Closing the Healthcare Gap by Applying Predictive Analytics to Improve the Use of Medicines

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About IMS Health

MISSION

Leverage information and technology services to deliver intelligence and drive improved performance for a growing universe of healthcare customers globally

Information

10+ Petabytes of unique data

800,000+ data feeds

100,000+ data suppliers

500M+ anonymous patient records

6M+ professionals and organizations

300,000+ social media sources

Technology

55 billion+ transactions p.a.

Cloud based analytics

Pre integrated IMS Health data

SaaS applications

Services

1,200+ healthcare informatics experts worldwide

4,500+ industry and customer experts worldwide

5 global operation centers of excellence

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About IMS Institute for Healthcare Informatics

MISSION

Provide policy setters and decision-makers in the global health sector with unique and transformational insights related to healthcare dynamics derived from granular analysis of information

Unbiased Information

Academic Research

HARVARD UNIVERSITY

MAYO CLINIC

JOHNS HOPKINS UNIVERSITY

STANFORD SCHOOL OF MEDICINE

Public Policy Support

CDC CENTERS FOR DISEASE CONTROL AND PREVENTION

World Health Organization

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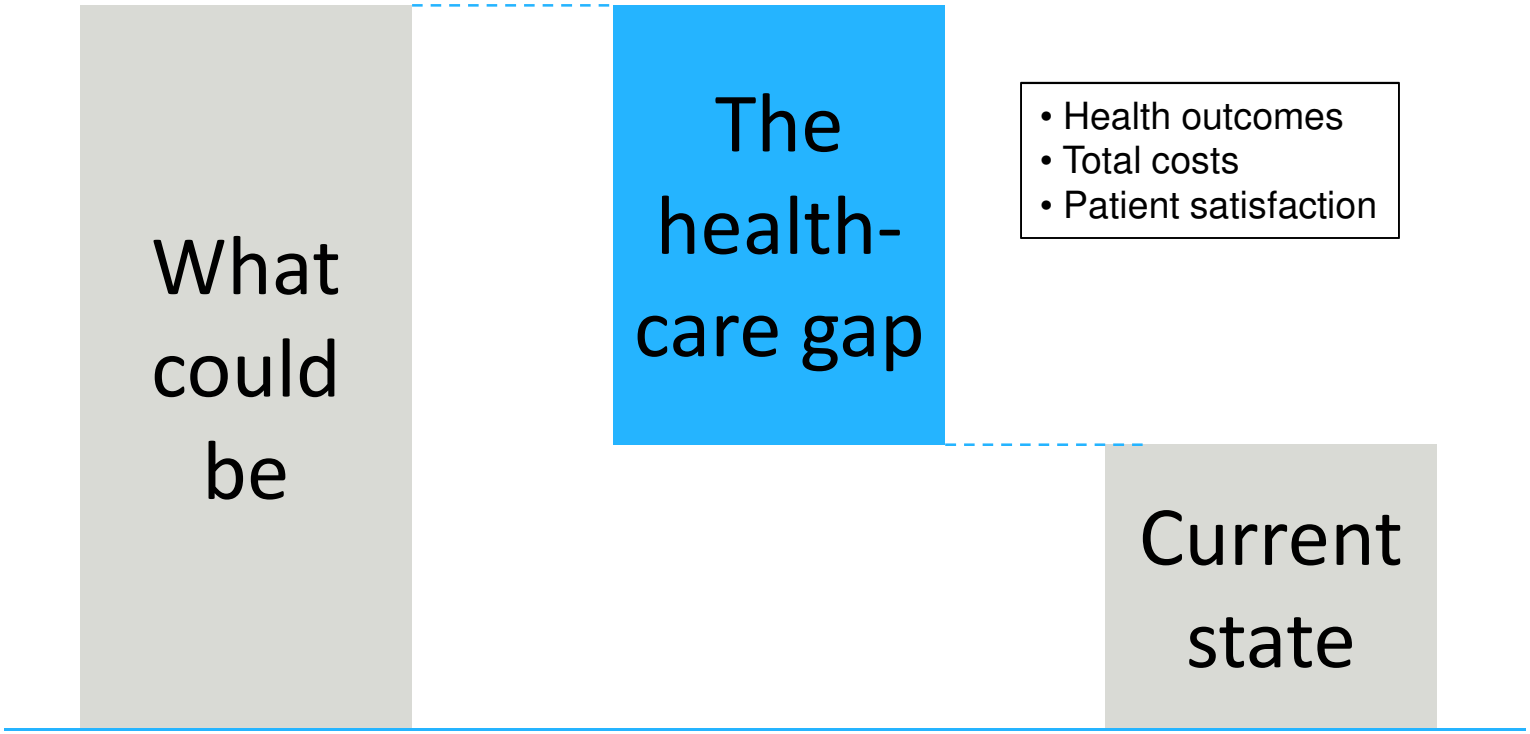
What is the healthcare gap?

Clinical and economic dimensions



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For example, the difference between responsible use of medicines and current reality ...

Improvements on...
1 Nonadherence to medicines
2 Untimely medicine use
3 Antibiotic misuse/overuse
4 Medication errors
5 Suboptimal generic use
6 Mismanaged polypharmacy

...would reduce overall health expenditure and improve outcomes

Nonmedicine spending, typically the larger portion of total health costs, would decrease due to reduced outpatient and hospital-based utilization*

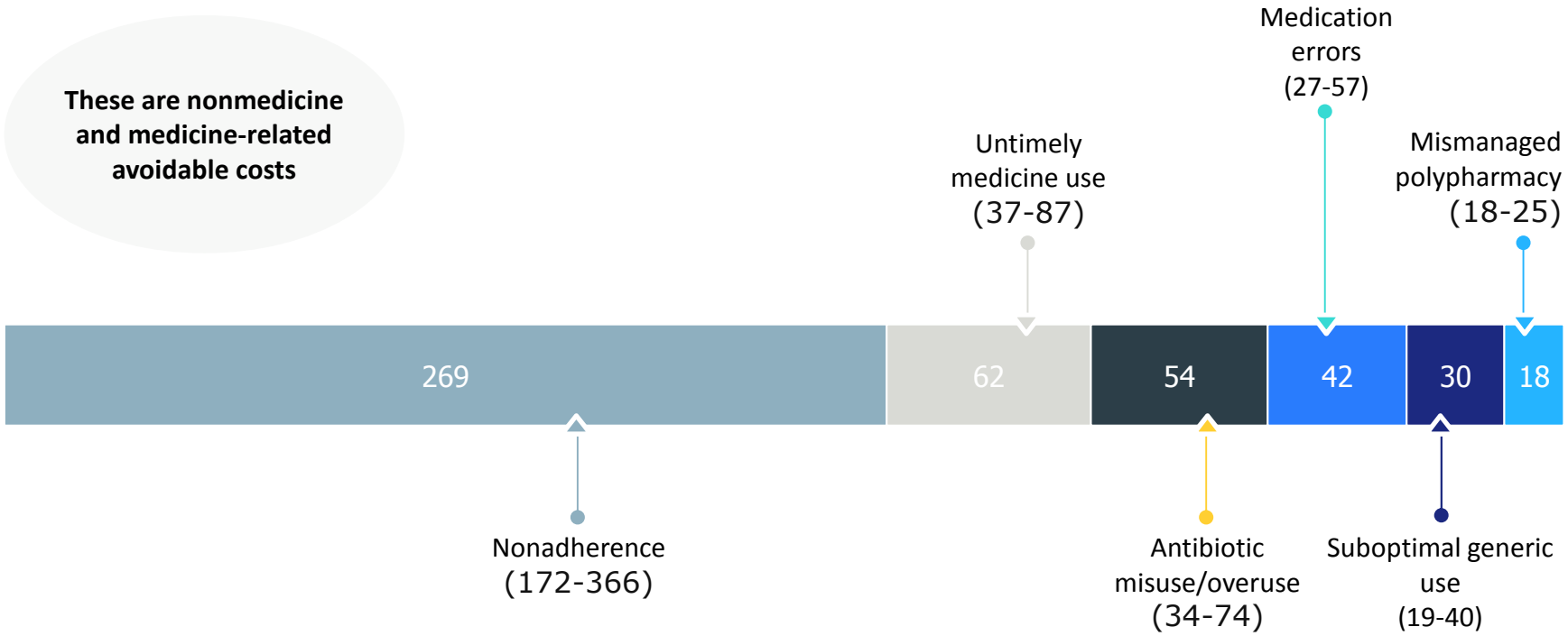
Medicine spending may increase or decrease: consistent and appropriate medicine use would increase medicine spending; reducing overuse and misuse would reduce medicine spending

Health outcomes would improve through better quality of life, reduced morbidity and mortality

… that results in a ~500 Billion USD avoidable cost opportunity annually

Annual magnitude of the opportunity in the health system
Total $Bn with minimum and maximum ranges

These are nonmedicine and medicine-related avoidable costs



This quantification effort is intended to trigger a meaningful discussion on how to assess the impact of responsible medicine use and not on the exact figures

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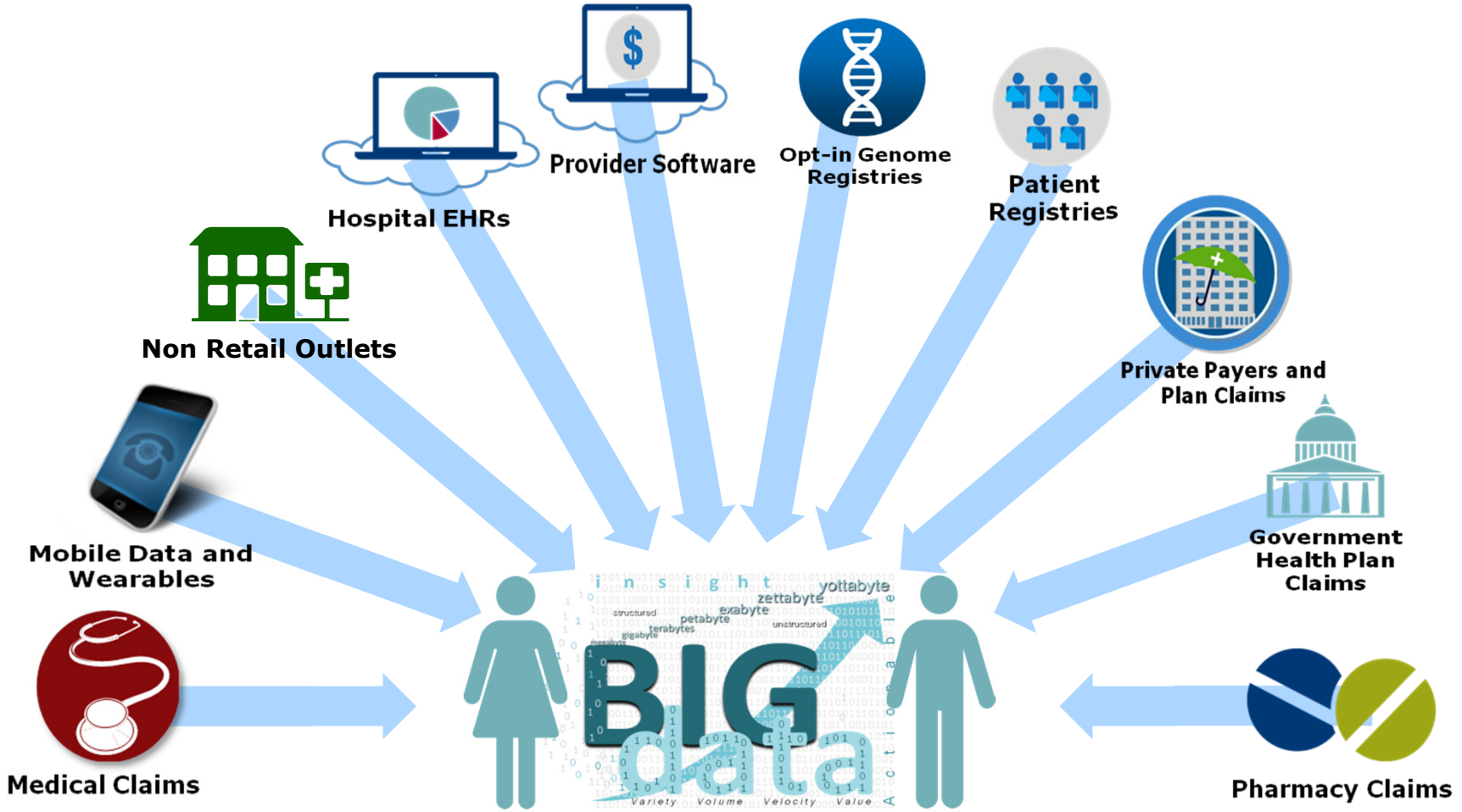
Growing availability of Big Data in healthcare



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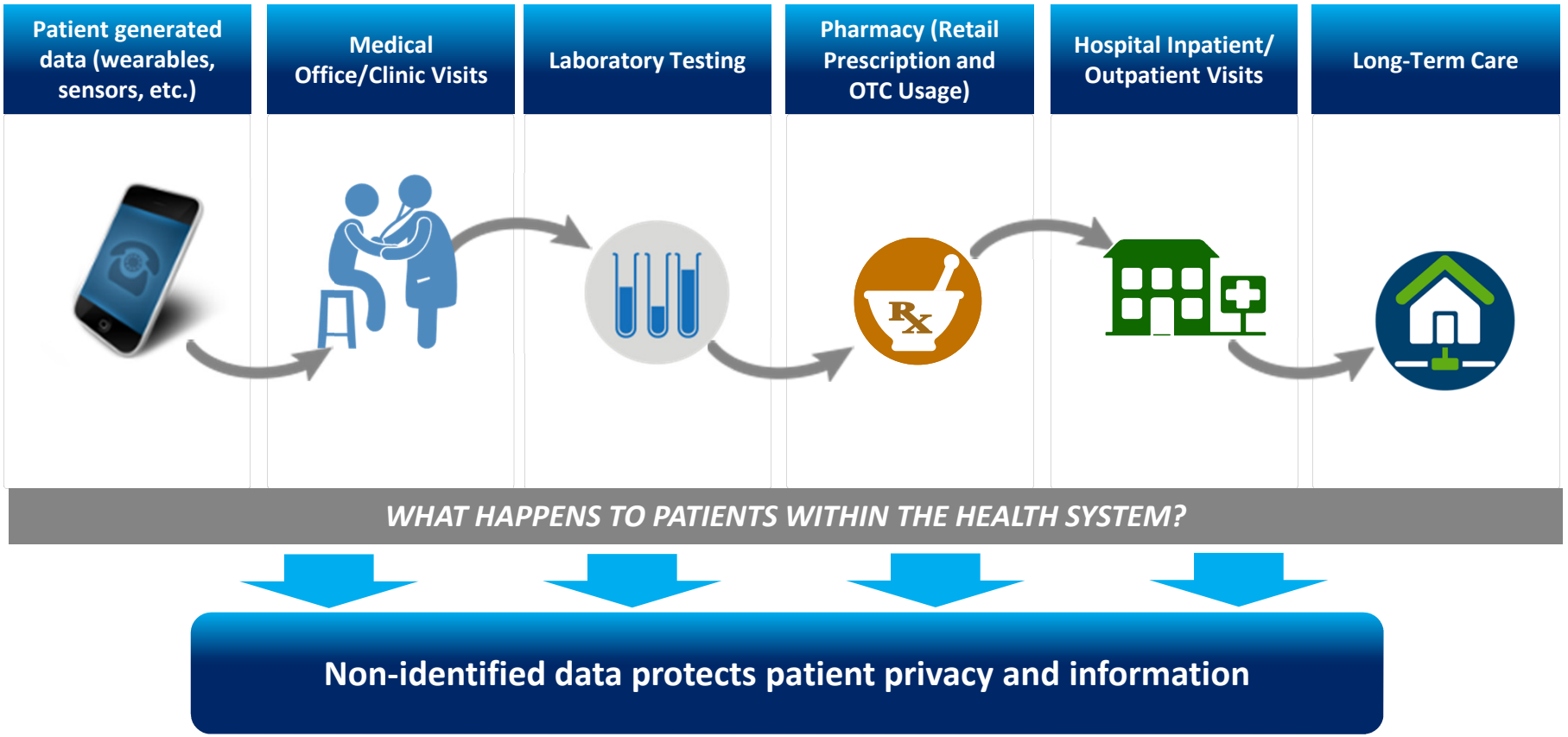
Non-identified data connecting fragmented healthcare



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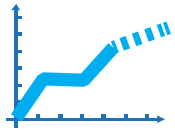
The value of predictive analytics

Predictive analytics can help overcome many common limitations of classical statistical methods encountered when analyzing complex data

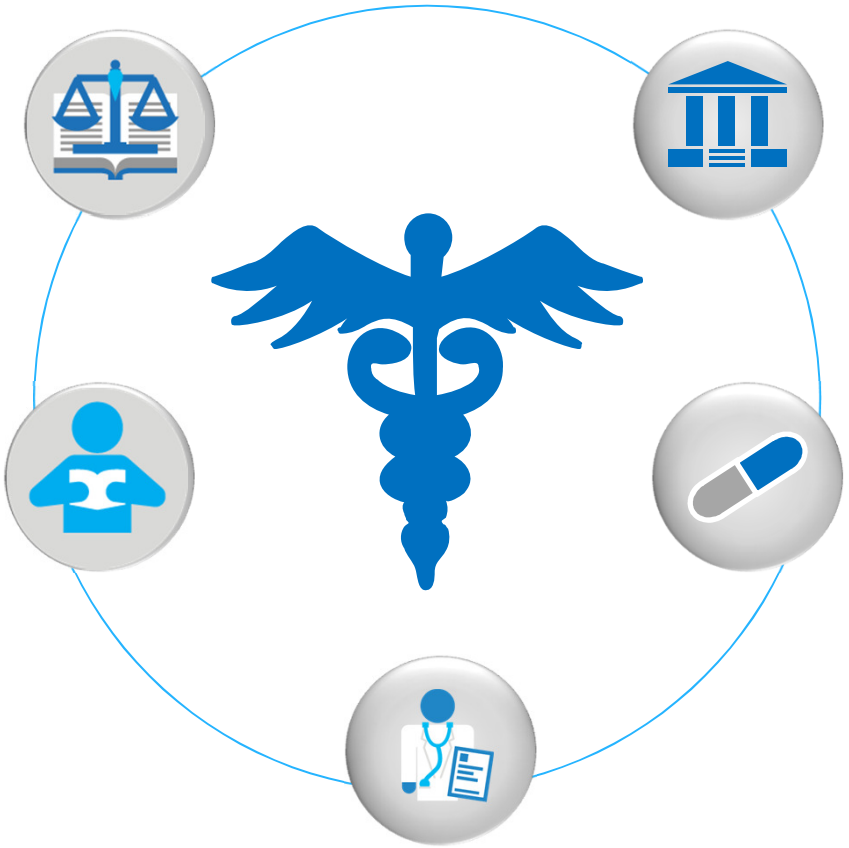


Study Feature	Classical statistics	Predictive analytics
Objective	Understanding associations between variables	Prediction / knowledge discovery
Scientific philosophy	Hypothesis-driven / variables pre-specified	Data-driven / variable agnostic
Statistical method (examples)	Descriptive, regressions	Random Forest, Support Vector Machines, Neural Networks
Strengths of approach	Widely understood; ideal for testing hypotheses; estimate impact of variables	Flexible / powerful; ideal at producing robust evidence in complex settings; prediction accuracy

The value of predictive analytics is being recognised across healthcare

Regulators
FDA now routinely license medical devices embedding advanced machine learning algorithms

CMS
Investing in predictive analytics to combat fraud leading to savings of $210m in 2013



Academia
Stanford, Johns Hopkins and dozens of other prestigious universities are building research centres to promote machine learning applications e.g. personalized medicine

Life Science
Widespread investment by pharma in predictive analytics to accelerate drug discovery, identify prognostic and predictive biomarkers, etc

Health Care Providers
Providers are reducing costs and improving patient health through predictive models for population risk management and hospital readmissions e.g. 20% reduction by Northshore health system in high-risk hospital readmissions

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Predictive analytics can add value throughout the product lifecycle

R&D

Accelerate drug discovery and understanding of disease pathology through identification of

- Lead compounds
- Mutations predictive of disease

CLINICAL DEVELOPMENT

Optimize clinical trial design and market access strategy through identification of

- Predictive biomarkers / factors for treatment response
- Prognostic biomarkers / factors for disease progression
- Patient recruits for trials

...as well as changing the TPPP of a major development program to increase the life-time value of a product

POST-LAUNCH

Enhance product uptake through

- Evidence generation on treatment effectiveness, patient targeting, treatment response profiling
- Supporting clinical decision-making via analytics-enable technology e.g. risk stratification tool

Applying predictive analytics capabilities

Identifying non-diagnosed patients: Finding new patients for treatments

e.g. rare disease detection, market sizing, physician targeting

Risk stratification for disease progression

Identify target populations for treatment through prediction of patients most likely to experience disease progression and who stand to gain most from treatment

e.g. identify high risk target groups for prioritized efforts to access

Treatment response profiling

Increase product understanding, targeting and development through identification of treatment patient responders and non-responders

e.g. identifying target groups for market access, post-launch for product understanding and identifying unmet need

Each of these analytics offerings can help realize significant health system benefits

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Identifying Undiagnosed Patients

OVERVIEW

- Diagnostic algorithms help identify undiagnosed patients
- Algorithms can help find new patients for treatments through:
  - Accelerating time to diagnosis
  - Identifying pockets of untreated patients / physician targeting
  - Detecting patients with rare diseases
- This can be achieved through evidence generation, salesforce targeting or automatic alerts in EMR systems

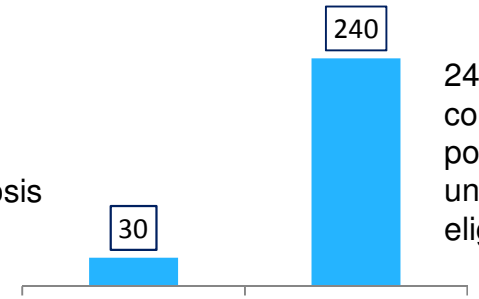
IMS STUDY

- A predictive algorithm was developed to identify potentially undiagnosed patients with a rare oncology disease
- Analysis was based on linked primary and secondary-care data
- 350 confirmed cases were identified out of ~3 million patients
- Algorithm development was based on 300 of the confirmed cases and 30k random unconfirmed cases
- The algorithm was validated using the remaining 50 confirmed cases and 70k random unconfirmed cases

OUTCOMES

- Out of the 70k patients in the validation data, the algorithm identified 270 patients suspected of having the disease, of which:

30 cases had a confirmed diagnosis (60% of the 50 confirmed cases)



240 cases had no confirmed diagnosis - potentially undiagnosed and eligible for treatment

Preliminary results; study on-going.

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2. Risk stratification for disease progression

OVERVIEW

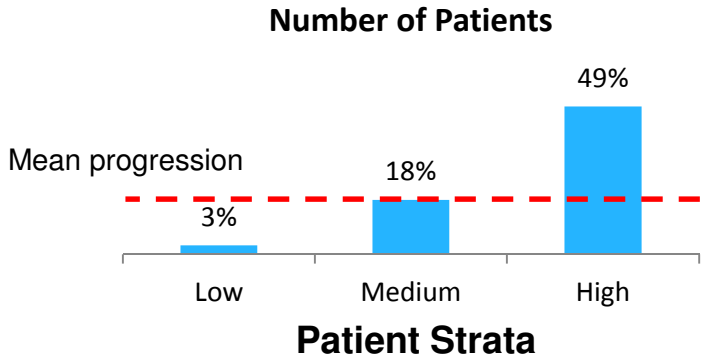
- Identifying patients most likely to experience disease progression
- Evidence can support product uptake by identifying types of patients who stand to gain most from treatment
- Published results can inform guideline development
- Predictive algorithm can be built into EMR to facilitate clinical decision-making

IMS STUDY

- A client has an ophthalmology drug expected to launch shortly
- Payers are unlikely to approve reimbursement for the large indicated population
- The client is interested in identifying patients most likely to progress from mild to advance disease stage
- The evidence can be used to secure reimbursement for targeted patient group

OUTCOMES

- The model was highly effective at stratifying patients by risk of disease progression[1]
  - Patients were **15 times more likely** to experience disease progression in the **highest compared to lowest strata**
- Key prognostic attributes included number of Optical coherence tomography, number of eye diagnoses and hypertension



Source: IMS RWE Solutions; Advanced Analytics

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3. Treatment response profiling

OVERVIEW

Identifying treatment responders / non-responders can support:

- Targeted market access strategy focusing on positive responders
- Enhanced product understanding by profiling types of patients who benefit most from treatment
- Assessment of unmet need

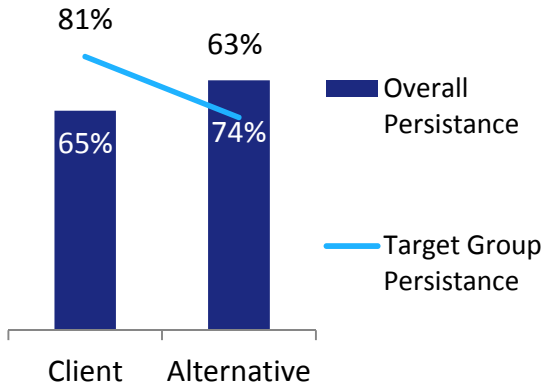
IMS STUDY

- A client with a product in neurology, was concerned about losing market share to an alternative product
- The client wanted to know the profile of patients who were more persistent (adherent) on their product compared to the alternative product
- This evidence could be used for targeted messaging

OUTCOMES

Analysis was based on uplift models, designed to identify treatment heterogeneity[1]

- On average, the persistence rate was 9% lower for the client product
- However, analysis revealed a sizeable potential target group
- Not only was the persistence rate for the client product high in the target group, it was 8 percentage points higher than for the alternative product
- In relation to all treated patients, the target group was more likely to be male, younger and have fewer co-morbidities.



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Future advancement of predictive analytics

Dependencies for increased value from predictive analytic techniques

Access to data sources	• Connected health data sets • Genomic data • Lab values
Advanced analytic tools	• Customization of existing technologies to healthcare-specific challenges
Application to decision-making	• Ease of use • Widening use by researchers • Evidence of impact and value