

Harnessing the power of IT

Big Data & Analytics to deliver Patient Centric Healthcare

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3rd Hinduja Hospital Healthcare Management Series

National Conference on
Redefining Healthcare
VALUE BASED DELIVERY

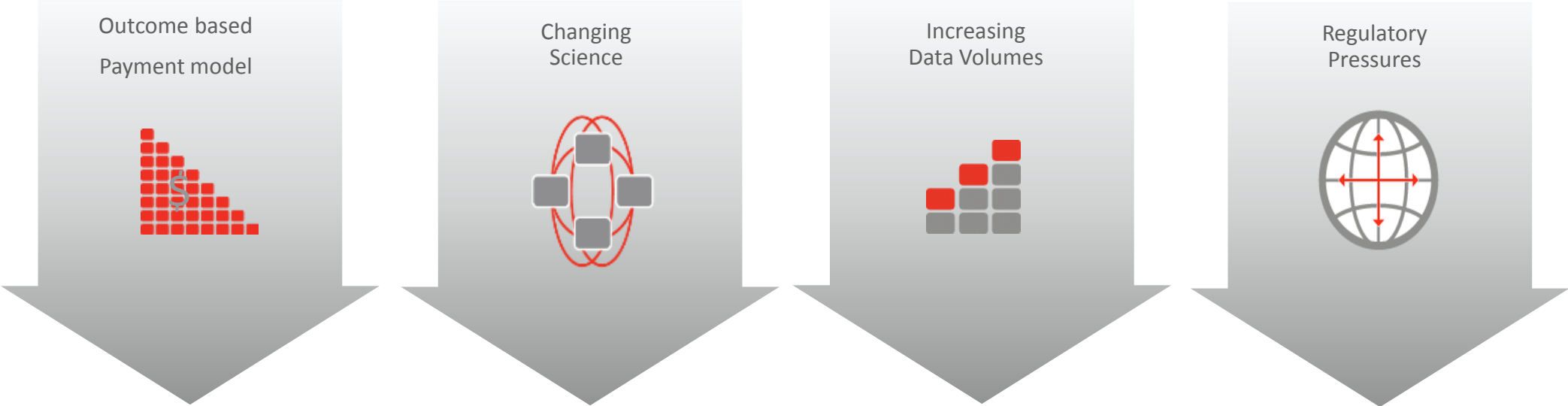
December 4th - 5th, 2015

ORACLE

Safe Harbor Statement

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Perfect Storm?



Traditional Approaches Are Limited

Point Applications

Limited, not scalable, and reinforce silos

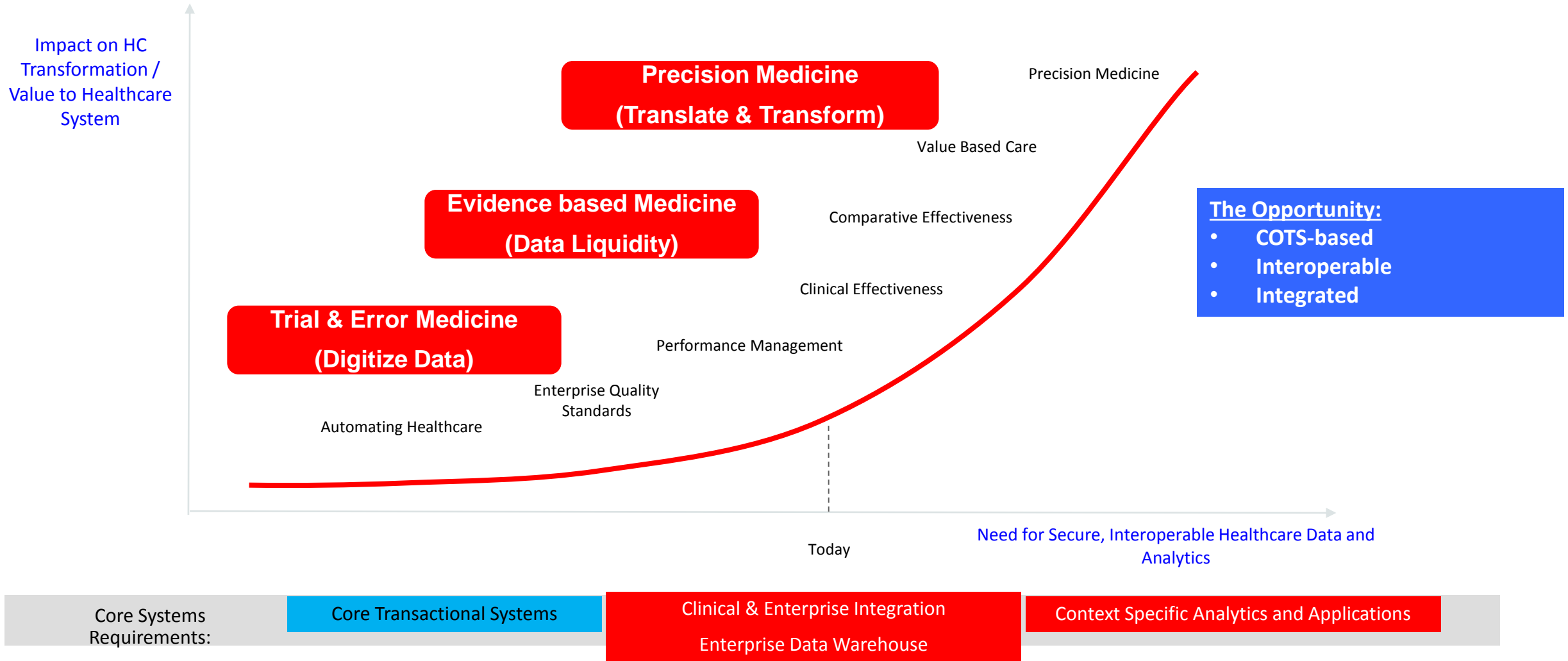
Homegrown Tools

Expensive to build and maintain

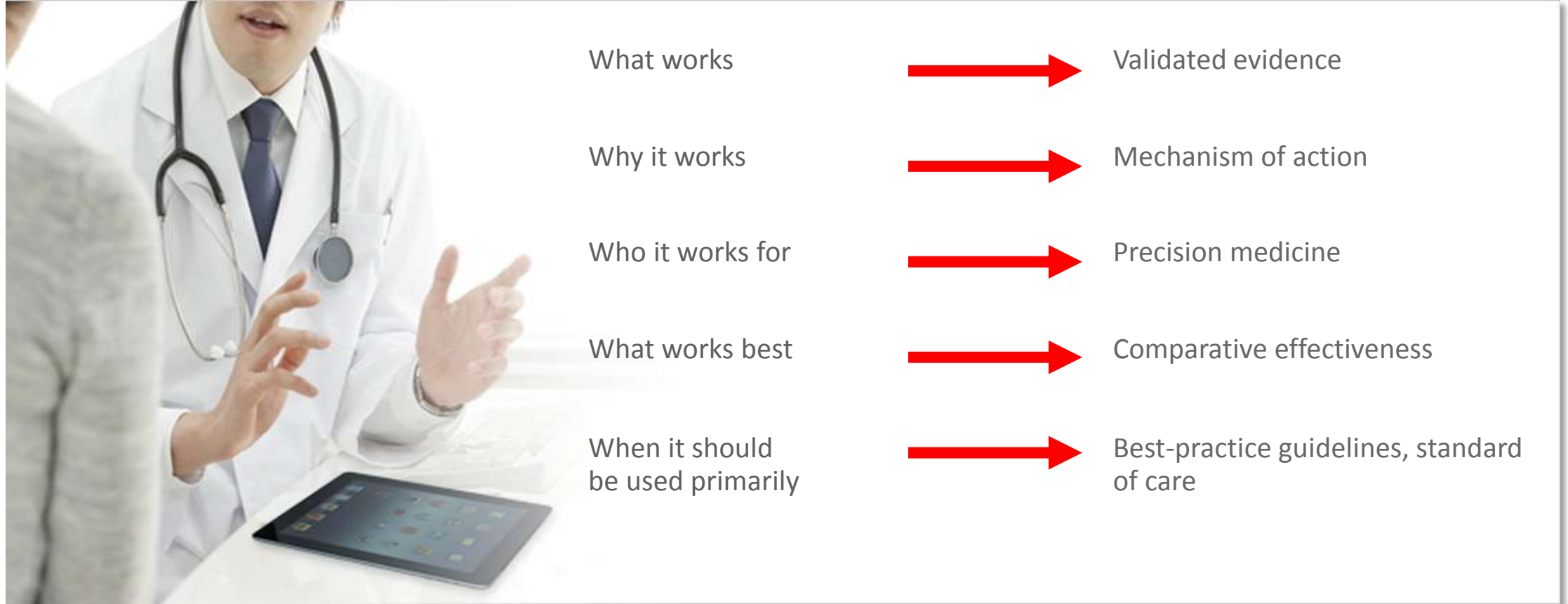
Established Solutions

Often proprietary, closed, and inflexible

The Journey of Transforming Healthcare



The “Hard Questions” in Healthcare Are Fundamentally Information Challenges



Big Data” Encompasses Many Types of Data

With varying volume, speed, and structural challenges



Structured and Unstructured Data

- EMR Records, free-text notes, images

Internal & External Sources

- Research, pharmacy, govt, population, other providers

Medical Device / Machine-Generated

- Blood pressure, Heart rate, glucose levels, weight, etc

Clinical

- Lab test results, pharma, pathology reports, discharge summaries, clinician notes, etc.

Imaging & Diagnostics

Web, Call Center, Social Media

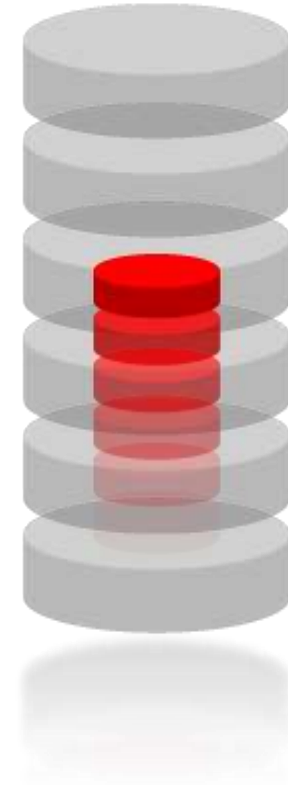
Financial & Operational

- Procedures, costs, charges, payments

“Omics”

- Genomics, Proteomics, Metabolomics

History, Family, Demographic



Big Data opportunities in Healthcare

Lower cost of healthcare delivery and raise care quality

1



Accountable Care

- Chronic Disease Mgt.
- Care Patterns
- Population Health
- Pay for Performance
- Telemedicine
- Patient Advocacy

2



Patient Engagement

- Customer Satisfaction
- Disease Mgt. / Prevention
- Social Media Interactions
- Care / Process Improvements

3



Operational Excellence

- Capacity Management
- Staffing Optimization
- Protocol Optimization
- Process Efficiency
- Supply Standardization
- Cost Accounting

4



Personal & Translational Medicine

- Personal Preferences
- Individualized Treatment
- Biometrics
- Data Management
- New Clinical Protocols

Big Data opportunities in Healthcare

Lower cost of healthcare delivery and raise care quality



Data Aggregation & Integration/
Data Interoperability

+



Clinical Analytics

=

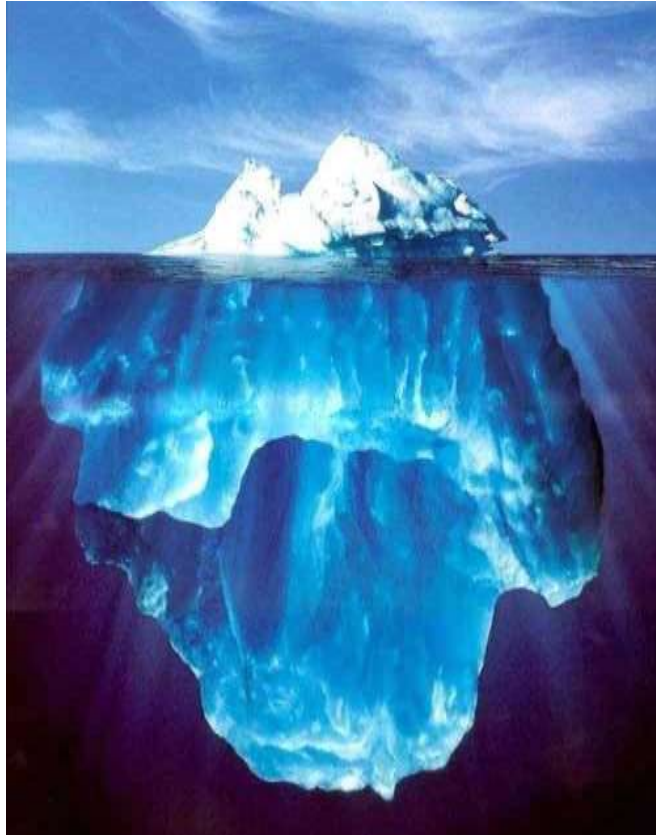
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Predictive Analytics



Analytics: More than Meets the Eye

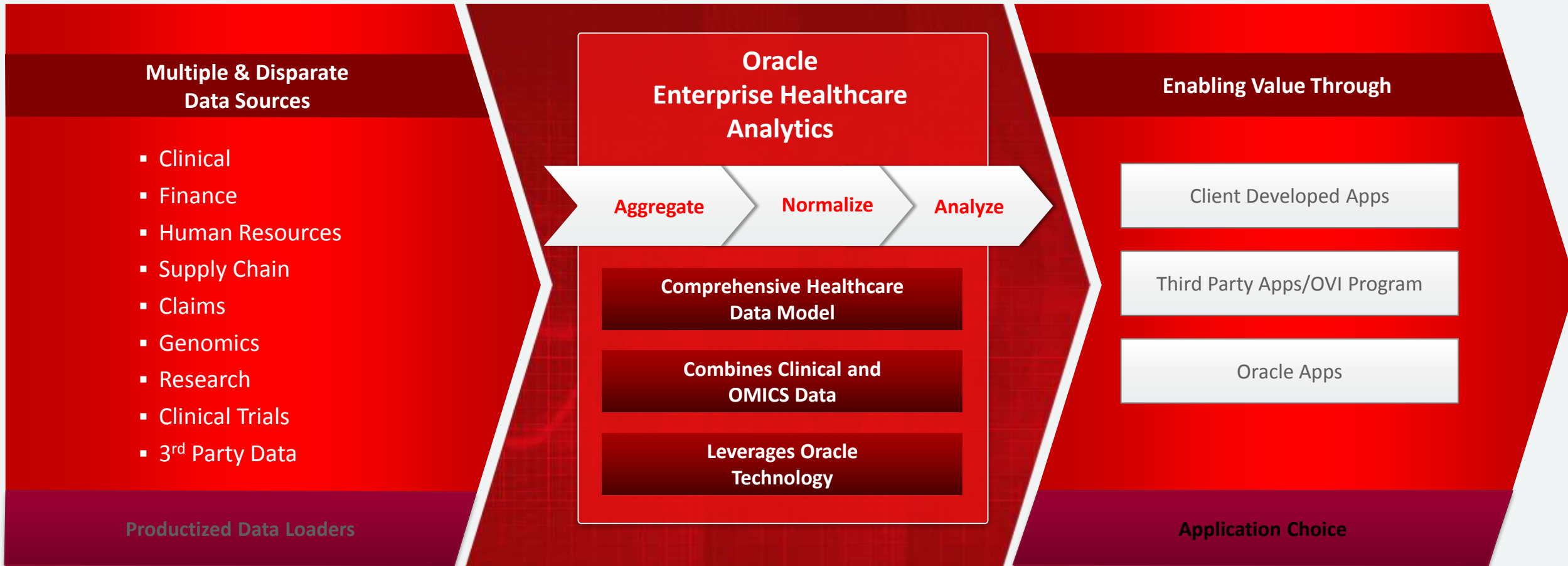


Data analysis and presentation is the relatively *EASY PART*.



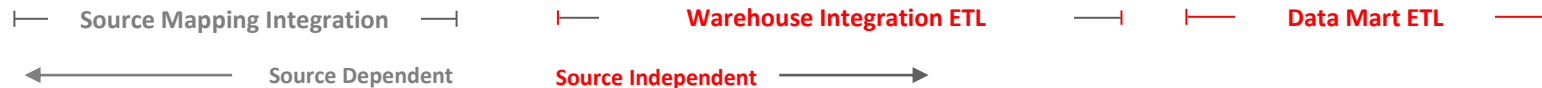
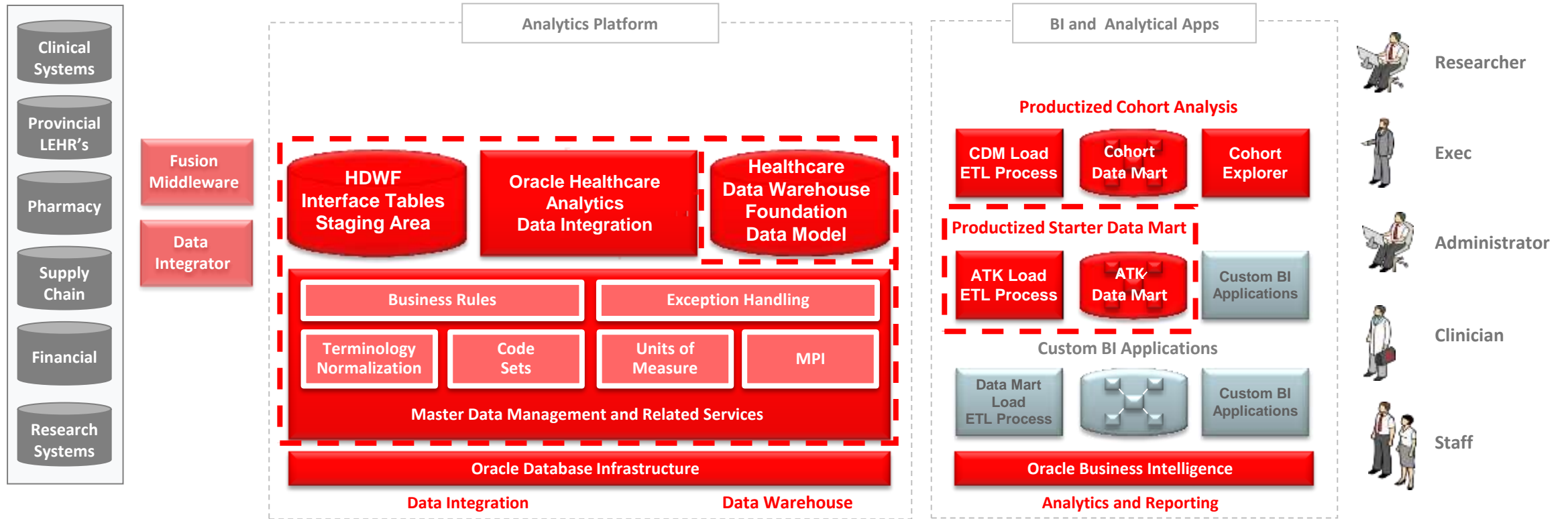
Data acquisition from myriad complex clinical, financial, administrative, and research source systems and the attendant cleansing, integration, and warehousing of this data is the *HARD PART*.

Powering Enterprise Healthcare Analytics



Enterprise Health Analytics

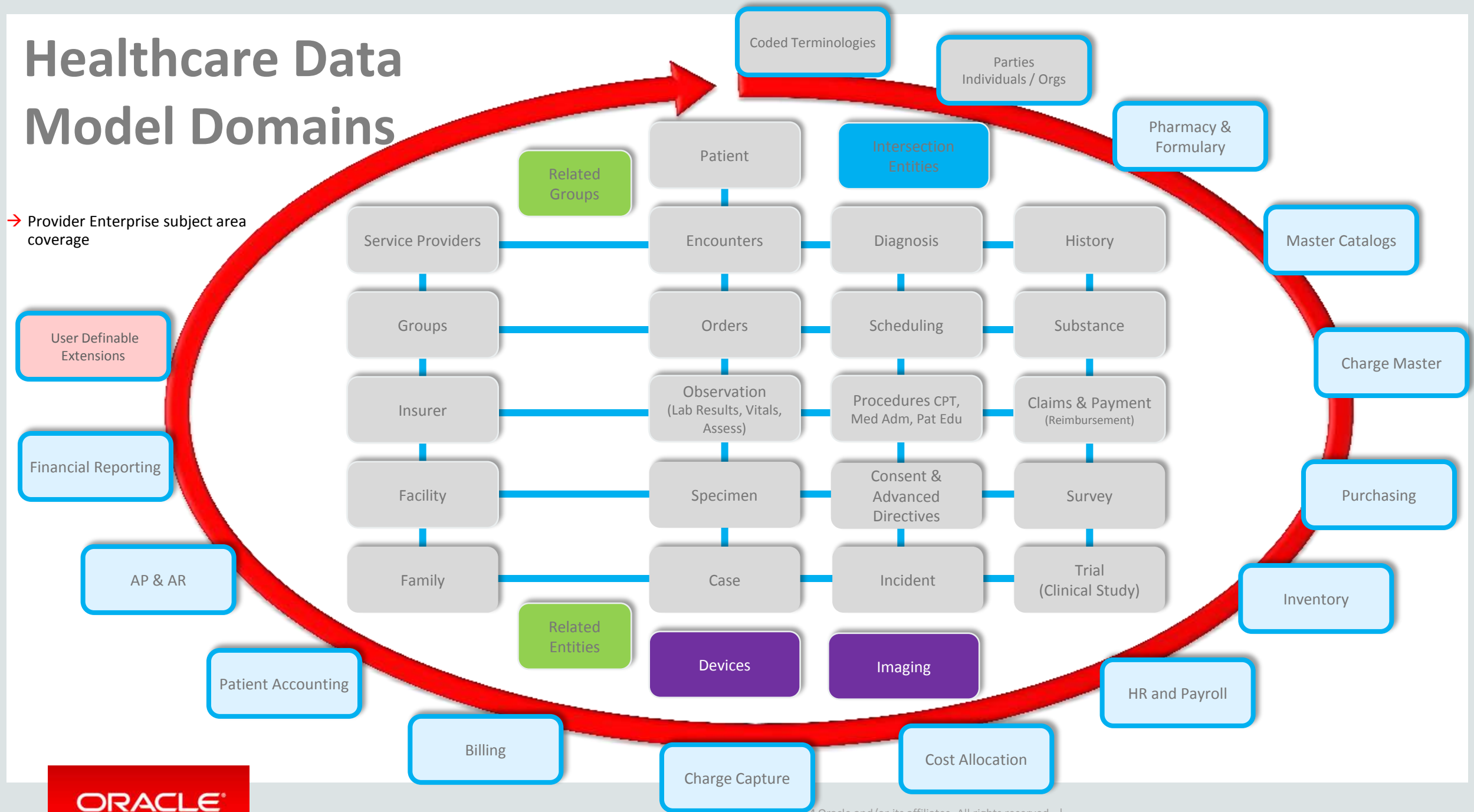
Data Integration, Standardization, Normalization, Governance



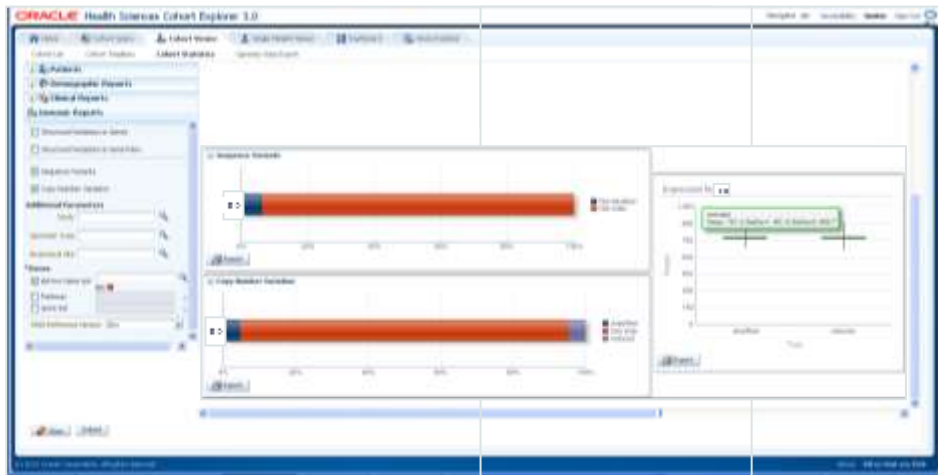
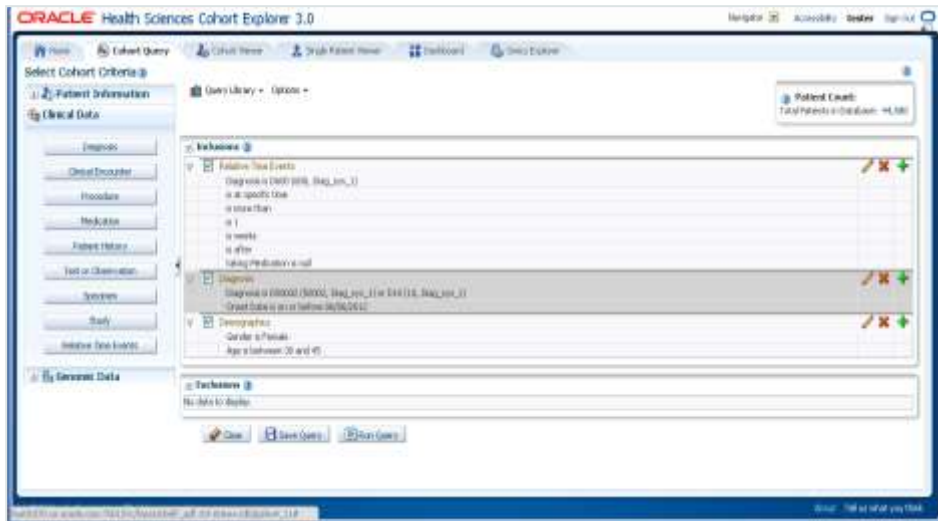
MPI = Master Person Index
ETL = Extract, Transform, Load

Healthcare Data Model Domains

→ Provider Enterprise subject area coverage



Prebuilt applications: Oracle Cohort Explorer



- Web based application designed for clinicians and researchers
- Easy-to-use **query tool** for patient cohorts and specimen:
 - Enables clinicians and researchers to be **self-sufficient** and **timely** in their validation of hypotheses
 - Ensures **access control** and **traceability** for regulatory environment
- Supports over **300 search criteria** (Patient Demographics, Diagnosis, Procedure/Treatment, Diagnostic Tests, Medications, Specimen...)
- Cohort Data Mart tuned to support real-time ad-hoc queries

Executive's Dashboard

- Overview By Entity
- Clinical Quality
- Wait Times
- Patient Satisfaction
- Patient Volumes
- Financials
- Employees
- Overview By Priority
- Period Wise Comparison
- Comparison By Entity

Quarter : 2014 Q 2
 Month : 2014 / 05

Reset

- Legend :
- Manual Feed
 - System - Not Integrated
 - System - Integrated
 - Under Revision

Clinical Quality
 System KPI Actuals for Clinical Quality

System KPI		KPI Actual
% Compliance with Core Clinical Measures	<input checked="" type="checkbox"/>	
% Compliance with Core Patient Safety Measures	<input checked="" type="checkbox"/>	
% Compliance with Core Risk Management Measures	<input checked="" type="checkbox"/>	
Inpatient Mortality Rate	<input checked="" type="checkbox"/>	
Sentinel Events	<input checked="" type="checkbox"/>	

[Edit](#) - [Refresh](#) - [Print](#) - [Export](#)

Wait Times
 System KPI Actuals for Wait Times

System KPI		KPI Actual
In-Patient Admission Wait Time	<input type="checkbox"/>	
Time To Schedule a E-Referral Appointment	<input type="checkbox"/>	
First Available Appointment	<input type="checkbox"/>	59.98

[Edit](#) - [Refresh](#) - [Print](#) - [Export](#)

Patient Satisfaction
 System KPI Actuals for Patient Satisfaction

System KPI		KPI Actual
Media Hits- Positive vs. Negative	<input checked="" type="checkbox"/>	
Overall Satisfaction	<input checked="" type="checkbox"/>	
Patient Complaints	<input checked="" type="checkbox"/>	

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Patient Volumes
 System KPI Actuals for Patient Volumes

System KPI		KPI Actual
Case Mix Index	<input type="checkbox"/>	0.80
Expected vs. Actual Length of Stay	<input type="checkbox"/>	89.37%
Inpatient Occupancy	<input type="checkbox"/>	76.87%
OR % Procedures Scheduled vs. Cancellation	<input type="checkbox"/>	

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Financials
 System KPI Actuals for Financials

System KPI		KPI Actual
Denials	<input type="checkbox"/>	
Actual vs. Budgeted	<input type="checkbox"/>	
Days of Inventory on Hand	<input type="checkbox"/>	67.18

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Employees
 System KPI Actuals for Employees

System KPI		KPI Actual
% of Nationals in the Workforce	<input type="checkbox"/>	18.30%
Employee Engagement Rate	<input checked="" type="checkbox"/>	
Vacancies (number of vacancies in budget positions)	<input checked="" type="checkbox"/>	

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From: 01/01/2015 To: 09/14/2015
 Medical Facility/Hospital: (All Column Values) Gender: (All Column Values) Payer: (All Column Values) Age: 0-18 Years; 19-64 Ye: (All Column Values) Race: (All Column Values) Chronic Condition: Type 2 Diabetes Provider: (All Column Values)
 [Apply] [Reset]

Population Snapshot

273 Patients

99 Providers

Gender: [Pie Chart]

Age: [Pie Chart]

Race: [Pie Chart]

Payer: [Pie Chart]

Utilization

0.01 Average Number Inpatient Admissions [Bar Chart]

2.06 Average Number Outpatient Visits [Line Chart]

0.17 Average Number ED Visits [Bar Chart]

3.74 Average Number Labs Ordered [Line Chart]

0.45 Average Number Rx Ordered [Line Chart]

Care Coordination

A1c A1c Good Control **0%** less than 7% **167** Number of Patients

LDL LDL Control **0%** <100 mg/dl **167** Number of Patients

BP BP Control **80%** <130/80 **166** Number of Patients

CoMorbidity

[Bar Chart showing CoMorbidity counts]

CoMorbidity	Count
Chronic Congestive Heart Failure	3
Coronary Artery Disease	3
Myocardial Infarction	1

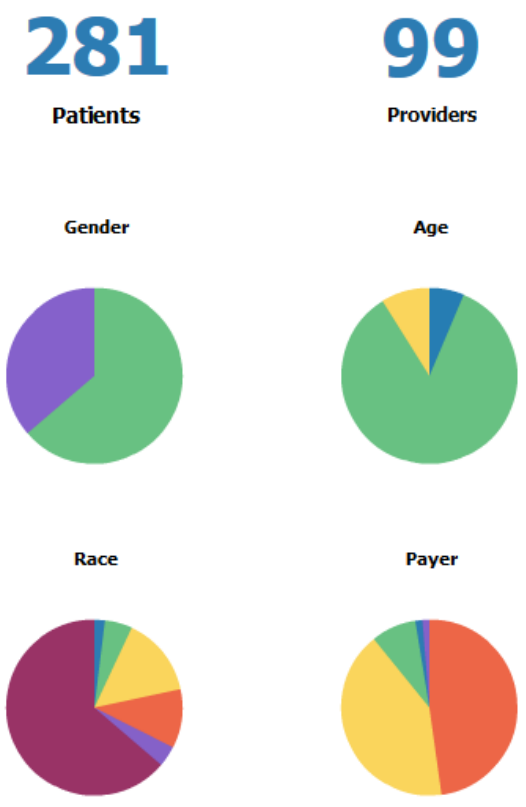
Vaccinations

20% Flu [Gauge Chart]

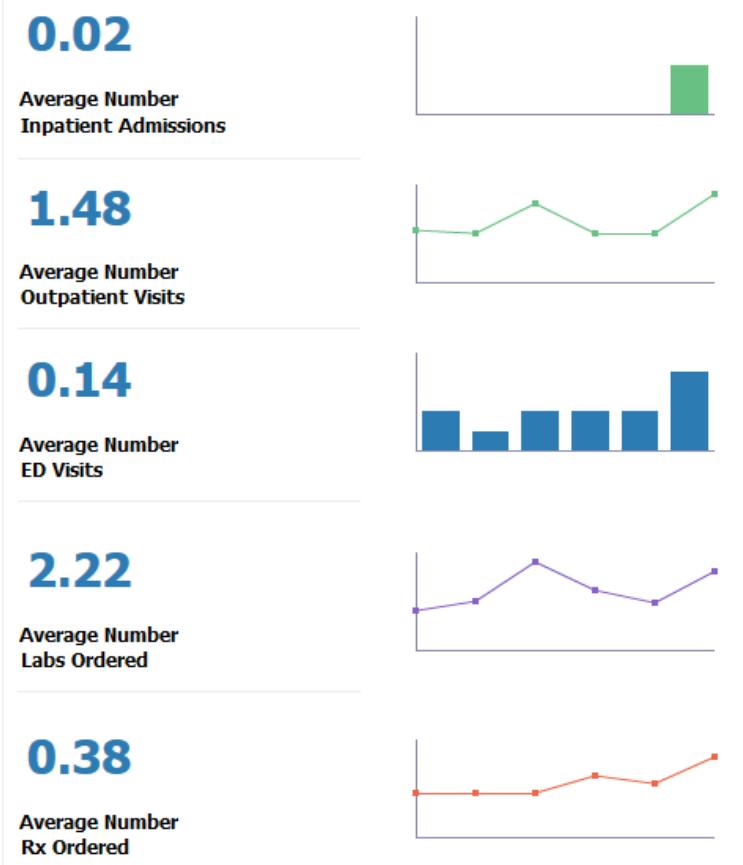
0% Pnuemococcal [Gauge Chart]

From: 01/01/2015 To: 09/14/2015
 Medical Facility/Hospital: (All Column Values) Gender: (All Column Values) Payer: (All Column Values) Age: 0-18 Years; 19-64 Yea... Race: (All Column Values) Chronic Condition: Hypertension; Myocar... Provider: (All Column Values) [Apply] [Reset]

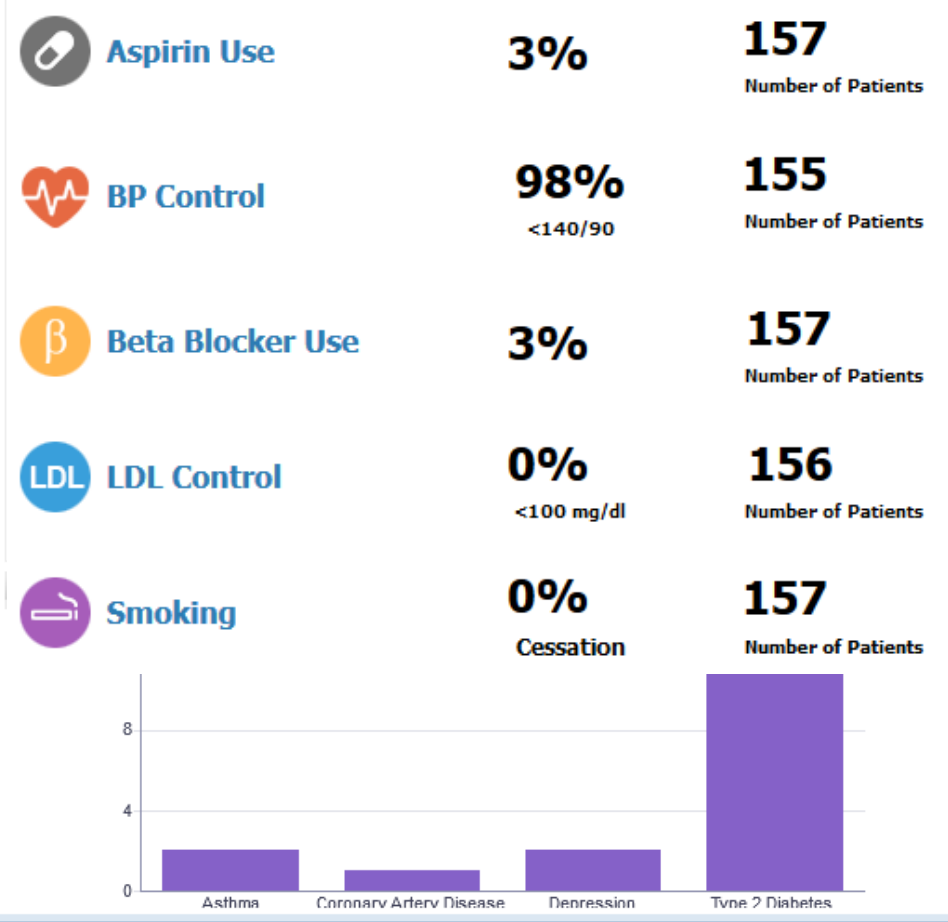
Population Snapshot



Utilization



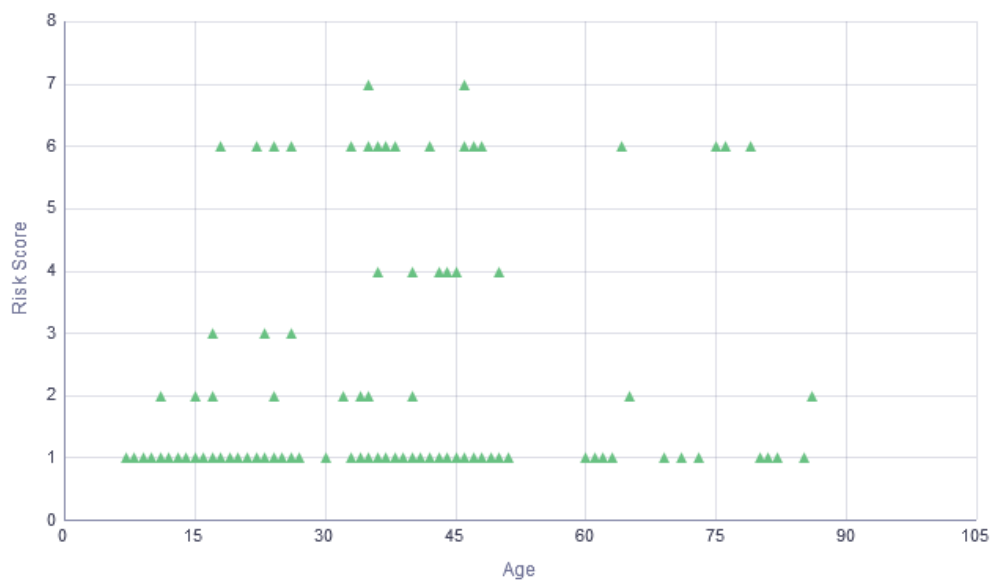
Care Coordination



Heart Failure
 Care Today **Care Tomorrow - Intervention** Care Tomorrow - Early Identification Patients Providers Patients & Providers

From: 01/01/2015 To: 09/14/2015
 Medical Facility/Hospital: (All Column Values) Gender: (All Column Values) Payer: (All Column Values) Age: 0-18 Years; 19-64 Ye: [v] Race: (All Column Values) Chronic Condition: Hypertension; Myocar: [v] Provider: (All Column Values) [Apply] [Reset]

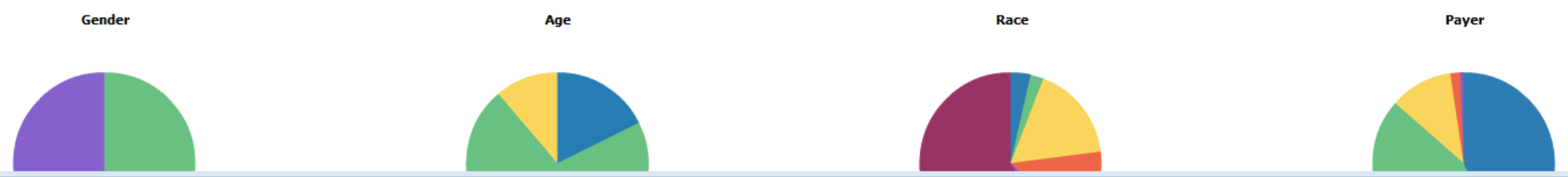
Care Intervention - Charlson Index



Patient List

	Beard, Gillian 000548077-01 46 Year(s)	7 Risk Score
	Madden, Aubrey 000002238-01 35 Year(s)	7 Risk Score
	Buckner, Darryl 000384434-03 75 Year(s)	6 Risk Score
	Christensen, Olga 666453994-04 75 Year(s)	6 Risk Score
	Dawson, Flavia 616490000-01 38 Year(s)	6 Risk Score

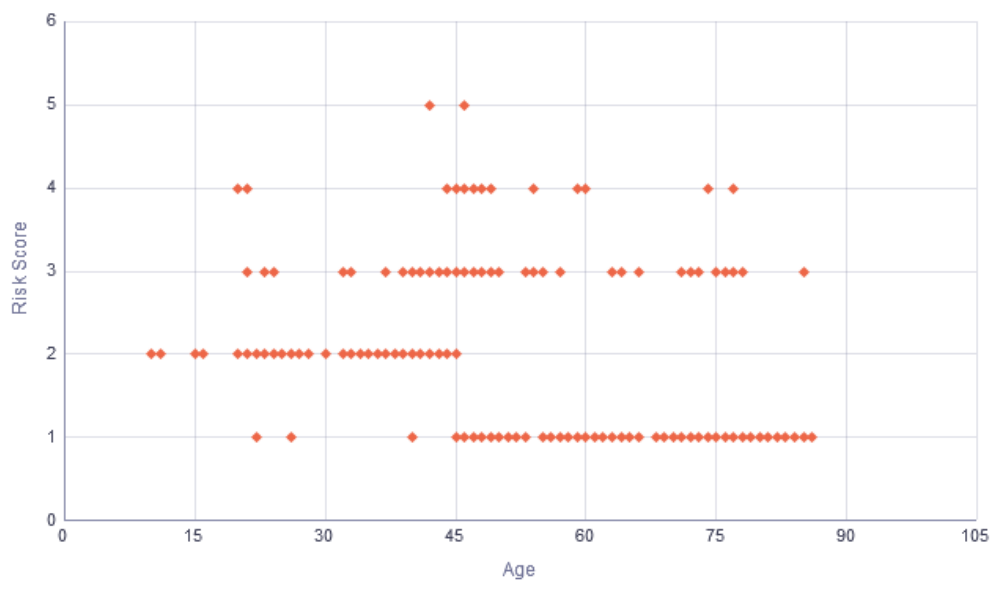
Population Snapshot



Diabetes
 Care Today Care Tomorrow - Intervention **Care Tomorrow - Early Identification** Patients Providers Patients & Providers

From: 01/01/2015 To: 09/14/2015
 Medical Facility/Hospital: (All Column Values) Gender: (All Column Values) Payer: (All Column Values) Age: 0-18 Years; 19-64 Year(s) Race: (All Column Values) Chronic Condition: (All Column Values) Provider: (All Column Values)
 [Apply] [Reset]

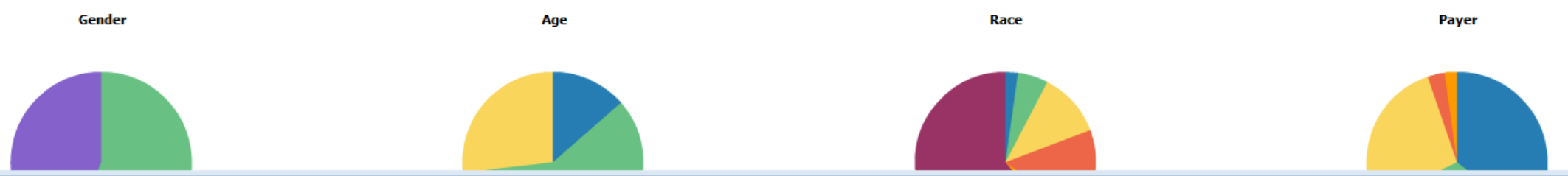
Early Identification - Prediabetes



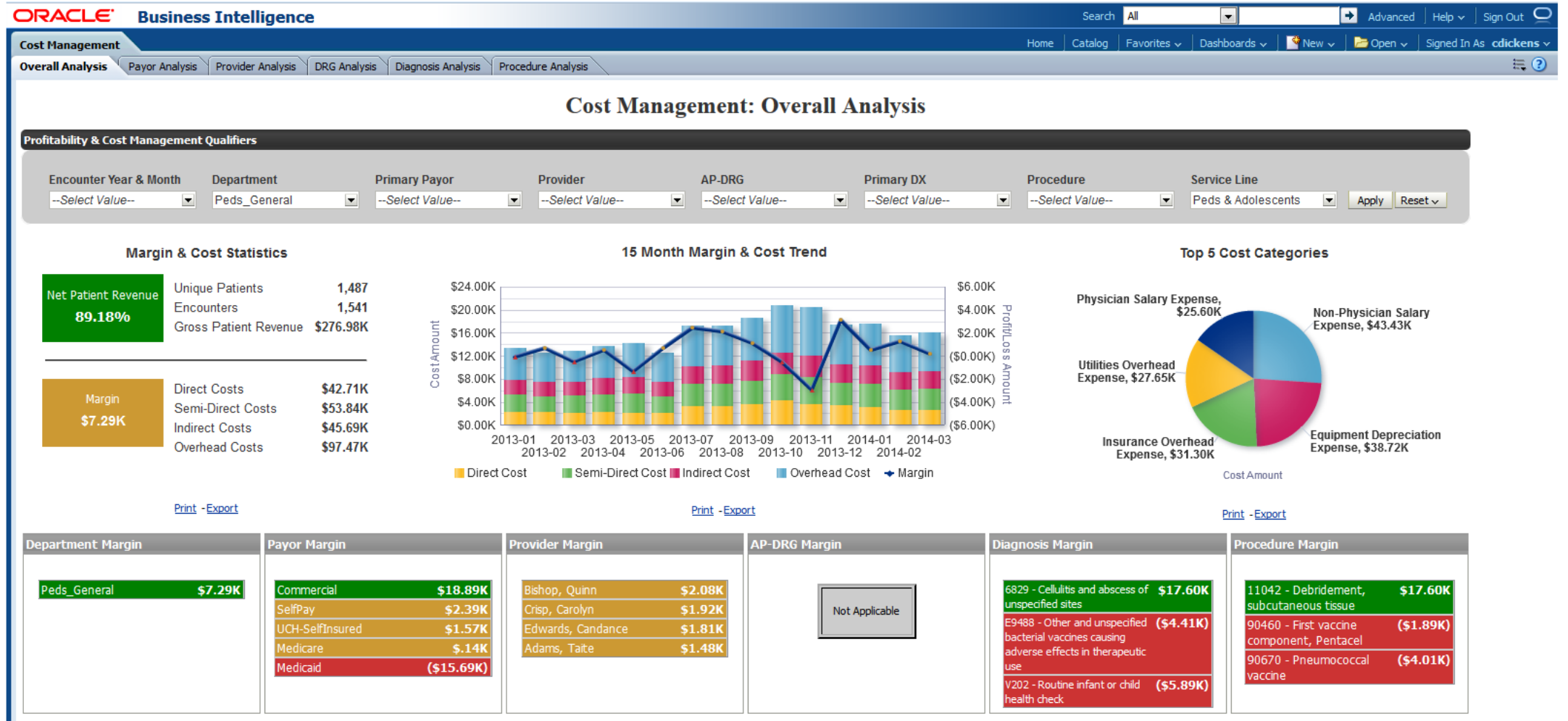
Patient List

	King, Christen 483390000-01 42 Year(s)	5 Risk Score
	Carter, Chaney 000147837-01 46 Year(s)	5 Risk Score
	Chen, Gary 071460000-06 59 Year(s)	4 Risk Score
	Baird, Xander 666745432-01 48 Year(s)	4 Risk Score
	Pugh, Lois 745520000-01 46 Year(s)	4 Risk Score

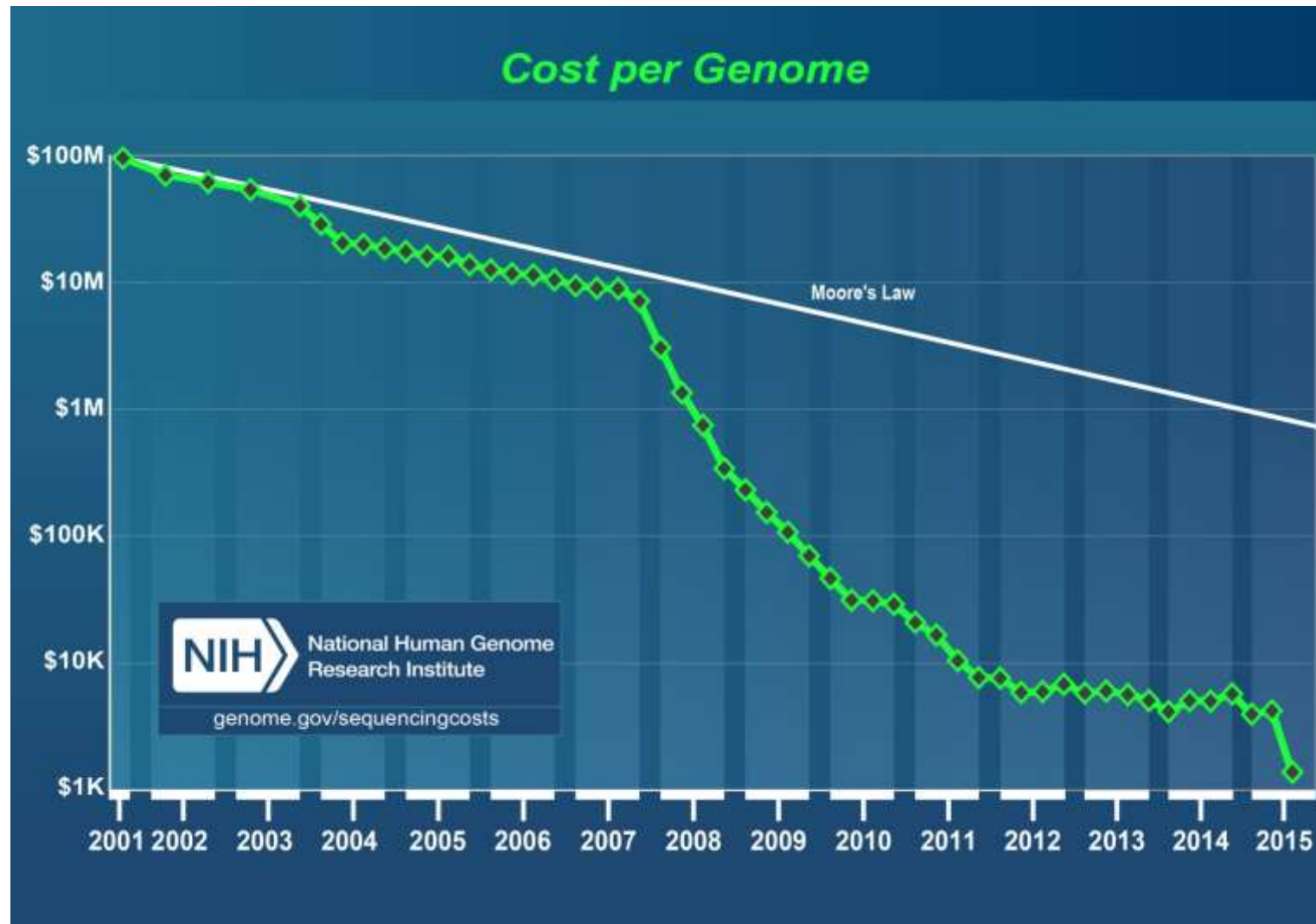
Population Snapshot



High-Performance Costing



Human Genome Sequencing Cost is reducing significantly



Translational Medicine Analytics Platform

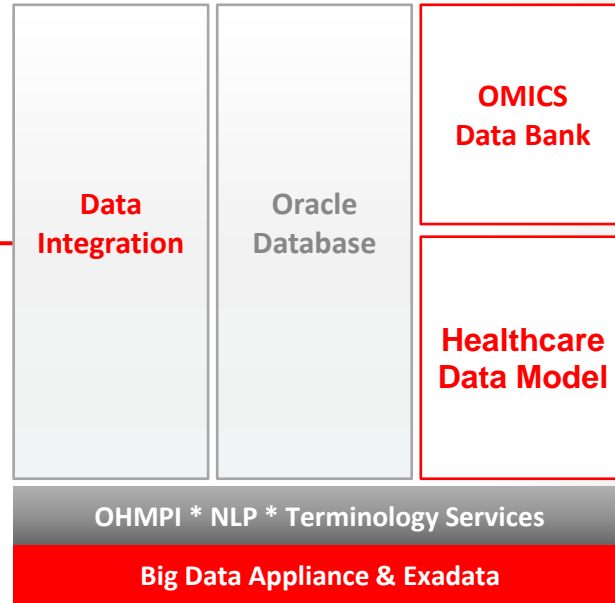
Clinical, Genomic and Multi-Source data integration with a normalized data structure

Source Systems

Clinical/EMR
Study/EDC
Omics
Biobank
Public Domain
Claims



Oracle Platform



Analytics Application Ready

Oracle

- Biomarker Discovery
- Protocol Validation & Patient Recruitment
- Patient Stratification
- Clinical & Molecular Data Collection for Trials
- Comparative Effectiveness
- Structured & Unstructured Data Analysis

Client Developed

Partner



Open Source & Custom



Data Modeled in Omics Data Bank Today

Reference Data

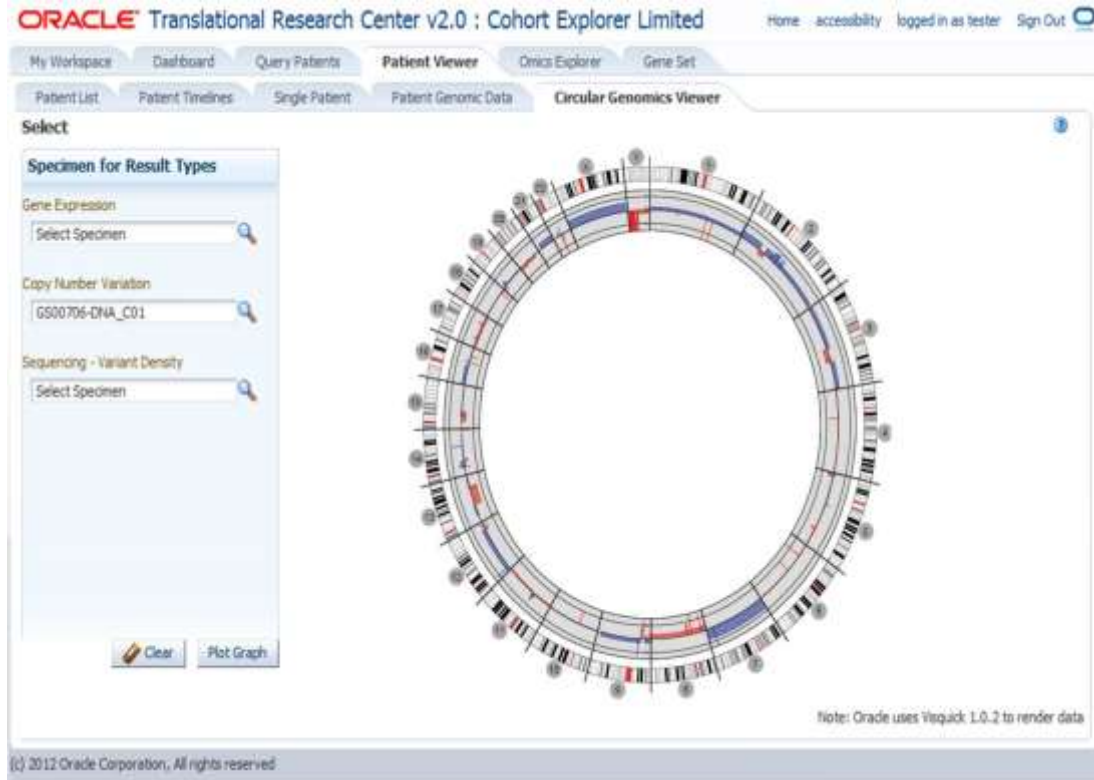
EMBL	dbSNP and COSMIC	HUGO	SwissProt/ UniProt	Pathway Commons	Polyphen/ SIFT	HGMD and Pharmacogenetic
<ul style="list-style-type: none"> gene_id transcript_id CpG site intron exon promoter splice site etc. 	<ul style="list-style-type: none"> SNP_id rs_id begin end x_reference Histology somatic etc. 	<ul style="list-style-type: none"> chromosome HGNC_ID ENTREZ_gene_id synonyms Approved_dt status MGI_id etc. 	<ul style="list-style-type: none"> protein name accession component_type component_desc start/end etc. 	<ul style="list-style-type: none"> pathwy_name gene_symbol frequency etc. 	<ul style="list-style-type: none"> prediction_score Prediction variant_id transcript_id etc. 	<ul style="list-style-type: none"> mutation ID variant type disease pmid confidence drug bank ID entrez ID etc.

Result Data

Simple Variant (SNP and Indel)	Gene Expression	Copy Number Variant Analysis	RNA Seq	Structural Variant	Genotype
<ul style="list-style-type: none"> SNP_id chromosome position variant_type replace_tag zygosity QC_score etc. 	<ul style="list-style-type: none"> probeset_id probeset_annot hybridization intensity P_value call etc. 	<ul style="list-style-type: none"> chromosome position normalized_cvg gc_corrected_cvg call_ploidy ploidy_score etc. 	<ul style="list-style-type: none"> raw_counts median_length RPKM chromosome position etc. 	<ul style="list-style-type: none"> chromosome breakpoint positions inserted/deleted DNA sequence join orientation etc. 	<ul style="list-style-type: none"> monomorphic ref any combination of genotype chromosome position etc.

The power of **Clinical** and Omics data in one single system

Example Use Cases

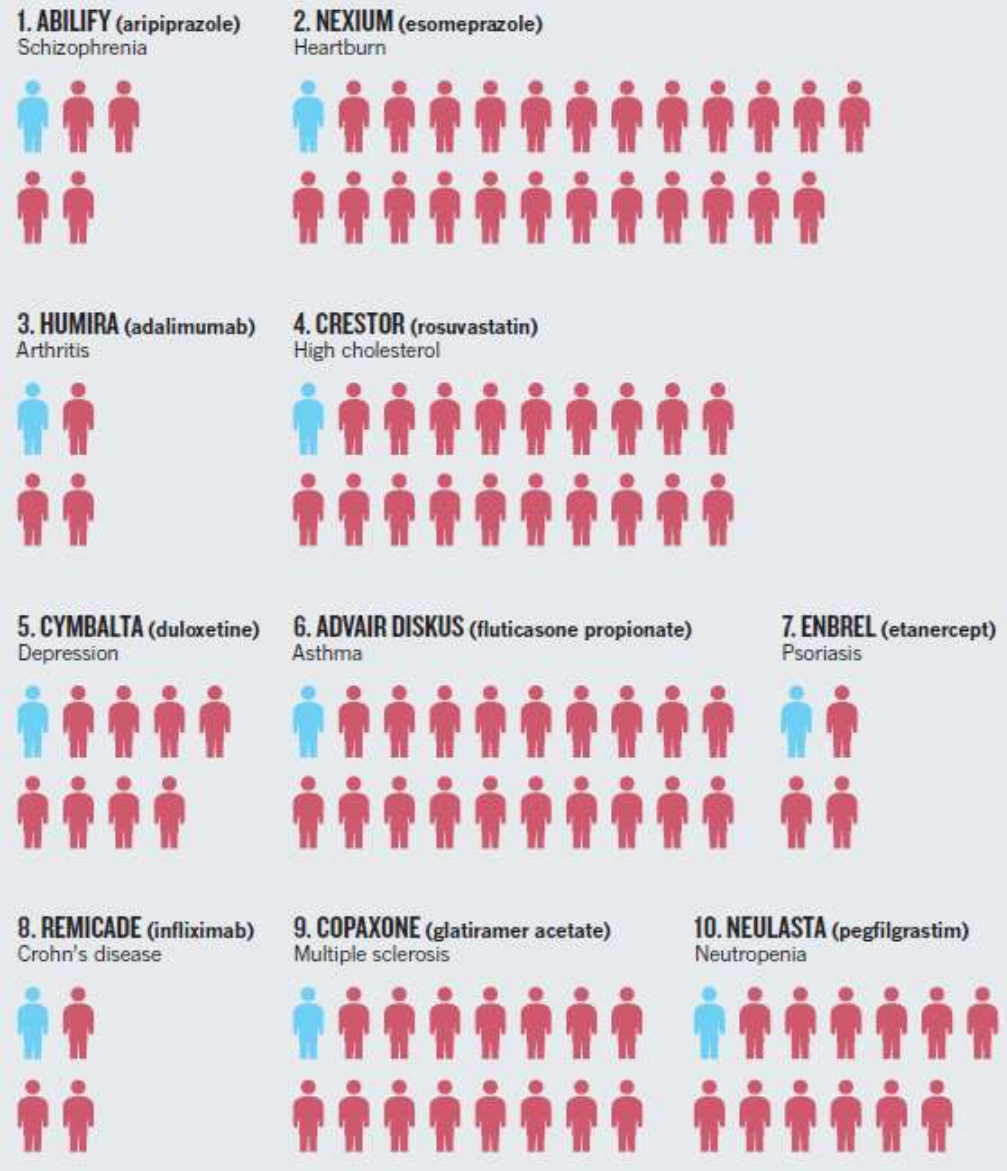


- Find patients that are poor responders for **drug Y** and have a mutation in the promoter region of Gene X
- What is the expression level of TP53 mutants by **cancer tissue**
- How many patients have **disease Z**, responded to treatment, have a **chromosome 18 deletion** and have **blood samples** in the biobank?
- Do mutations in the coding sequence of Gene X perturbs its expression across all of my projects
- Show **HER+ cell lines** that have ERBB2 copy number gains
- Take only the **exome portion** of the whole genome and do a statistical association analysis with phenotype Z and then prioritise the genes based on their **variant type** (e.g. non-syn SNPs), **annotations** (e.g. growth factors) and membership to **known pathways**

Roadmap - Precision Medicine?

Top 10 marketed drugs in the US only help between 1 in 4 to 1 in 25 people.

610 | NATURE | VOL 520 | 30 APRIL 2015



Precision Medicine

Molecular Pathologist



Molecular Tumor Board



Clinical Geneticist and Care Team



Classification
(filter +
annotation)

Clinical
Interpretation

Report
(creation and
distribution)

Narrow the focus on gene
mutations of interest

Associate clinical implication
with the variants

Deliver to ordering clinicians

Summary

Healthcare Analytics

From individuals to populations, bridging the care gaps for better health

The evolution of precision medicine

The evolution of population health management

The evolution of accountable care

The evolution of patient engagement

The evolution of patient satisfaction



Accelerating the Evolution of Human Care