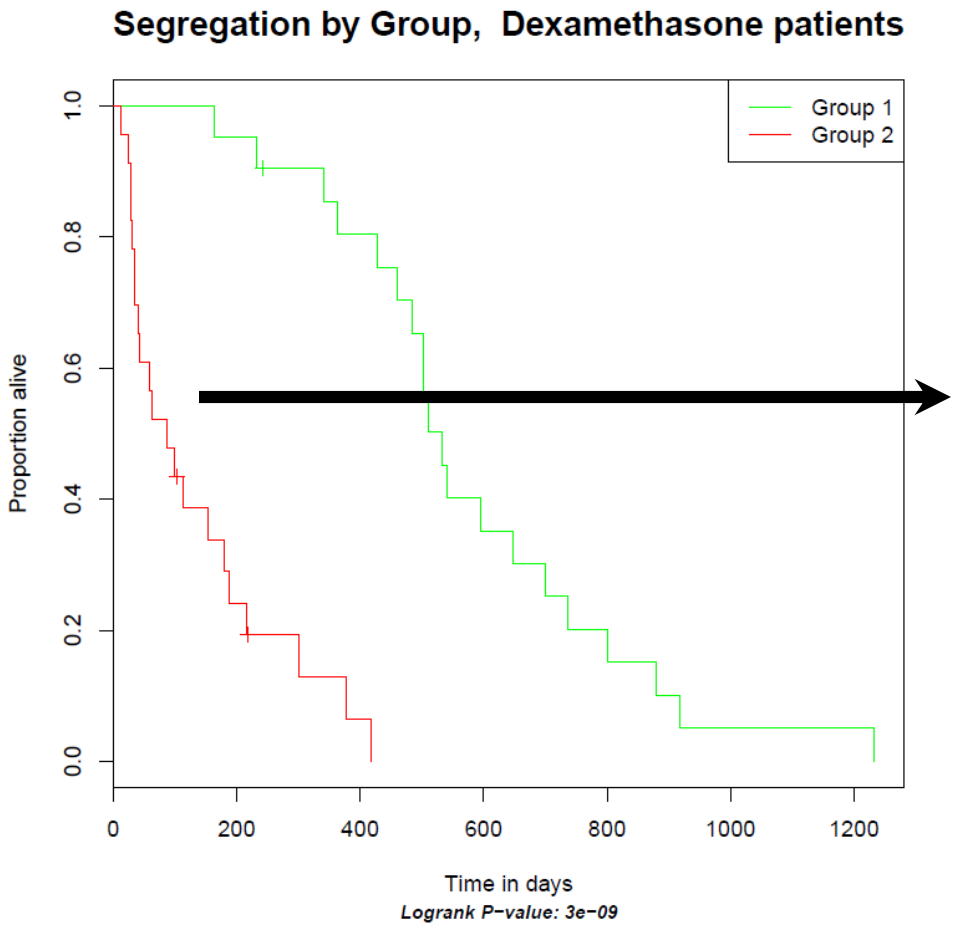






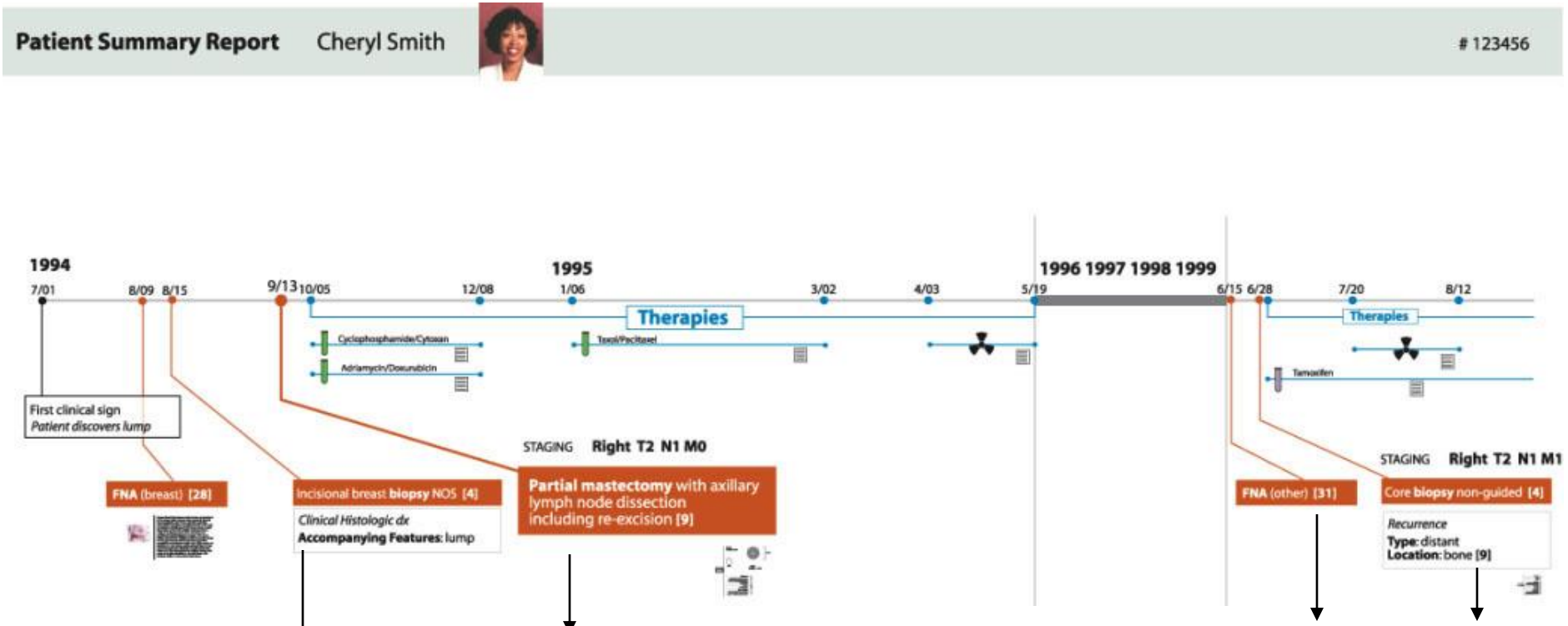
Insight

Actionable insight: patients in group 2 do not respond well to Dexomethasone

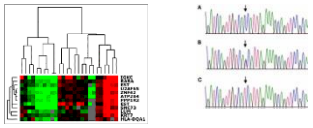


- Save unnecessary expense by not treating these patients with therapy that is likely to not benefit them
- Increase quality of life by sparing them unwanted side effects of likely ineffective therapies
- Enroll these patients in any available new investigational drug trials based on their tumor genetic profile

Transforming care through personalized medicine

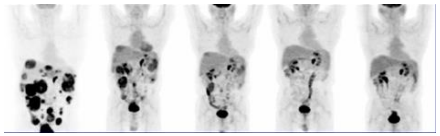


Molecular Profiling of tumor biopsy



Treatment with therapies targeted toward genetic context of tumor

Monitoring of blood biomarkers



Monitor objective tumor response with imaging

Further biopsy to assess genetic makeup of remaining tumor

Further treatment using alternative targeted therapies


ORACLE®