Population Based, Precision Medicine

A strategy to optimize employer population health & wellbeing

Presented by: Quest Diagnostics and Guest

18th Population Health Colloquium
Philadelphia, PA
March 20, 2018
Personalized Medicine, Machine Learning, and Genomics - A strategy to optimize employer population health & wellbeing

Session Agenda

1. **Workplace Screening as a Population Health Strategy to Identify and Engage High Cost Conditions** (30 min)
   Steven Goldberg, MD, MBA, VP, Chief Health Officer, Health & Wellness, Quest Diagnostics
   Maren Fragala, PhD, Director, HealthyQuest, Quest Diagnostics

2. **Similarity analysis in population data to provide predictive power in patient-centered outcomes** (30 min)
   Wendi Mader, Director, Marketing and Strategy – Health & Wellness, Quest Diagnostics
   Stewart Sill, Senior Health Advisor, Consumer Health Strategy, IBM Watson Health

3. **Population Based Precision Medicine: Delivering the Right treatment for the Right patient at the Right time across a population** (30 min)
   Jay Wohlgemuth, MD, SVP and Chief Medical Officer, Research & Development, Medical and Employee Health, Quest Diagnostics

4. **Panel Discussion-All** (30 min)
Setting the stage: Health Care Costs

Employers continue to confront annual increases in the cost of health benefits.

Current estimates have health care costs increasing by between 5.0% and 6.5% in 2018\(^1,2\)  

High Cost Conditions\(^3\)

Drive 31% of employer spend yet represent 1.2% of the employed population

$122,382  
Avg. high cost claimant cost annually

---

3. American Health Policy Institute (AHPI) survey of 26 large employers

---

Confidential—For Internal Use Only
Setting the stage: American Workforce Demographics

More Americans (153M) receive health benefits through an employer than any other source of coverage.

Healthcare coverage in U.S.

<table>
<thead>
<tr>
<th>Insured through: (number of people insured)</th>
<th>Total U.S. population 323.2 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employer</td>
<td>163 million (47.3%)</td>
</tr>
<tr>
<td>Medicare</td>
<td>55.5 (17.2%)</td>
</tr>
<tr>
<td>Medicaid</td>
<td>49 (15.2%)</td>
</tr>
<tr>
<td>Medicaid/CHIP</td>
<td>23.6 (7.3%)</td>
</tr>
<tr>
<td>Affordable Care Act</td>
<td>9.1 (2.9%)</td>
</tr>
<tr>
<td>Other</td>
<td>4 (1.2%)</td>
</tr>
<tr>
<td>Uninsured</td>
<td>29 (9%)</td>
</tr>
</tbody>
</table>

Source: Charles Gaba / ACASignups.net

Employment Population

Shaded area represents a recession as determined by the National Bureau of Economic Research. Click legend items to change data display. Hover over chart to view data. Source: U.S. Bureau of Labor Statistics.
Empowering better health with diagnostic insights

1. Vision

2. 2-Point Strategy

- **Accelerate** growth
  - Grow General Diagnostics
  - Expand Advanced Diagnostics
  - Extend Diagnostic Services

- **Drive** operational excellence
  - Enhance the Quest customer experience
  - Deliver invigorated operational efficiencies

3. Goals

- Promote a healthier world
- Build value
- Create an inspiring workplace

How We Operate

**Our principles**
- Focus on diagnostic information services
- Strengthen organizational capabilities
- Deliver disciplined capital deployment

**Our behaviors**
- Agile
- Customer Focused
- Transparent

**Our values**
- Quality
- Integrity
- Innovation
- Accountability
- Collaboration
- Leadership

NEWQUEST

Quest Diagnostics™
Quest is part of the healthcare infrastructure...

- Serves 50% of hospitals
- 470,000 Physicians connected to Care360 portal
- 675+ EMR interfaces
- Expanding retail presence

- Access to ~80% of U.S. insured lives
- Serves 1/3 of the U.S. adult population
- Q² Solutions helped develop 50% of all FDA-approved Oncology Precision Medicine drugs since 2014
Quest has a distinctive set of capabilities in our base business that we leverage to serve population health and extended care.

- **10,000 Mobile Nurses**
- **3 Large Scale Call Centers**
- **3,500 Logistics vehicles and 25+ aircraft**
- **Connectivity with 470,000 physicians**
- **5,000 Mobile examiners and phlebotomists**
- **2,200 Patient Service Centers**
Workplace Screening as a Population Health Strategy to Identify and Engage High Cost Conditions

Steven Goldberg, MD, MBA, VP, Chief Health Officer
Maren Fragala, PhD, CSCS*D, Director, HealthyQuest
Average Health Care Cost in 2017 was $13,482 per employee*

Employers paid $9,297 (69%) and employees were responsible for $4,185 (31%)¹

Health Care Costs by Industry¹

<table>
<thead>
<tr>
<th>Industry</th>
<th>Total Cost</th>
<th>Premium Costs</th>
<th>Pharmacy Costs</th>
<th>Professional Services Costs</th>
<th>Outpatient Costs</th>
<th>Inpatient Costs</th>
<th>Other Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Employers</td>
<td>$9,527</td>
<td>$2,762</td>
<td>$1,672</td>
<td>$1,818</td>
<td>$644</td>
<td>$888</td>
<td>$928</td>
</tr>
<tr>
<td>Retail/Hospitality/Food Services</td>
<td>$5,682</td>
<td>$2,616</td>
<td>$1,818</td>
<td>$888</td>
<td>$594</td>
<td>$1,011</td>
<td>$1,433</td>
</tr>
<tr>
<td>Banking/Financial</td>
<td>$8,478</td>
<td>$2,757</td>
<td>$1,527</td>
<td>$846</td>
<td>$644</td>
<td>$1,111</td>
<td>$1,669</td>
</tr>
<tr>
<td>Technology/Telecommunications</td>
<td>$9,262</td>
<td>$2,749</td>
<td>$888</td>
<td>$1,111</td>
<td>$928</td>
<td>$1,508</td>
<td>$2,641</td>
</tr>
<tr>
<td>Health Care Providers</td>
<td>$9,511</td>
<td>$2,641</td>
<td>$1,011</td>
<td>$888</td>
<td>$1,433</td>
<td>$1,669</td>
<td>$928</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>$8,928</td>
<td>$2,171</td>
<td>$1,508</td>
<td>$846</td>
<td>$437</td>
<td>$1,433</td>
<td>$2,641</td>
</tr>
<tr>
<td>Insurance</td>
<td>$6,946</td>
<td>$4,937</td>
<td>$1,011</td>
<td>$888</td>
<td>$1,433</td>
<td>$1,669</td>
<td>$928</td>
</tr>
</tbody>
</table>

Components of Health Care Spending¹

- Pharmacy: 31%
- Professional Services: 17%
- Outpatient: 3%
- Inpatient: 19%
- Other: 30%


* Includes out of pocket costs and contributions.
3 tier approach to controlling costs and improving care: plan design, health plan partner oversight, and population health

**Population Health – Improved care and lower costs**

- Cost Waste Health Risk
- Population Health Experience Quality

**Annual self-funded employer claims trend vs. Quest**

- 2015: 6.6%
- 2016: 6.2%
- 2017: 6.0%
- Self-funded Employers

- 2015: 5.7%
- 2016: 4.2%
- 2017: -1.0%
- Quest

Key spend categories  Quest employee population

- **$71 M**: 3,300 hospitalizations
- **$69 M**: 555,500 prescriptions
- **$28 M**: 5,053 Diabetic, 1,336 IHD patients, 500 stroke patients
- **$26 M**: 1,926 cancer patients, 451 diagnosed in '16
- **$15 M**: 2,880 back surgery, 290 hip, knee, shoulder surgery
- **$52 M**: 687 > $75K
- **$260 M**: Other
Quest employee offered population health programs target clinical benefit and ROI

Comprehensive health screenings allows us to identify likely high-cost claimants.

**Basic**
- Obesity
- Metabolic Syndrome
- Blood pressure
- Cholesterol

**Comprehensive**
- Diabetes
- Prediabetes
- Chronic kidney disease
- Tobacco use
- Colon cancer
- Cardiovascular disease
- Liver disorders
- Thyroid issues
- Sleep apnea

**Prevalence of Metabolic Syndrome**

[Map showing prevalence rates across different regions]
Need to identify and prevent potential high cost claimants

Comprehensive health screenings allow early detection of risk and intervention.

- Healthy weight
  - Normal labs
  - $3-4K/ year

- Overweight and Prediabetes
  - $5-9K/ year

- Type 2 Diabetes, CKD, and Heart Disease
  - $12-22K/ year

State of Our Employee Health

We carry a high health risk burden for chronic disease.

Blueprint for Wellness | 2017 Company Profile

Health Burden

- **Health Risk Score** 18% higher than benchmark
  - Employees = 1.34 vs. Benchmark = 1.16

- **Risk factors in employee population** (mod. or high):
  - 72% at risk for BMI
  - 59% at risk for Blood Pressure
  - 22% at risk for HbA1c

- **Modifiable lifestyle & behavioral factors**
  Opportunities for intervention to reduce health risk:
  - Exercise – 86%
  - Nutrition – 67%
  - Stress - 27%
  - Tobacco – 11.5%
# Focus on 3 conditions for health impact and value

## Prediabetes:
- **84.1 million** Americans have prediabetes
- **$510** annual costs per case
- **90%** are not aware they have the condition

## Diabetes
- **1 in 10** Americans have diabetes (diagnosed or undiagnosed)
- **$10,970** annual costs per case
- **↓ 58%** in 3-yr risk with diabetes prevention program & 5%-7% sustained weight loss

## Chronic Kidney disease (CKD)
- **1 in 7** U.S. adults have CKD
- **$12,700** annual costs per case (stage 4)
- **↓ 68%** in risk of adverse events with healthy lifestyle

---

Employees underestimate their illness burden

89% with High Risk for Chronic Kidney Disease, 59% for High Cholesterol, and 28% for Diabetes first learned of health condition through lab-based wellness program.

**Prevalence of chronic disease risk factors**

- **Obesity** (BMI >25): 7 of 10 at risk
- **Blood Pressure** (>120/80): 6 of 10 at risk
- **Cholesterol** (Total > 200, LDL > 130, ratio > 5.0): 5 of 10 at risk
- **Metabolic Syndrome** (3+ Risk Factors): 2.2 of 10 at risk
- **Tobacco** (+ cotinine): 1.2 of 10 at risk

**Newly identified health conditions**

- **Hyperlipidemia**: 52% identified
- **Diabetes**: 31% identified
- **CKD**: 59% identified
- **Obesity**: 21% identified
- **Blood Pressure**: 7% identified
- **Cholesterol**: 6% identified
- **Metabolic Syndrome**: 7% identified
- **Tobacco**: 2% identified

Quest Diagnostics Health and Wellness Database

Sustainability requires population health interventions

HealthyQuest bridges gaps in care to facilitate healthy living and reduce progression of chronic disease

**Care Pathway**

- **Screen**
  - Health Risk Assessment & Laboratory Test
- **Discuss with Physician**
- **Personalized Care / program**

**Better Health Outcomes**

**Population Health**

- Evaluate patterns in disease and health of large population
- Provides the best advice based on what we know works for most people
- Gives each person the best chance of staying healthy and getting well

- Prediabetes prevention
- Diabetes management
- Chronic Kidney Disease

~36,000 / yr
Physician Health Information Sessions

Empowering better health through personal *understanding* diagnostic insights

**Member experience**

- Better Understand: 94%
- Personalized: 94%
- Would use again: 94%
- Satisfied: 93%
- Results more relevant: 93%

**Frequently discussed Tests**

1. Cholesterol (total, HDL, LDL, ratio) (29-44%)
2. Vitamin D (38%)
3. hs-CRP (34%)
4. Glucose (23%) & HbA1c (15%)
5. Iron (16%) & Ferritin (8%)

- 88% discussed behavior change
  - diet (82%),
  - physical activity (56%),
  - meds (20%)

- 19% recommended physician follow-up in 1-4 weeks
  - (80% in 1-3 mos.; 1% in 6 mos.)

- 9% transferred to GrandRounds
Chronic Kidney Disease

Screening and physician follow-up to prevent progression of chronic kidney disease and associated adverse health consequences

Having kidney disease increases the chances of also having heart disease and stroke ¹

73% of end stage renal disease is attributable to modifiable risk factors, blood sugar, and blood pressure management ¹

198 individuals
eGFR <60 + no kidney related claims in the past 2 years

Enhanced screening
eGFR retest+ urine albumin Confirmed n~104

28 physician sessions to discuss results

Behavior Change
• 73% Diet
• 41% Physical activity
• 50% Medications

Follow-up
• 28% Nephrologist in 1-2 wks
• 40% PCP in 1-2 wks
• 48% PCP in 1-2 mos.

¹ CDC. National Chronic Kidney Disease Fact Sheet, 2017

Confidential—For Internal Use Only
Screening + Care drives measurable outcomes with our 16-week Diabetes Prevention Program

- Participants lost 4.5% bodyweight over 16 weeks\(^1\)
- 38% reduction in 3-yr diabetes risk\(^2\)

\(^1\)140 enrolled; 110 completed 4-8 sessions; 83 completed 9+ sessions.
Similarity analysis (Machine Learning) in population data to provide predictive power in patient-centered outcomes

Wendi Mader, Director, Marketing and Senior Health & Wellbeing Strategist
Stewart Sill, Senior Health Advisor, IBM Watson Health
Patient centered outcomes

“Given my personal characteristics, conditions, and preferences, what should I expect will happen to me?”
“What are my options, and what are the benefits and harms of those options?”

Factors relating to the burden of chronic disease

- Conditions in the environments in which people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks
- Factors related to urban design, school physical education, diminishing screen time, and workplace programs all stimulate physical activity
- Menu labeling, changes in food portion sizes, and increasing the availability of affordable, fresh produce can stimulate healthy diets
- Similarity analysis in population data by characteristics, conditions, and preferences can enable better health outcomes

Social Determinants of Health

- Economic Stability
- Education
- Neighborhood & Built Environment
- Health and Health Care
- Social & Community Context
Three key problems with current approaches to population health management

1. Screening is seen as an end point—not as a starting point.

2. Basic screening does not reveal potential high cost claimants.

3. High-cost claimants are not being provided convenient, rapid and simple access to care.
Patient centered, Value-based care

Effective population health management cannot be achieved without personalized medicine

**Population Health**
- Evaluate big datasets to discover patterns in the diseases and health of large populations
- Goal is to give each person the best chance of staying healthy and getting well
- Take the guesswork out of medicine so you get the best advice based on what we know works for most people

**Patient-centered Personalized Medicine**
- Individualizes care based on patients' characteristics such as their genetics, behavior, and environment.

- genetics
- behavior
- environment
Population Health to Systems Approach

Population health screenings can reduce future morbidity and mortality when it identifies an actionable disease or pre-diseased state in asymptomatic people.

**Population Health**

- Seeks the most precise treatments for individuals with the goal of achieving the best health for everyone.
- Data on large groups allows us to do subgroup analyses.
- How age, sex, and other factors affect disease, diagnosis, and treatment to achieve more specific health guidance.
- Population health allows us to draw the most individualized conclusions.
- Many approaches to wellness and prevention occur outside the context of clinical practice. (Frieden, 2010).

**Systems approaches to biology and medicine**

- Emerging model of medicine that focuses on maximizing wellness for each individual, rather than merely treating disease (Wood, 2004).
- Includes predictive, personalized, preventive, and participatory aspects.
- Extends beyond genomic medicine because “genes and their products almost never act alone, but in networks with other genes and proteins and in context of the environment” (Chakravarti, 2011).
- Provides opportunities to study and measure the effects of environmental exposures; (Gohlke JM, 2011).


Merging data sources for similarity analysis and predictive outcomes

A variety of factors predict health outcomes in obesity

- **Endogenous factors**: genes and gene expression;
- **Individual factors**: dietary intake, exercise habits, TV-viewing patterns, and income;
- **Neighborhood factors**, such as availability of grocery stores, walking environment, and food advertising;
- **School-related factors**: availability of sugary beverages and school health education;
- **Industry factors**: portion-size norms in restaurants and packaged foods;
- **State policies and regulation of food marketing**: national food distribution programs and support for various agricultural products;
- **Life-course factors**: history of breastfeeding, maternal health, and parental obesity.

Leveraging data integration to manage employee health

Blueprint for Wellness

- Fully integrated solutions
- Engagement platform
- Cognitive computing power
- Integration of medical claims data

Highly personalized reporting
Specific key areas of focus with integrated programs to support change
Predictive risk calculations providing deeper insights about the 'path a participant is on'
Similarity analysis including age, gender, and geographic comparisons
Personalized results that inspire change

- Relevant comparisons
- Prior year results
- Coordinated care
- Interactive online reporting

“...The way the screening results were presented was truly extraordinary.”
Blueprint for Wellness – opportunities for additional value

**Identification/Awareness**
- Personalized offers for screening based on demographics, health, and consumer profile
- More targeted risk feedback and predictive insights/modeling from integration of multiple data sources
- Deeper risk alerts related to specific conditions

**Education/Activation**
- Prioritized action list based on guidelines/research (eg, behaviors, preventive care)
- What works best for people like them

**Referral/Follow-up**
- Easy pass into personally relevant follow-up care/support/tools
- Follow-up alerts/monitoring to prompt actions at the right times
Data and knowledge driven approach

- Integrated participant record
- Longitudinal trend analyses
- “People like me” clustering
- Risk assessment and predictive models
- Guidelines extraction and prioritization
- Context personalization
Machine Learning Clustering Revealed 23 Unique Personas

- **Lifestyle**
  - Diet/Exercise
  - Trends

- **Awareness**
  - Pre-existing condition
  - Understanding of status
  - Goals related to change

- **Activation**
  - Access to PCP
  - Regular physical exams
  - Behavioral changes

- **Health risk**
  - Risk of CVD/Diabetes
  - Trends

**National cohort**

**Quest cohort**

**Individuals of similar socio-demographics**

**Specific micro-cohort**
Example Persona – The Macho Men
**Report Generation Process Overview**

**Determine individual state**
- Build longitudinal patient record (LPR) formed from HRA, Claims and Lab data
- Identify current medical conditions by applying guidelines on LPR
- Identify awareness, perception and engagement levels
- Identify trends by comparing current state with previous years of data found in the LPR

**Identify risks and cohorts**
- Compare my individual state, risks, and costs to average and best performers in cohort
- Determine readiness to change health behavior according to Stages of Change model
- Determine risk factors and their importance for each risk
- Assess risks and associated costs by applying standard risk and predictive models
- Identify cohort(s) by applying stratification models and clustering

**Generate recommendations**
- Generate all potential recommendations by applying medical guidelines
- Identify gaps in following recommendations in each area
- Determine medical benefits for closing the gaps based on guidelines, risks factors and SME
- Estimate the ease of closing the gaps based on SME input
- Compare myself to those who already follow specific recommendations

**Personalize**
- Prioritize and frame recommendations based on degree of benefit and feasibility to the user
- Select comparative emphasis based on cohort, behavior analysis & Stage of Change model
- Prioritize significant health alerts both positive and negative
- Determine the message type: gain framing, loss framing, reward & reinforcement
George and Ann have nearly **identical biometric profiles** (Metabolic Syndrome) but differ on other factors like trends, risk, awareness, behaviors, motivation, and comparison to peers, therefore have **different report features**.
Example Report Features for Persona Pairs

Alice and Sofia have nearly identical biometric profiles (Pre-Diabetes) but differ on other factors like trends, risk, awareness, behaviors, motivation, and comparison to peers, therefore have different report features.
Population Based Precision Medicine: Delivering the Right treatment for the Right patient at the Right time - across a population

Jay Wohlgemuth, MD, SVP and Chief Medical Officer
Population based precision medicine

- Aggressive population health implementation programs improve health and lower costs of care for employers and employees
- Use of population data drives programs to connect individuals to the precision care they need – right intervention, right cost, right provider
- Technologies are transforming the care we can deliver to consumers in their homes / communities
- ALL healthcare is consumer healthcare – reduction in complexity and increased convenience for consumers is a critical enabler of population health strategies
Unhealthy employees are hurting your bottom line.

1.2% of your employees are high cost claimants. Each of them cost $122k on average annually.¹

Also— health-related issues are costing you in lost work and medical copays.²

---

2. CDC. 2017. Business Pulse
We innovate across healthcare disease areas and technologies
> 650 MDs and PhDs with broad-ranging expertise
Quest Diagnostics has transformed to the leader in Diagnostic Information Services (more than a lab)

- Empowering better health with diagnostic insights
- Partnerships with leaders in healthcare
- Enabling consumers to access care
- Smart use of IT tools and integrated solutions
- Delivering advanced diagnostics to the community
- Big data to improve population health
- Hospital to Home: right care, right cost, in a convenient way
Quest Quanum™ - A critical enabler of solutions for populations, providers, and patients

### Analytics Suite
- Data Diagnostics
- Lab Utilization
- On Demand Informatics
- Clinical Pathways

### Clinical & Financial Suite
- eLabs
- ePrescribing
- Interactive Insights
- IBM Watson Genomics
- EHR
- Practice Management
- Revenue Cycle Management

### Digital Experiences
- MyQuest™
- Healthcare Provider Portal
- Quanum Analytics Portal
- BluePrint for Athletes™
Our Health Trends database — driving value for our customers and country

- HCV screening and treatment with CDC and Rx partners
- Closing gaps in care with Data Diagnostics®
- Diabetes prevention with AMA and CDC
- Improving mutation analysis actionability
- Annual Prescription Drug Monitoring Health Trends™ report
- Providing access to cancer precision medicine with IBM Watson and MSKCC
- Improving clinical trials enrollment and CDx development and commercialization
The Quest universe of patients in the US that potentially qualify for a clinical trial: 180,000
For the same trial, using traditional clinical trial units, 8000 people are identified.
National population data enables treatments for “rare” diseases with targeted therapies

- Hereditary Xerocytosis (HX) genetic disease causing hemolytic anemia
- Mutations in ion-channel proteins in RBC membrane, targeted therapy inhibits PIEZO1 is mutated in the majority of cases
- 48,404,254 patients representing ~20% of US population across all 50 states characterized for Hemoglobin and MCHC suggest US prevalence of HX is higher than thought – estimate 34,249 ~1:1400 US adults aged 18-99
- Unexplained anemia or elevated MCHC, as well as -> potential HX -> enrollment in pivotal trials (2019)

In A First, Pfizer Spins Out Biotech Firm With $103 Million In Funding
September 25, 2017, Ellie Kincaid, FORBES STAFF

Prevalence Estimate of Possible Hereditary Xerocytosis as Derived from a Large Laboratory Database

Harvey W. Kangham, Justin K. Nile, Denis R. Gallagher, Alexis River, Seth L. Alper, Carlo Brugn, L. Michael Snyder.
1. Quest Diagnostics, Marlborough, MA 01752
2. Division of Nephrology and Vascular Biology Research Center, Beth Israel Deaconess Medical Center, and Department of Medicine, Harvard Medical School, Boston, MA 02215
3. Department of Laboratory Medicine, Boston Children's Hospital and Department of Pathology, Harvard Medical School, Boston, MA 02115
Quest and Q² Solutions are enabling all aspects of drug and companion development.

Integrated CDx Solutions with

Marker selection & study design, Informatics/Analytics

Assay development, validation & scale up

Strategic consulting: regulatory & reimbursement, Enrollment Solutions

Deep experience in 3-4 way CDx development relationships

Global clinical trial wraparound services including Central Lab

Registration & market access expertise (510(k); PMA; CE Mark)

Access to Reagent kit production / GMP

Commercial, diagnostic & market analytics capabilities

Pre-launch medical communications & proficiency training

Rx

Preclinical
Clinical Development
FDA Filing
Launch

IVD

Feasibility
Development
Lab Validation
Clinical Validation
IVD Registration
Commercialization & Modification

LDT
We are delivering healthcare at the right time, in the right place, at the right cost, in a more convenient way

Hospital to Home: Quest Extended Care Services

- 7000 mobile phlebotomists and NPs
- Self-collection / minimally invasive technology
- Telemedicine enabled referral into appropriate care
- Quest Hospital services – service 50% and run 140+ hospital labs
Six sites open in Texas and Florida
Population health: an integrated solution to identifying and closing gaps in care can help effectively deliver solutions to those in need

Identification of gaps in care

Support through provider workflow

Extend care: PSC, retail, mobile nursing, home care

Target Gaps in Care for Diabetes

Care360® or Quest’s integration with nearly 600 EHR platforms

MyQuest
Closing gaps in care in the community
Example: Premier ACO Diabetes Gaps

- Premier ACO has ~10,000 diabetics in DFW and Southern OK with MANY gaps in care

<table>
<thead>
<tr>
<th>Diabetics</th>
<th>HbA1c gaps</th>
<th>Retinal exam gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,371</td>
<td>5,500</td>
<td>6,118</td>
</tr>
</tbody>
</table>

- Given revenues associated with gap closure, and the difficulty in closing gaps, a shared savings ACO model is appropriate

- Significant focus on rural areas where patients can be harder to engage

- Quest is helping Premier close these gaps through
  - Use of our PSCs, Walmart sites, Visiting nurses,
  - EMR data exchange services,
  - Home based self-collection kits,
  - Chronic care management, program enrollment and
  - Deployment of medical diagnostics in the field

Identify eligible participants
Conduct AWV & schedule appointment
Patient obtains services from Physicians and Partners
Documented in EMR, Care360, Partner Rad System (Mammography)
Interventions & Resources team available to patients for follow up
Patient, physicians, ACO, Care Managers provide results
Together with our partners, we will address major gaps in medical care through population based precision medicine.

- 28M+ Lipid panels
- LDL
  - 70
  - 100
  - 130
  - 160

Gaps in Care

- 834,500 of U.S. adults have FH
- 73.5M in the US have high LDL
- 1 out of every 3 with high LDL are treated to guidelines

FH Genetic Testing and Care

Cholesterol lowering therapy initiation

Cholesterol lowering therapy under treated
At Quest we are improving care and lowering costs through population health

**Annual self-funded employer trend vs. Quest (blue line)**

- **Lowering costs for Quest**
- **Improving care and costs for employees**

**Our formula for effective population health depends on our Blueprint for Wellness**

- **Engage**
- **Screen**
- **Identify**
- **Interpret**
- **Connect to Care**
- **Intervene**
- **Prevent**
- **Save**
**Connect Members to Care: Physician Health Information Sessions**

Immediate access to a board-certified physician

Referral / enrollment in population health solutions (pre-diabetes, diabetes, smoking cessation, renal care, home sleep study)

Referral to in-network providers based on needs

Secure follow-up report

Questions about your screening results?

Get the answers you need from a board-certified physician

- Over the phone
- When it’s convenient
- At no cost to you

To schedule your free physician consultation:
- Go to TH.PWNHealth.com/PHIS/CompanyABC
- Call 1.844.659.3998.
Focus on 3 conditions for health impact and value

### Prediabetes:
- **84.1 million**
  - Americans have prediabetes
- **$510**
  - Annual costs per case
- **90%**
  - Are not aware they have the condition

### Diabetes
- **1 in 10**
  - Americans have diabetes
- **$10,970**
  - Annual costs per case
- **↓ 58%**
  - In 3-yr risk with diabetes prevention program & 5%-7% sustained weight loss

### Chronic Kidney disease (CKD)
- **1 in 7**
  - U.S. adults have CKD
- **$12,700**
  - Annual costs per case (stage 4)
- **↓ 68%**
  - In risk of adverse events with healthy lifestyle (BMI, PA, not smoking, diet)

---

Blueprint for Wellness® powered population health programs: Medical and health economic yield

<table>
<thead>
<tr>
<th>BFW Solution</th>
<th>Medical and Financial ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes prevention – testing and care</td>
<td>✓ Quest target 2,279 enrolled in 2018</td>
</tr>
<tr>
<td></td>
<td>✓ 26% risk reduction for progression to diabetes</td>
</tr>
<tr>
<td>Chronic renal disease prevention and care</td>
<td>✓ 30M in US have CKD, 85% are unaware</td>
</tr>
<tr>
<td></td>
<td>✓ Quest 2017: 800 invited to program, Including 14 at stage IV or V and many more potential stage I-III</td>
</tr>
<tr>
<td></td>
<td>✓ 70% of those contacted agreed to participate</td>
</tr>
<tr>
<td></td>
<td>✓ $0.5M per year saved by preventing 4 patients from reaching ESRD</td>
</tr>
<tr>
<td>Colorectal cancer early detection and prevention</td>
<td>✓ 4,500 engage in screening (FIT)</td>
</tr>
<tr>
<td></td>
<td>✓ 315 (7%) positive; 17 (5.4%) with cancer</td>
</tr>
<tr>
<td></td>
<td>✓ Early detection reduces 5 year death rate by 33%</td>
</tr>
<tr>
<td></td>
<td>✓ Extends life of 2 members 5 years</td>
</tr>
<tr>
<td>Home based sleep diagnosis and care</td>
<td>✓ Rapid and cost-effective home based diagnosis of OSA</td>
</tr>
<tr>
<td></td>
<td>✓ Avoidance of very costly office based sleep diagnosis</td>
</tr>
<tr>
<td></td>
<td>✓ Appropriate and high quality care for underlying cause</td>
</tr>
</tbody>
</table>
Chronic Kidney Disease | Program example

We can estimate the clinical benefit and economic return

Chronic kidney disease (CKD) in the U.S.:

- 30M have CKD, and 85% are unaware of their disease
- ~$100B annual healthcare costs for advanced stage CKD
- Blood test identifies those with CKD—glomerular filtration rate (eGFR)

Company population (US) = 13,811 average age = 40 66% female

- Employees at risk
- Confirm CKD by retesting
- Telemedicine consult with M.D.
- Referral to PCP or nephrologist

Health & Financial Benefit

- Year 3: 7 severe 3 failure, $389k
- Year 5: 9 severe 5 failure, $606k

Progression rates based on: Sud et al., 2016; Sud et al., 2014; Chiu et al, 2008
Blueprint for Wellness: improving care and lowering costs through population health

Engage Screen Identify

- BFW
- PSCs
- Worksite programs
- Our examiners
- Retail
- Wellness engine

Interpret Connect to Care

- BFW - MyGuide
- PHIS (Physician Health Information Sessions)
- BFW results to PCP
- Grand Rounds – 2nd opinion and physician referrals

Intervene Prevent Save

- Care from appropriate PCP or Specialist
- Omada program
- Renal care program
- Home sleep assessment
- Employer sponsored programs (e.g., Diabetes)
Pharmacogenomics can be effectively implemented in an employer sponsored health plan

- Genetic testing to determine risk of drug reaction and likelihood that a drug will work
- 50% of patients are on a prescription drug that fails to be effective or incur side effects
- Quest plan members are offered PGx testing across relevant mutations
- Integration with pharmacy benefit for healthplan
- Decision support for prescribing physician with pharmacist support
Population Based Precision Medicine

• Aggressive population health implementation programs improve health and lower costs of care for employers and employees

• Use of population data can drive programs to connect individuals to the precision care they need – right intervention, right cost, right provider

• Technologies are transforming the care we can deliver to consumers in their homes / communities

• ALL healthcare is consumer healthcare – reduction in complexity and increased convenience for consumers is a critical enabler of population health strategies