Predictive Modeling and Disease Management Applications

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Disease Management – Introduction

A multidisciplinary, systematic approach to health care delivery that:

Includes all members of a chronic disease population

Supports the physician-patient relationship and plan of care

Optimizes patient care through prevention, proactive, protocols/interventions based on professional consensus, demonstrated clinical best practices, or evidence-based interventions; and patient self-management

Continuously evaluates health status and measures outcomes with the goal of improving overall health, thereby enhancing quality of life and lowering the cost of care

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Disease Management – The Transition

Traditional	Progressive
Benefit-Centered	Member-Centered
Reactive	Proactive/Anticipatory
Cost-Containment	Quality/Outcomes
Acute episodes of care	Long-term Management
“Diagnosis” Driven	Interplay of Illness and Environment
Minimal Member/Physician Contact	Direct Member Contact with Physician Collaboration
Arranging, Authorizing, Approving	Assessing, Planning, Coordinating, Monitoring, Evaluating

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Predictive Modeling – Functional Definitions

Use of analytical and statistical techniques applied to specific clinical indicators (such as medical and pharmacy claims data, laboratory values, and other clinical information) to identify members who are most likely to incur high health costs and concomitant deterioration in health.

Models used for underwriting and models used to effect medical management may differ. Correlation coefficients (R-squared and Pearson) may be more valuable for underwriting.

Sensitivity, specificity, and positive predictive effects are essential for medical management.

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Predictive Modeling Essentials

Accepts readily available information, including medical claims, pharmacy claims, and lab test results

Leverages Symmetry's Episode Treatment Groups (ETG) to build clinically homogenous markers of future risk

Predicts both future expenditures and calculates the probability of a hospitalization

Multiple predictive horizons available based upon available data and business needs

Transparent – allows users to easily understand the clinical and utilization factors affecting a member's risk

Characterizes members along a number of dimensions, including clinical details and gaps in care

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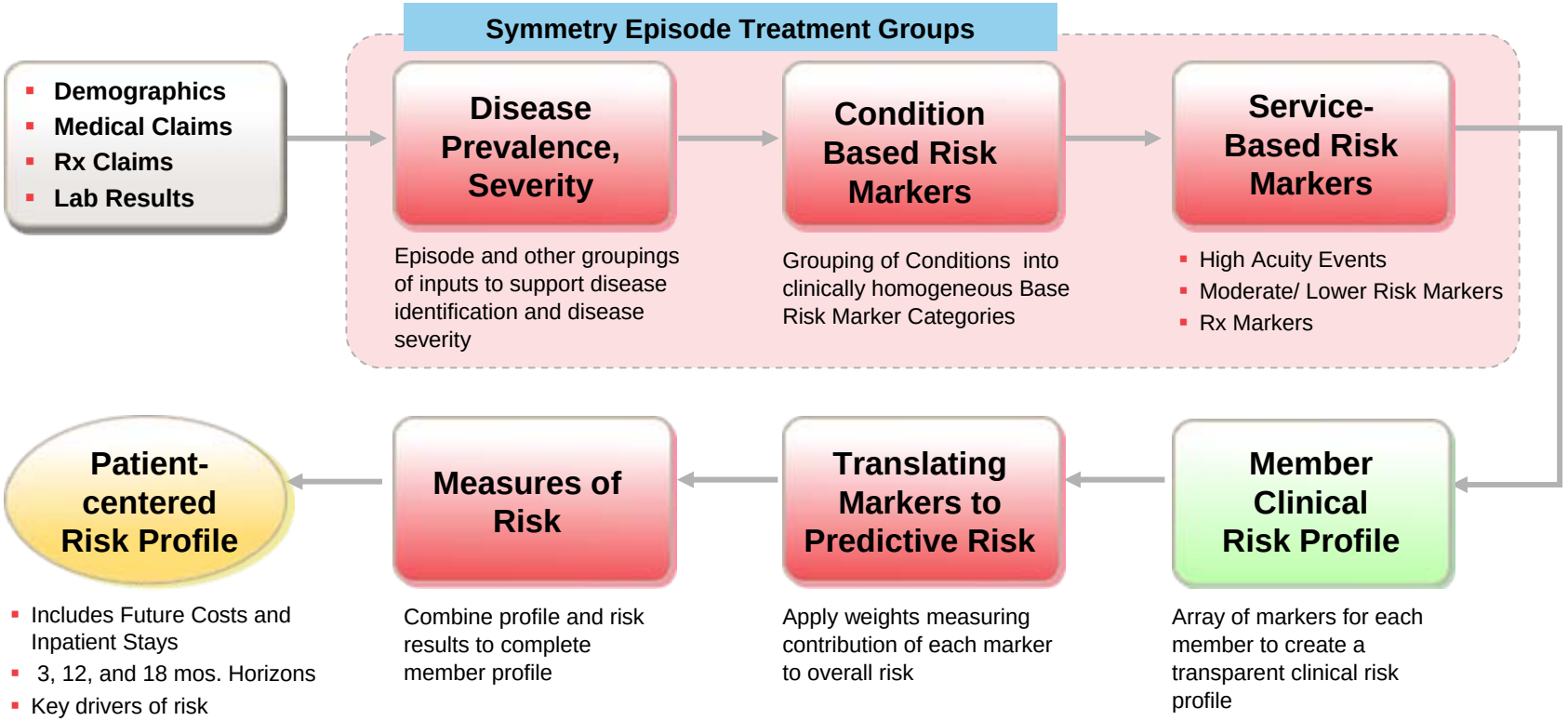
Measuring Individual Risk

Measures of risk at the individual member level



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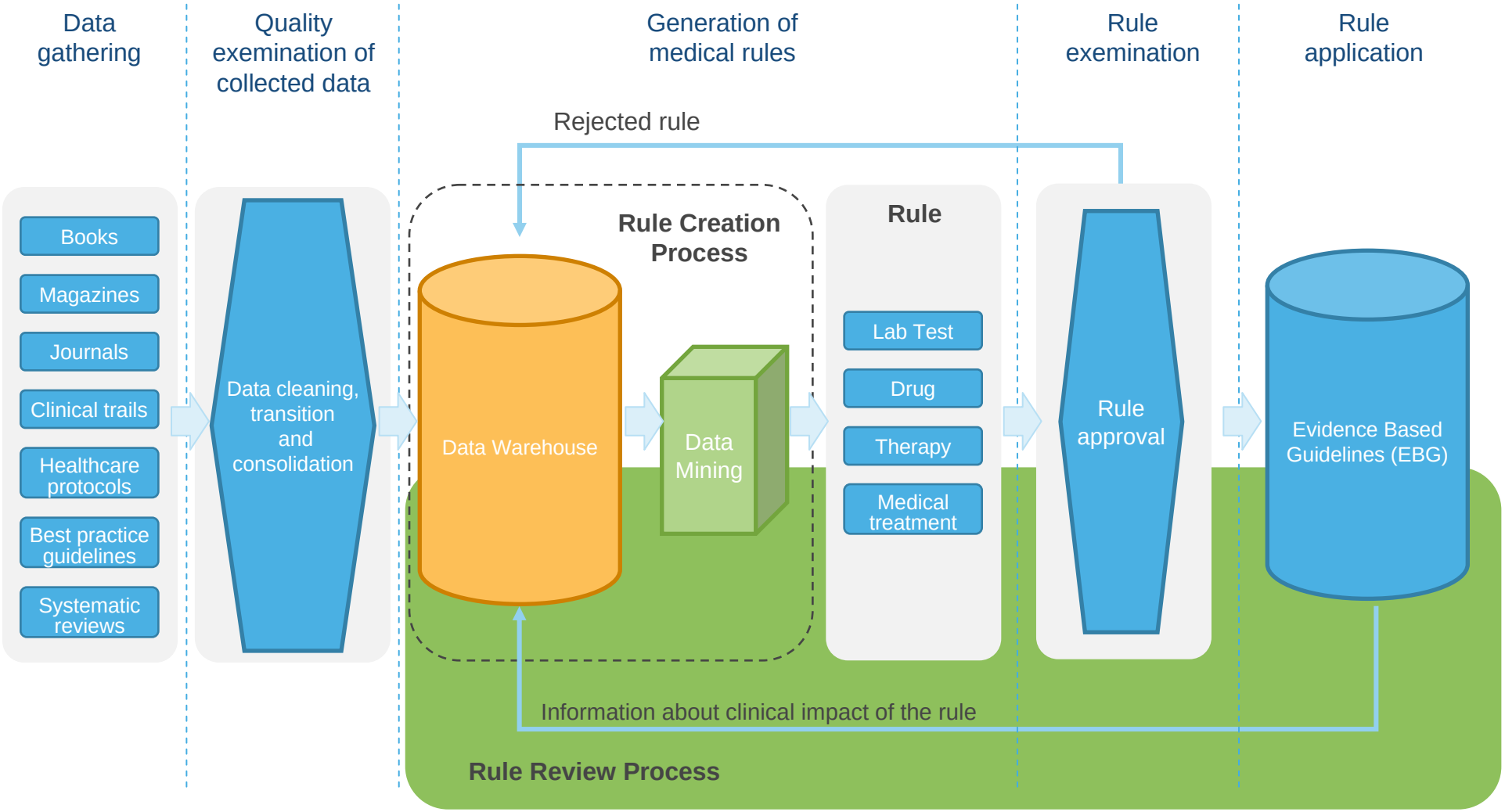
Risk Generation Framework



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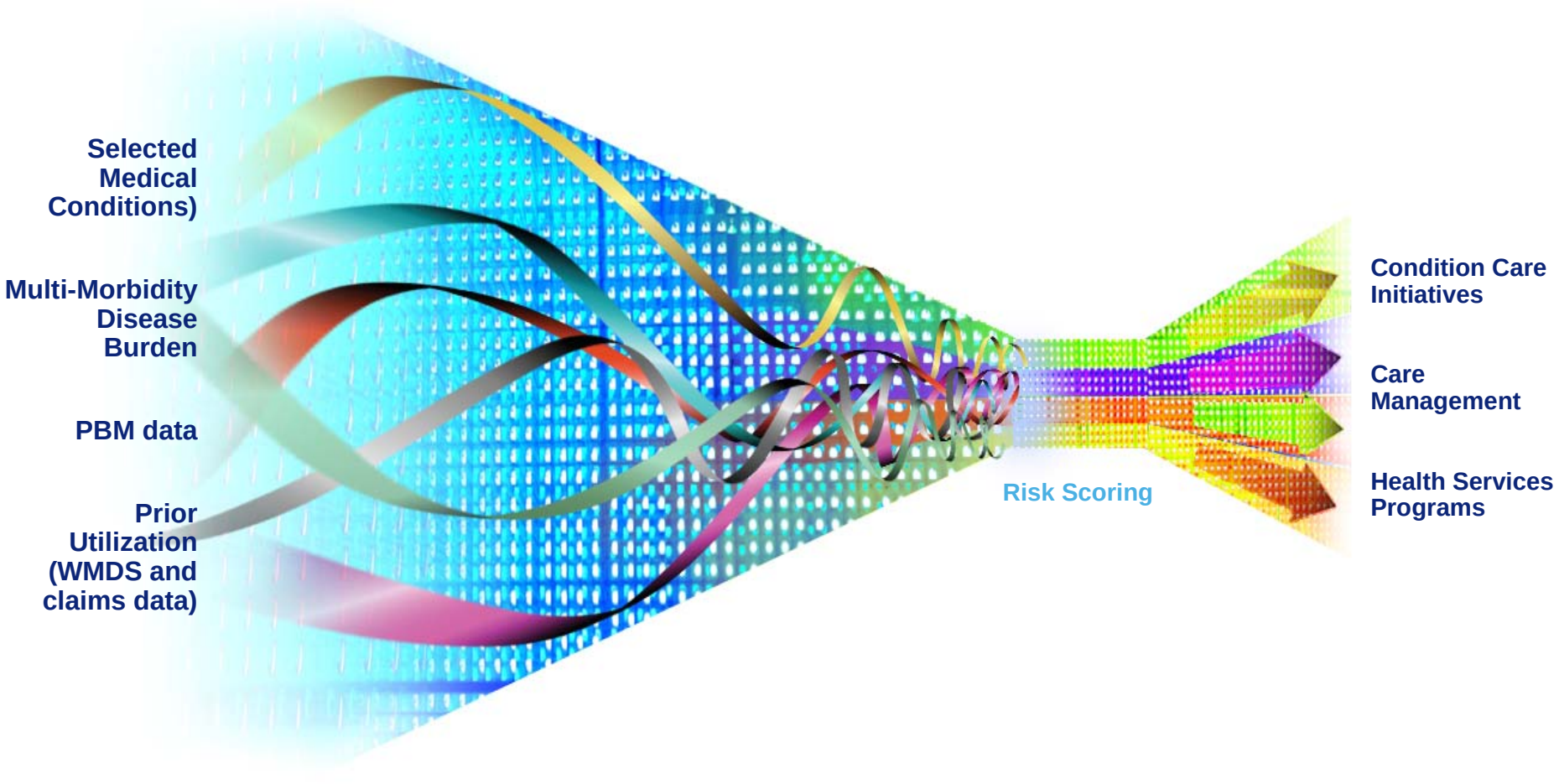
Connecting Past and Current Health with Future Risk



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Step One – Data Inputs Used for Prediction

- Medical claims
  - diagnosis codes (ICD9/10-CM)
  - procedure codes (CPT, HCPCS)
- Pharmacy claims – NDC codes
- Demographics (age, gender, ethnicity, geography)
- Clinical data – lab results
- A 12-month “experience period” used for prediction
- Data needs – complete, consistent, valid
- Supports a range of input data scenarios

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Step Two – Markers of Risk

What is a Risk Marker?

Characteristic that can be assigned to an individual and used to differentiate risk

Goal: optimize use of available inputs to create markers that are:

- Predictive
- Provide clinical insights
- Robust across populations and over time

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Step Two – Markers of Risk (cont.)

Predictive models should use ETGs and other information to "optimize" use of data to create risk markers

ETG episodes of care – identify:

- clinical conditions
- levels of condition severity
- link services to those conditions

Within that context, service and treatment patterns, lab results and other information are then assessed

Result is a clinical risk profile for each individual – array of their risk markers

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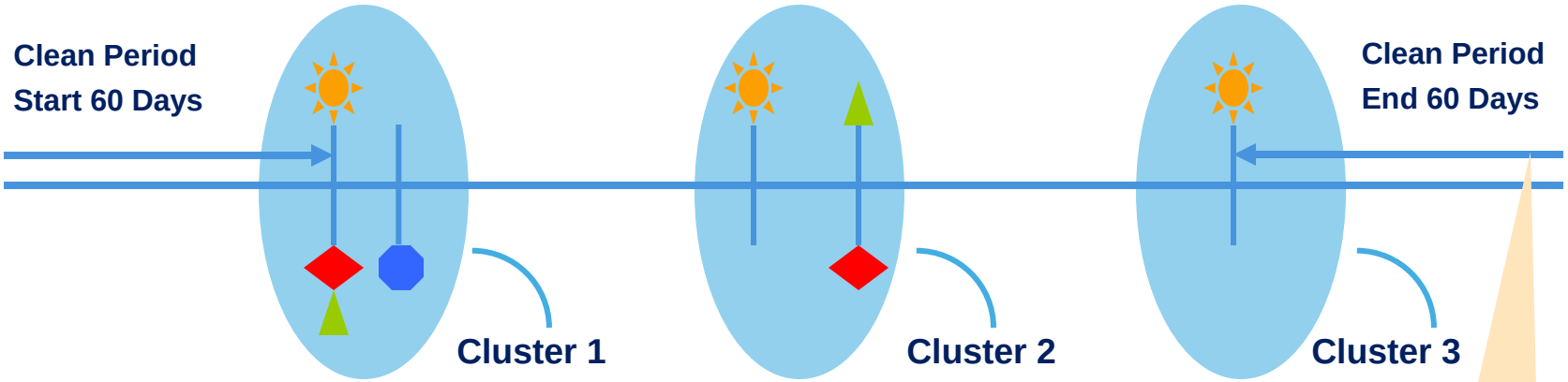
Example: Acute Bronchitis Episode



Office Visit (Anchor Record)

Lab Services (Ancillary Record)

Radiology (Ancillary)

Pharmacy Records (Ancillary)

Does not require the episode to be closed

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Common Risk Markers

- Base and Severity
- Medical Service
- Higher-acuity events (inpatient, ER) – type and timing
  - Episode cluster markers – cluster frequency and timing
  - Pharmacy Service
- Age/Gender
- Lab Results
- Hierarchies are applied

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Marker Examples

Markers and Risk Weights for Selected Chronic Marker Families

Marker Type	Diabetes	Ischemic Heart Disease	Heart Failure	Asthma and COPD
Base Marker	0.420	0.563	0.762	0.160
Added severity I	0.325	0.169	0.205	0.105
Added severity II	0.681		0.443	0.369
High episode clusters, recent 3 months	0.907	0.713	1.366	0.751
High episode clusters, recent 12 months	0.721	0.480	0.484	0.652
Moderate episode clusters, last 4-12 months	0.318	0.158	0.201	0.250
Emergency room visit, recent 3 months	0.669	0.364	1.368	0.185
Acute care inpatient event, recent 3 months	2.362	0.963	3.052	1.475
Acute care inpatient event, last 4-12 months	1.078		0.729	0.572

All members identified with a condition receive the base marker
Some members receive added risk based on ETG and **severity** level on episode triggering the base marker
Some members receive added risk based on acute and cluster service markers (hierarchical)

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Pharmacy Marker Examples

Pharmacy services can:

Trigger a base marker

- Insulin
- HIV/AIDs antiviral treatment

Differentiate risk within a marker family

- Cardiovascular base marker, with anti-arrhythmic agents
- Cystic fibrosis, agents used to treat cystic fibrosis

Differentiate risk in general

- Agents to treat enzyme deficiency states
- Growth hormones

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Lab Result Markers

When available, lab results can be used to supplement the other markers of risk
Types of lab markers

- Presence of an extreme lab result, e.g.,
  - Alanine aminotransferase, extreme high value, recent period
  - Cancer-125 (tumor marker), high or extreme high value, recent period
- Trend in lab results, e.g.,
  - C-reactive protein, significant increase in result
  - Albumin, significant decrease in result

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Step Three – Translating Markers to Risk Measurements

- "Risk Weights" – measure a marker's incremental contribution to risk
- Estimated from large population (about 14M for V6)
  - Statistical approach depends on model
- Each marker must have its own weight for each of the models supported by
  - Model outcome being predicted, data inputs and timing impact weight assigned to a marker

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Predictive Modeling Outputs

- Individual's markers and the risk weights are combined to produce measures of risk
- Model should provide for each individual two key risk outputs:
  - Future risk, costs
  - Future risk, inpatient use
- These key risk outputs will differ depending on model (timing, application, etc.)
- Supporting information explaining risk score is also produced

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How To Interpret Weights

- A relative risk of 1.0 = the average person
- Therefore, a risk score of .70 means that the individual is only 70% as likely to use healthcare resources than the average person
- A risk score of 37.0 means that the individual is 37 times more likely to use healthcare resources as the average person

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Risk Score Interpretation Example

- **Measure of future risk:**
  - "Future Risk, Costs"
  - 12 month and 3 month values

Linear Relationship

- **Translation of risk into future healthcare costs:**
  - "Future Costs"
  - $$$ for next 12 months and $$$ for next 3 months

- **Relative risk for an inpatient admission:**
  - "Future Risk, Inpatient"
  - 12 month and 3 month values

Linear Relationship

- **Probability of having a future inpatient admission:**
  - "Inpatient Stay Probability" (Max Probability is limited to 90%)
  - In the next 12 month and 3 month time horizons

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Risk Scores

- Cost Risk Score – Relative risk of the member compared to other plan members with respect to utilization of medical services
- Admission Risk Score – The relative risk of this member compared to other people with respect to future, non-obstetric inpatient stays
- Inpatient Stay Probability – The probability that this member will have one or more non-obstetric inpatient stays in the next 12 months

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Risk – Prediction of Future Costs Example

		Relative Risk Score	Predicted Annual Cost
Base	Diabetes	0.420	$ 1,714
Severity	Diabetes, Added Severity II	0.681	$ 2,728
Service	Inpatient stay, diabetes within recent 3 months	2.362	$ 9,637
Base	Heart Failure	0.762	$ 3,109
Severity	Heart Failure, Added Severity I	0.205	$ 836
Service	High HF episode clusters, recent 3 months	1.366	$ 5,573
Demographic	Male, 55 – 64	0.616	$ 2,513
		6.412	**$26,161**

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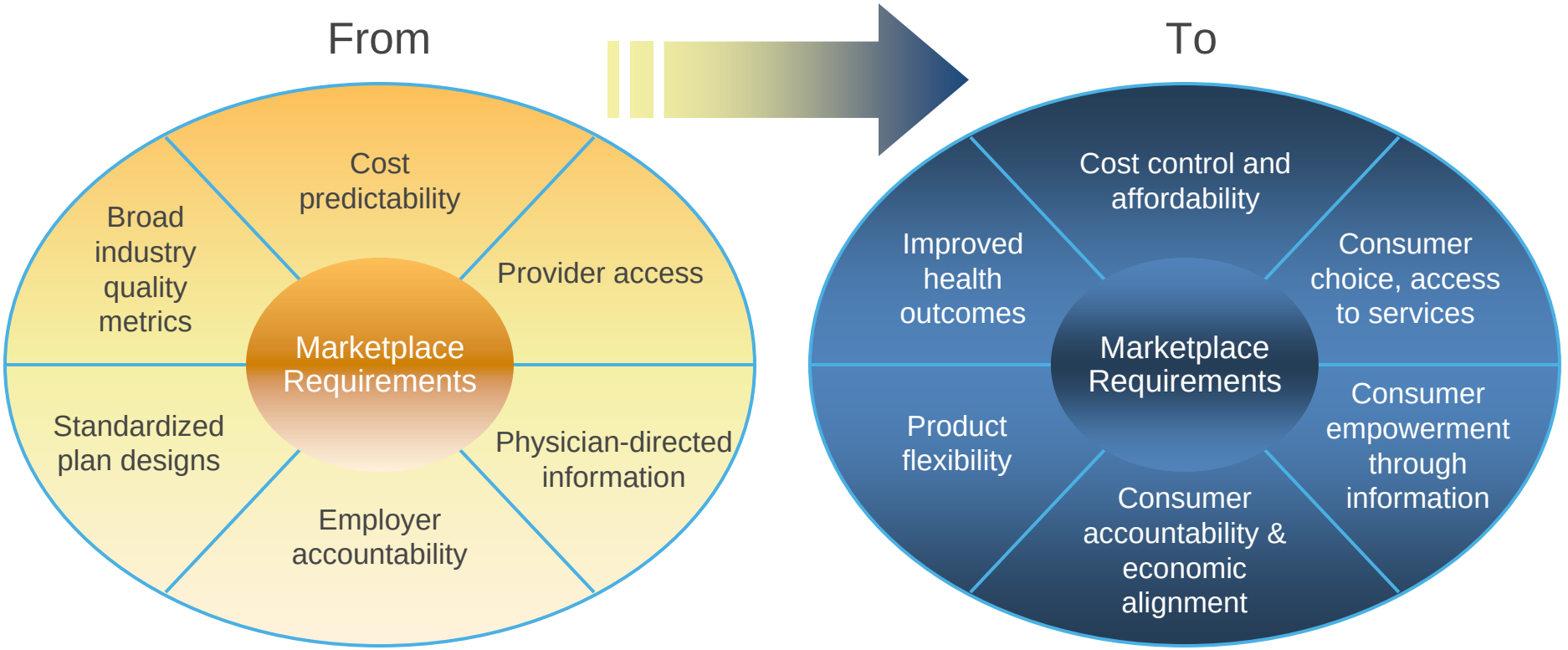
Bring It All Together

New market requirements are driving a new definition of success



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The Big Data = Big Win

THE SECRET OF SUCCESS IS THERE IS NO SECRET

Proactive identification instead of reactive

Coordinated, patient-centric care is key

Primary care integration at every level

Primary care provider as “quarterback”

Correct information disparities

Payors, clinicians, caregivers, families, patient all work together for a holistic continuum of care

Transition of care – bridging the gap between hospital discharge and primary care appointment

(Highest percentage of readmission usually occurs within the first two weeks of discharge)

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Limitations

The “Impact Factor” is critical to Medical Management. Level of “impact” varies

- Diagnosis
- Psychosocial factors
- Current treatment modalities
- Asymmetrical information
- Affect of medical site utilization
- Point of care continuum
- Disease progression
- Educational/socio-economical factors

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What Distinguishes Successful Models?

	MODEL SYNTHESIS
Targeting	▪ Patients with chronic conditions including co-occurring serious mental health diagnoses and substance abuse ▪ Those hospitalized in previous year or at time of enrollment
Intervention	▪ Conduct comprehensive in-home initial assessment ▪ Develop a mutually agreed upon “action plan” with goal ▪ Frequent face-to-face contact ~1/month
Primary care provider	▪ Strong rapport with primary care provider, specialist, hospital ▪ Face-to-face contact through co-location, regular hospital rounds, accompanying patients on physician visits ▪ Assign all of a physician’s patients to the same care coordinator when possible
Patient Education	▪ Provide evidence based education and coaching interventions for managing health, symptoms, and medications
Training	▪ Initial comprehensive training ▪ Teach-back and performance feedback
Community Link	▪ Coordinated communication among physicians, health and community providers, and patient and families

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Best Practices

- Follow evidence based practices/guidelines for care management
- Address psychosocial issues
  - Staff with experts in social supports and community resources for patients with those needs
- Being a communications facilitator
  - Care coordinators actively facilitating communications among providers and between the patient and the providers
- Implement self management, coaching and support with patient/family
- Implement effective medication management plan
- Manage care setting transitions
  - Having a timely, comprehensive response to care setting transitions (esp. from hospitals and skilled nursing facilities)

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Questions??

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