NorthShore’s Pharmacogenetics Program

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NorthShore University HealthSystem
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About NorthShore

• Integrated Health System
  – Multi-Site
  – 4 Hospitals
  – 750+ Physician Medical Group; 75 Offices
  – Academics - University of Chicago (UC)
  – Informatics – EMR in 2003
Interconnectivity is vital to success
Center for Personalized Medicine

Coordinates predictive/diagnostic and therapeutic services along with education & research

Molecular Pathology
- Tumor sequencing
- Hot spot NGS panel
- Microarray

Clinics
- Medical Genetics
- Oncology
- Pharmaco-genomics
- Cardiology
- Neurology
- Diabetes

Systemic integration
- Pharmaco-genomics
- Genomic results display

Education
- Physicians
- Nurses
- Pharmacists
- Employees
- Patients

Research
- Clinical
- Biorepository
- Translational
PHARMACOGENETICS PROGRAM
Pharmacogenetics Subcommittee

Specific drug/gene pair (CDS) working group

Clinical outcomes working group

Drug/gene prioritization working group

Bioinformatics working group

Genetic testing working group

EPIC working group

Gene evaluation working group

Education working group
Pharmacogenetics Team at NorthShore

<table>
<thead>
<tr>
<th>Liana Billings</th>
<th>Mark Dunnenberger</th>
<th>Karen Kaul</th>
<th>Nancy Ostrowski</th>
<th>Jonathan Silverstein</th>
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<tbody>
<tr>
<td>Lynn Boecler</td>
<td>Kamalakar Gulukota</td>
<td>Janardan Khandekar</td>
<td>Ari Robicsek</td>
<td>Joshua Straus</td>
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<td>Justin Brueck</td>
<td>Larry Helseth</td>
<td>Emily Lachiewicz</td>
<td>Linda Sabatini</td>
<td>Mira Suseno</td>
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<td>George Carro</td>
<td>Peter Hulick</td>
<td>David Lovinger</td>
<td>Meredith Sefa</td>
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<td>John Cavataio</td>
<td>Ashton Hullett</td>
<td>Holley May</td>
<td>Annette Sereika</td>
<td>Izabela Wozniak</td>
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<td>Reni Craft</td>
<td>Nora Joseph</td>
<td>Anna Newlin</td>
<td>Jae Shin</td>
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Pharmacogenetic Implementation

1. Drug/Gene pair nomination
2. Drug/gene pair approval
3. Functional assessment
4. Functional integration
5. Committee approvals
6. System wide education and outcomes monitoring
7. Go live
8. Targeted education
GENETIC TEST RESULTS
Results workflow
DISPLAY IN EHR
CDS

• Passive
  – Results all in one section
    • HUGO gene name plus interpretation

• Active
  – Pre-test
    • Account for clinical parameters such as:
      – WBC >1K
      – Recent blood transfusion

  – Post-test
    • Wording determined by clinicians most likely to prescribe
    • Built to handle enzymatic results if available
Drug/Gene Pairs implemented

• TPMT/Thiopurines
• HLA-B/Abacavir and Carbamazepine
• More than 30 different rules to create these pre and post test alerts
• Needed a better solution for scalability and sustainability
Third Party CDS Solution

- ActX
- Integrated in EHR
- Customizable rules engine for post test alerts
  - Genotype specific
- Patient genome profile
  - Searchable by drug
EARLY METHOD TO BRING PERSONALIZED MEDICINE TO CLINICAL CARE
Pharmacogenetics Clinic

• Goal
  – Provide NorthShore with a service to meet the current pharmacogenomics needs of the community

• Structure
  – Clinic appointments occur over two days, about 14 days apart
  – Uses existing infrastructure at the Center of Medical Genetics
  – Multidisciplinary team: GC, MD, APN and pharmacists
  – Patient be self/physician referred to Pharmacogenomics Clinic
  – Third Party genotyping with a 14 gene panel (PGXL)

• Cost
  – Gene panel ~$400 if not covered by insurance
  – Office visit co-pay
### 14 Gene Panel

<table>
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<tr>
<th>Gene 1</th>
<th>Gene 2</th>
<th>Gene 3</th>
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<tbody>
<tr>
<td>$CYP2D6^*$</td>
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<td>$SLCO1B1^*$</td>
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* Genes with pharmacogenomically actionable variants
• 3 components
  – High-risk variants
    • Drug recommendations tailored to individual patients
  – Other genes tested
  – Medication list
    • Tells patients if there was genomic data available for the drugs on their current list
Data from clinic

• Most patient have clinically actionable variants
• Psychiatry most common referring group of physicians
• Most physicians have referred multiple patients
Conclusion

- Three ways we are using CPIC guidelines at NorthShore
  - Drug/Gene pair nomination
  - Third party CDS solution
  - Pharmacogenomics clinic
Questions?

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