Using Genetics to Improve Health Outcomes for Members With Chronic Conditions

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This is Linda
Takeaways

- Personalized Medicine and Genetics
- Cost of Getting it Wrong
- Innovation in Action: Better Health, Lower Costs in Kentucky
- Population Analysis and Program Implementation
- Opportunities, Results, Outcomes
Personalized Medicine

Tailoring medical treatment to the individual characteristics of each patient.
How Does it Work?

GENETICS
This is how it works
What Do We Inherit?

- Hair color and texture
- Eye color
- Heart health
- Breast cancer
- Height
- Metabolism of medications
Personalized medicine is the practice of clinical decision-making such that the decisions made maximize the outcomes that the patient most cares about and minimizes those that the patient fears the most, on the basis of as much knowledge about the individual's state as is available.”

Benefits of Personalized Medicine

Help people make informed decisions about their health care\(^1\)

- Risk Predilection—predisposition to disease, e.g. enlarged heart
- Diagnosis—e.g. metabolic diseases, cystic fibrosis
- Companion Diagnostics—e.g. oncology
- Pharmacogenomics—improved outcomes through

Personalized Treatment for Cancer: Paradigm Shift Towards Molecular Subsets of Cancers

**Example:**
Non-Small Cell Lung Carcinoma is not a single type of cancer. It has many subtypes; each needs tailored treatment.
Why Most Drugs Only Work in Some Patients

27% of the U.S. population cannot metabolize Clopidogrel

Codeine has little effect on as much as 20% of the population

Even everyday drugs, such as Advil and Tylenol, can have widely varying effects
Health Care Costs Are Spiking

1 in 4 Americans take four or more prescription drugs

Source: KFF Health Tracking Poll (conducted February 14-24, 2019)
Health Care Costs Are Spiking

- 82% of Americans take at least one medication
- 50% of the medications patients take are ineffective
- 4th leading cause of death in the US is Adverse Drug Reactions.
Health Care Costs Are Spiking

Yearly, this translates into:

- 128,000 Deaths
- >2 million Emergency Department visits
- >1,500,000 Hospitalizations
- 3.5 million Physician office visits
- 1.7—4.6 Increased days per effected hospital stay
- 20.4% of hospital re-admissions

* C. van der Hooft et al., "Adverse Drug Reaction Related Hospitalizations," Drug Safety 29, no. 2
Cost of Genetic Testing is Dropping

Genomic Medicine: Evidence-Based and Patient-Centered

Does it:

✓ Change a patient’s therapy management?
✓ Improve outcomes?
✓ Improve quality of life?
✓ Improve productivity?
✓ Change how family members are managed?
✓ Lower health care cost in the long run?
Too Familiar . . .

Linda, age 73

- Takes 9 prescription medications, 3 vitamins
- Type 2 diabetes
- High cholesterol
- Arthritis
- Family history of cardiac issues
- Constant joint pain
- Restricted mobility
- Hospitalized twice this year
Too Familiar . . .

Linda’s doctor doesn’t know:

Linda’s morning glass of grapefruit juice prevents one of her medicines from working

Three of her meds conflict and are causing adverse side effects

Two other meds are completely ineffective because of her genetics
Your DNA Really Matters

Drug is toxic but beneficial

Drug is toxic and non-beneficial

Drug is nontoxic and non-beneficial

Drug is nontoxic and beneficial

Pharmacogenomics (PGx)
Using DNA to see what drugs will be safe and effective
So Many Variables . . .

Are these drugs safe?

Are they all necessary?

Are they going to work?

Medications Taken Together Have Risks

- Genetic metabolism risks
- Genetic adverse reaction risks
- Genetic competitive inhibition
- Drug interaction risks
- Contraindications
- Pregnancy/lactation risks
- Juvenile risks
- Anticholinergic burden risks
- Geriatric toxicity risks
- Lifestyle risks
- Duplicative therapy warnings
- FDA black box warnings
- Reported side effects
- Drug label warnings
A complete PGx Program should provide:

Rigorously-vetted genetic guidance with dozens of other factors of patient-specific prescribing risk.

Health care providers need to be empowered with answers rather than research materials.

Real-time modeling should allow pharmacists and doctors to see the results of medication changes before they experiment with them on their patients.
E-PGx Program Components

A complete PGx Program should provide: A turn-key program that combines genetic testing with expert pharmacy review and immediately actionable treatment guidance.

Population Analytics

“Will this program provide benefit for our members?”

Member Engagement

Fully-coordinated education and enrollment

Genetic Testing

Cost-effective DNA testing by CLIA-licensed laboratories

Pharmacy MTM Review

Clear, actionable recommendations via Medication Action Plan (MAP)
Case Studies

“We can apply this at national scale, cost effectively, to save money for the health care system and to improve patient outcomes.”

Peter Silvester, SVP Life Science Solutions, Thermo Fisher Scientific

01 Senior Populations
34,000 retirees in a system facing extreme economic pressures

02 Large Employer
30,000 ‘working well’ employees
Using de-identified claims information, the pension fund received an in-depth analysis of the potential return on investment with the program.

34,000 retirees aged 65 to 107

Using de-identified claims information, the pension fund received an in-depth analysis of the potential return on investment with the program.

- 15 Average number of prescriptions
- 75% Had high BP/heart disease
- 58% Had high cholesterol
- 50% Had pain/inflammation
Population Analytics

PGx Drugs Prescribed (% of Patients)

- Atorvastatin
- Metoprolol
- Omeprazole
- Simvastatin
- Metformin
- Pantoprazole
- Meloxicam
- Tramadol
- Diclofenac
- Oxycodone
- Carvedilol
- Clopidogrel
- Sertraline
- Alprazolam
- Esomeprazole
- Citolam
34,000 retirees aged 65 to 107

Using de-identified claims information, the pension fund received an in-depth analysis of the potential return on investment with the program.

83%

Percent of patients taking meds with known PGx implications
Using de-identified claims information, the pension fund received an in-depth analysis of the potential return on investment with the program.
TRS—Kentucky Mission

TRS will reduce healthcare costs by implementing a program focused on improving medication safety, efficacy, and quality of life for its members.

The program will utilize genetic testing and personalized therapy analysis delivered to physicians through expert pharmacist consultation.
Invite and Enroll Members

Key Messages

✓ We are making smarter use of healthcare dollars with a new personalized medicine program.

✓ We have engaged partners to work with your doctor.

✓ This new benefit will test your DNA to make sure your medications will be safe and effective for you.

✓ The analysis and test results will only be used by pharmacists and your doctor. Your information will not be shared with us.
DNA Collection Kits

DNA Collection kits sent to members’ homes once they enroll

Kits returned in same box, processed by lab within 2 weeks
Overview: Comprehensive Medication Safety Management

1. Enroll Members
2. Collect genetic information
3. Empower pharmacists with MTM software and genetic guidance
4. Communicate the Medication Action Plan
Addressing Health Concerns Early

Age Groups

6,377 >80 yo
46 >100 yo

TRS Retirees (2017)
Success Metrics

35,712 Medicare Eligible Health Plan

Voluntarily Enrolled: 7,732

Samples Returned: 5,708

Medication Action Plans Delivered: 4,422

Medications: 38,964

Reviewed: Prescriptions per member
9

Medication Action Plans with immediate medication change recommendations
64%

Medication Action Plans that required prescribing physician attention
80%

As of 6/17/2019
# Opportunities to Impact Health

<table>
<thead>
<tr>
<th>Genomic Condition</th>
<th>Population Prevalence (TRS-KY)</th>
<th>Clinical Risk</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYP2C19 Poor or Intermediate Metabolizer</td>
<td>~ 28 in 100</td>
<td>Clopidogrel (Plavix) non-responder; significant risk of thrombotic event, MI, stroke</td>
<td>Alternative medication therapies</td>
</tr>
<tr>
<td>Factor V-Leiden, Factor II, MTHFR</td>
<td>~8 in 100</td>
<td>Increased risk of venous thrombosis</td>
<td>Targeted screening and prophylactic medical intervention</td>
</tr>
<tr>
<td>CYP2D6 non-typical</td>
<td>~ 59 in 100</td>
<td>Inefficacies of Antidepressants, Beta-blockers, Pain management</td>
<td>Alternative medication therapies and management of postoperative care</td>
</tr>
<tr>
<td>CYP3A4 non-typical</td>
<td>~ 18 in 100</td>
<td>Adverse reactions to Atorvastatin (Lipitor) and others</td>
<td>Alternative medication therapies</td>
</tr>
<tr>
<td>SLCO1B1 altered liver uptake</td>
<td>~ 28 in 100</td>
<td>Adverse reactions to Simvastatin (Zocor) and others</td>
<td>Alternative medication therapies</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>~ 99%</td>
<td><strong>Multiple Adverse Drug Reactions; health care outcomes associated with lack of treatment</strong></td>
<td><strong>Targeted and Episodic Medication Reviews and Medication Therapy Management</strong></td>
</tr>
</tbody>
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Opportunities to Impact Health

Recommendations by Disease State

- Cardiovascular Disease: 55%
- Acid Reflux: 18%
- Mental Health: 20%
- Pain: 7%

16A-34
Other Success Metrics

- 64% resulted in medication change recommendation
- 94% of recommendations accepted by prescribers

“I believe it would be unethical not to have all of our participants tested.”

- George Brett MD, Medical Director
Cost of Getting it Wrong

**MA3**
- Medication Adherence
- Medication Appropriateness
- Medication Adversity

#### Components of MA3 Cost

<table>
<thead>
<tr>
<th>Service</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Clinic outpatient visits</td>
<td>0.64%</td>
</tr>
<tr>
<td>Specialty office visits</td>
<td>0.82%</td>
</tr>
<tr>
<td>Employee work days missed</td>
<td>0.95%</td>
</tr>
<tr>
<td>Laboratory services</td>
<td>0.09%</td>
</tr>
<tr>
<td>Urgent care visits</td>
<td>0.48%</td>
</tr>
<tr>
<td>Emergency room visits</td>
<td>2.99%</td>
</tr>
<tr>
<td>Home health visits</td>
<td>25.31%</td>
</tr>
<tr>
<td>Hospital admissions</td>
<td>67.18%</td>
</tr>
<tr>
<td>Durable medical goods</td>
<td>1.55%</td>
</tr>
</tbody>
</table>

#### Medication Adherence
- Limited patient engagement in treatment decisions
- Cost
- Low perceived need/efficacy
- Concern about side effects
- Forgetfulness
- Lack of social support
- Impaired cognition
- Unclear or misunderstood medication instructions
- Low health literacy
- Complex drug regimen/high pill burden

#### Medication Appropriateness
- Is there an indication for the drug?
- Is the medication effective for the condition?
- Is the dosage correct?
- Are the directions correct?
- Are the directions practical?
- Are there clinically significant drug-drug interactions?
- Are there clinically significant drug-disease interactions?
- Is there unnecessary duplication with other drugs?
- Is the duration of therapy acceptable?
- Is this drug the least expensive alternative?

#### Medication Adversity
- Dose-related
- Non-dose-related
- Dose-related and time-related
- Time-related
- Withdrawal
- Failure of therapy

↓ Adverse drug events
↑ Patient satisfaction
↑ Overall patient health
↑ Quality-of-life
↓ Cost of medications
↓ Number of outpatient visits
↓ Costs of outpatient visits
↓ Number of laboratory tests
↓ Emergency department visits
↓ Number of hospitalizations
↓ Costs of Hospitalization
Risk Reduction

Reduction in MA3 related risk incidents

Incidents per month related to MA3 risk for 2154 enrolled members

28%

16A-37
Cost Reduction

Reduction in cost-to-plan spending after 6 months: 17%

Increase in control group: 2.5%

PM/PM for 2154 members who participated in the program

PM/PM for 2267 risk-equivalent members who did not participate in the program
Member Feedback

“It’s been years since I’ve seen something come through to make me stop and say, ‘Wow! This is a great idea.’”

“This is very much needed!”

“I am so excited about this benefit!”

“This is wonderful! It's nice to see TRS participating in new and more exciting things!”

“This came at the best time!”

“This is what health care should be.”
Member Feedback

“The results showed that the cholesterol medicine I was on was not metabolizing well. The [KY]RX nurse said there were other drugs in a different family that could work without the same problem. My doctor was notified and the change was made. **I have far more energy now.**”

I heard about DNA testing regarding prescriptions on a national news story 2 years ago. I thought at that time that this was the future of medicine. I never dreamed that I would be asked to be part of the pilot program for DNA testing for prescriptions in Kentucky. Thanks to Jane Gilbert and Gary Harbin for having the foresight to see that this would be very important to our Kentucky Retired Teachers. I did the testing and thank goodness I did because 2 of my medicines were not working well together. Thanks to Lea G. at the (KY)Rx Coalition for working with me to get the medicine issue resolved. Once again, I am proud to be a retired teacher in Kentucky where TRS is looking out for the well being of its members!!!

“... (The pharmacists) did say that one of my medications that I take once a day was only working for the first few hours due to my DNA and that I should discuss it with my doctor. My doctor had the report, he checked it and agreed with the pharmacist. I now take that pill 2 times a day and I can tell a difference in my stamina for the afternoon. As friends get together, the DNA test is the topic of conversation. The people who have completed the process loved it, the ones who haven't gotten their results are anxiously awaiting and the other people are searching for the number to call so they can start the process. Thanks!”
What is E-PGx?

- Knowing which medications work best for your body—and which do not.
- Knowing your genetic analysis and results are confidential and secure—they belong to you.
- Knowing that (with E-PGx) you can make better health choices, have more control, and save money.
- Knowing what you learn might be useful to family members who share your genes.
- Knowing your participation can help others—now and in the future.
Thank You

Questions?