Family Health History Risk Assessment in the Context of Health Disparities

R. Ryanne Wu, MD
Family Health History

• Family health history (FHH) is an essential initial screen for assessment of genetic contribution to health and disease.

• Guidelines endorse the use of FHH for risk stratification

• Many barriers to the collection of adequate FHH for disease risk stratification.
Why Risk Stratification Is Important

- More and more guidelines are based on risk level.
- Allows targeting of appropriate strategies to the appropriate patient to maximize benefits over risks.
- For example, breast MRI increases detection of cancers but also frequency of biopsies, to decrease likelihood of an unnecessary biopsy, risk of breast cancer should be > 20%.
Why Risk Stratification is Not Routinely Practiced

Patient barriers
- Lack of knowledge of personal and FHH
- Lack of communication with family
- Lack of appreciation of importance of FHH

Provider barriers
- Time constraints
- Lack of standardization of FHH collection
- Algorithms require a computer and are located in different places
- Difficulty synthesizing into actionable prevention strategies
Example

- Patients’ risk based on FHH assessed using current clinical guidelines.

- PCPs given complete FHH and risk calculation results.

- Asked to select appropriate risk management option.

- Miss-estimated risk:
  
  Breast cancer = 12%  Colon cancer = 30%

  Ovarian cancer = 7%  Thrombosis = 3%
Genommedical Connection

• Funded by Department of Defense

• Goal: Improve integration of genomics into routine clinical care (Genomic Medicine Model)

• Collaboration of Duke University, UNC-Greensboro, and Cone Health system
Genomic Medicine Model

• Education
  – Patient activation
  – Improve quality of FHH data
  – Provider buy-in

• Resources for patients and providers

• Patient-oriented risk stratification tool
  – Improve efficiency of data collection
  – Improve uptake of risk-stratified preventive care
  – Flexible and modular platform
Guiding principles

• Easy for patients to use
• Removes burden of data collection from PCPs
• Risk stratification based on guidelines familiar to PCPs
• Clinical decision support for conditions with strong evidence
• Clinically useful risk categories
• Decision support reports at appropriate level
• Reports that encourage patient-physician discussion

Development team

Genetic counselors, medical geneticists, cardiologist, oncologist, health behaviorist, IT experts
MeTree

• Educates patients on what and how to collect FHH

• Collects 3 generation family history
  48 diseases

• Decision support for 5 pilot diseases:
  Breast cancer  Colon cancer
  Ovarian cancer  Thrombosis
  Hereditary cancer syndromes

• Generates reports:
  Pedigree  Provider report
  Tabular FHH  Patient report
Patient Report:

MeTree® Personalized Profile for (ID: 12012) based on your answers to Questionnaire #1624 on 07/08/2010

Talk to your doctor about:

Referral to a genetic counselor

Why?

There's an increased chance that cancer runs in your family for these reasons.

You have:

- At least 3 members in your family with the same cancer.

Regular colon cancer screening

Your chances of colon cancer increase with age. This is why most people should have regular screening beginning at age 50.

More information

Several colon cancer screening tests have been shown to be effective. Talk with your doctor about the one that's right for you.

The information is based on facts you entered into MeTree®. It may not be accurate if facts are not correct. This program does not take into account all factors that may influence disease risk. Talk with your doctor about how other factors, such as health habits, influence disease risk. Based on your needs, a genetic counselor may suggest additional screenings that are not included in this report.
Physician Report:

02/25/2010

MeTree Personalized Risk Profile
MeTree ID: #1234
Questionnaire: #9999
Patient X
DOB: 5/25/1965 Age: 41
BMI: 28

ACTIONABLE ITEMS

- Refer to genetic counseling for comprehensive INHERITED THROMBOPHILIA risk assessment & management
- Refer to genetic counseling for comprehensive CANCER risk assessment & management
- Coordinate risk management for HNPCC syndrome according to NCCN guidelines (www.nccn.org)
- Discuss chemoprevention for breast cancer (tamoxifen)

INDICATIONS

Personal History
- Venous thrombosis in unusual location (head, neck, arm or abdomen).
- Patient meets Amsterdam II criteria for clinical diagnosis of HNPCC syndrome.
- Patient’s 5-year breast cancer risk (Gail model estimate = ___ %) exceeds cut-off of 1.65%.

Family History
- At least 1 first-degree relative was diagnosed with colorectal cancer < age 50.
- At least 3 relatives with HNPCC-related cancers (colorectal, uterine, gastric, ovarian, renal, small bowel, pancreatic, brain).

Contraindication(s)/Other Factors to Consider:
- Patient using oral estrogen or progesterone.
- Patient has had stroke.
- Patient has had blood clot(s).
- Refer to pedigree for additional indication(s) relating to thromboembolism

NOTE(S):

- Tamoxifen’s effectiveness for breast cancer chemoprevention has not been tested in women who are under age 35, pregnant, breastfeeding, or taking hormone replacement therapy.
- Tamoxifen is associated with increased risk of endometrial cancer and thromboembolic events.
- Check patient’s previous tamoxifen use.

MeTree© Assessment Tool recommendations are based on information supplied by patient. They may not represent a complete clinical assessment and are not intended to supplant physician discretion in risk management. Based on your needs, a genetic counselor may suggest additional screenings that are not included in this report.

1Chest Guidelines Chest 126; 3 September 2004 Supplement 401S
6Vogel VG et al. JAMA. 2006;295:E1-E15
Tabular FHH Report:

<table>
<thead>
<tr>
<th>Relation</th>
<th>Firstname</th>
<th>Age</th>
<th>Cause of death</th>
<th>Breast/Ovarian</th>
<th>CRC</th>
<th>Other cancers</th>
<th>Thrombosis related</th>
<th>Chemo prev</th>
<th>General health</th>
</tr>
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<tbody>
<tr>
<td>self</td>
<td></td>
<td>64</td>
<td></td>
<td></td>
<td></td>
<td>None / skin cancer /</td>
<td>stroke /</td>
<td></td>
<td>high bp / high cholesterol / stroke / None /</td>
</tr>
<tr>
<td>sister</td>
<td></td>
<td>51</td>
<td></td>
<td>None /</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>None /</td>
</tr>
<tr>
<td>brother</td>
<td></td>
<td>68</td>
<td></td>
<td>None /</td>
<td></td>
<td></td>
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<td>high bp / None /</td>
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<tr>
<td>brother</td>
<td></td>
<td>62</td>
<td></td>
<td>None / skin cancer /</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>high bp / None /</td>
</tr>
<tr>
<td>brother</td>
<td></td>
<td>60</td>
<td></td>
<td>None /</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>high bp / None /</td>
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<tr>
<td>niece</td>
<td></td>
<td>20</td>
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<td></td>
<td>None /</td>
</tr>
<tr>
<td>niece</td>
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<td>32</td>
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<td>None /</td>
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<td></td>
<td>None /</td>
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<tr>
<td>niece</td>
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<td></td>
<td>None /</td>
</tr>
<tr>
<td>niece</td>
<td></td>
<td>22</td>
<td></td>
<td>None /</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>None /</td>
</tr>
<tr>
<td>nephew</td>
<td></td>
<td>34</td>
<td></td>
<td>None / skin cancer /</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>None /</td>
</tr>
<tr>
<td>nephew</td>
<td></td>
<td>28</td>
<td></td>
<td>None /</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>high bp / high cholesterol / None /</td>
</tr>
<tr>
<td>father</td>
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<td>91</td>
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<td>None / skin cancer /</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>high bp / high cholesterol / None /</td>
</tr>
<tr>
<td>paternal Uncle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>None /</td>
</tr>
<tr>
<td>paternal Grandfather</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>alzheimer's disease / None /</td>
</tr>
</tbody>
</table>

MeTree ID: 12012
Implementation-Effectiveness Trial

- **2 Intervention clinics and 1 control**

- **Optimize and adapt MeTree through stakeholder feedback**

- **Integrated model into clinic workflow**
  - Patient identification and notification
  - Access to the tool
  - Clinical resources needed for support

- **Evaluation metrics**
  - Impact on clinic workflow, physician performance and acceptance
  - Model performance
  - Movement of patient through model components
  - Movement of patients through activation cycle
<table>
<thead>
<tr>
<th></th>
<th>Study Patients # (%)</th>
<th>Baseline clinic population # (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>1184</td>
<td>45000</td>
</tr>
<tr>
<td>Gender: Male</td>
<td>490 (41.4%)</td>
<td>56.1%</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• White</td>
<td>969 (81.8%)</td>
<td>75.2%</td>
</tr>
<tr>
<td>• Black</td>
<td>159 (13.5%)</td>
<td>15.47%</td>
</tr>
<tr>
<td>• Other</td>
<td>56 (4.7%)</td>
<td>9.4%</td>
</tr>
<tr>
<td>Age: Mean (SD)</td>
<td>58.8 (11.79)</td>
<td>59.3 (13.5)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• HS or less</td>
<td>158 (13.3%)</td>
<td></td>
</tr>
<tr>
<td>• Some college</td>
<td>245 (20.7%)</td>
<td></td>
</tr>
<tr>
<td>• College degree</td>
<td>461 (38.9%)</td>
<td></td>
</tr>
<tr>
<td>• Any graduate work</td>
<td>320 (27.0%)</td>
<td></td>
</tr>
<tr>
<td>No. of relatives (range)</td>
<td>22.89 (8-71)</td>
<td></td>
</tr>
</tbody>
</table>
PATIENT AND PROVIDER USER EXPERIENCE

Wu, *BMC Family Practice*, 2013
Evaluation of Provider Experience

Provider Experience

- FH more important now
- Improved practice
- Made practice easier
- Affected workflow
- Recommend to peers
- Report helpful
- Tabular pedigree helpful
- Disagreed with report

0% - 100%
Evaluating Patient Acceptance

**Satisfaction**

Experience

- strongly positive
- positive
- neutral
- negative
- strongly negative

**Anxiety**

Experience

- strongly positive
- positive
- neutral
- negative
- strongly negative

*strongly positive means, low anxiety with a strongly positive experience*

**Ease of Use**

Experience

- strongly positive
- positive
- neutral
- negative
- strongly negative

- The computer was easy to use.
- Words on the computer screen were easy to see.
- The questions were easy to understand.
## Patients’ Perceived Benefits of Using MeTree

<table>
<thead>
<tr>
<th>Respondents</th>
<th>3 Months N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>454</td>
<td></td>
</tr>
</tbody>
</table>

### Risk Awareness

<table>
<thead>
<tr>
<th>Benefit</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>More aware of my risk</td>
<td>389 (85.1%)</td>
</tr>
<tr>
<td>More aware of my family health risk</td>
<td>415 (89.4%)</td>
</tr>
<tr>
<td>Changed how I think about my health</td>
<td>393 (85.8%)</td>
</tr>
</tbody>
</table>

### Usefulness

<table>
<thead>
<tr>
<th>Benefit</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MeTree was helpful</td>
<td>403 (89.6%)</td>
</tr>
<tr>
<td>My pedigree was helpful to me</td>
<td>415 (91.6%)</td>
</tr>
<tr>
<td>My pedigree was helpful to my doctor</td>
<td>398 (91.7%)</td>
</tr>
<tr>
<td>I would recommend MeTree to others</td>
<td>421 (92.7%)</td>
</tr>
</tbody>
</table>
CLINICAL VALIDITY

Wu, BMC Family Practice, 2014
# Quality of Entered FHH data

<table>
<thead>
<tr>
<th>Quality Criterion</th>
<th>Baseline FHH N=390 for all and 227 for deceased</th>
<th>MeTree N=1184 for all and 1179 for deceased</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 3 generations of relatives</td>
<td>0 (0%)</td>
<td>1184 (100%)</td>
</tr>
<tr>
<td>2. Relatives’ lineage</td>
<td>111 (28.4%)</td>
<td>1184 (100%)</td>
</tr>
<tr>
<td>3. Relatives’ gender</td>
<td>356 (91.2%)</td>
<td>1184 (100%)</td>
</tr>
<tr>
<td>4. Pertinent negatives noted</td>
<td>173 (44.3%)</td>
<td>1184 (100%)</td>
</tr>
<tr>
<td>5. Age of disease onset</td>
<td>71 (18.2%)</td>
<td>854 (72.1%)</td>
</tr>
<tr>
<td>6. Cause of death</td>
<td>213 (98.1%)</td>
<td>695 (58.9%)</td>
</tr>
<tr>
<td>7. Age of death</td>
<td>172 (75.7%)</td>
<td>1156 (98.0%)</td>
</tr>
</tbody>
</table>

- Pre-MeTree < 4% of FHHs were high-quality (single relative)
- Post-MeTree 99% of FHHs were high-quality (single relative)

**50% of FHHs were high-quality (50% relatives)**
Accuracy of FHH

- 54% talked with relatives (mean 2.89 relatives)
  - 38% found relatives had diseases they did not know about previously.
  - 29% learned age of relatives when they developed a disease

- In a select group referred to GC (N=38), 16 (42%) changed some component of FHH after review with genetic counselor.
  - 5/38 (13%) no longer met criteria for GC as a result.
16% of patients had a change in their recommendation

- 6% from high risk to population risk
- 10% from population risk to high risk

Beadles, *Familial Cancer*, 2014
CLINICAL UTILITY
## Recommendations

**44% (523/1184) received at least one recommendation**

<table>
<thead>
<tr>
<th>Disease</th>
<th>N (%) identified as needing increased screening/prevention according to MeTree (N=1,184) *</th>
<th>N (%) previously identified as high-risk by PCP of those MeTree recommended increased screening for (N=488)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast Cancer*Δ</td>
<td>68 (9.8%)</td>
<td>0/30</td>
</tr>
<tr>
<td>Ovarian Cancer*</td>
<td>14 (2.0%)</td>
<td>0/2</td>
</tr>
<tr>
<td>Colon Cancer</td>
<td>221 (18.8%)</td>
<td>0/85</td>
</tr>
<tr>
<td>Thrombosis</td>
<td>42 (3.5%)</td>
<td>1/18 (5.6%)</td>
</tr>
<tr>
<td>Total</td>
<td>307 (25.9%)</td>
<td>1/135 (0.7%)</td>
</tr>
</tbody>
</table>

*Breast Cancer & Ovarian Cancer: men removed from analysis; N=694 in MeTree and N=284 in chart review

ΔBreast Cancer: breast MRI or chemoprevention recommendations
28% (330/1184) received a genetic counseling recommendation

<table>
<thead>
<tr>
<th>Disease</th>
<th>N (%) identified as needing genetic counseling according to MeTree (N=1,184)</th>
<th>N (%) previously identified as high-risk by PCP of those who got a GC recommendation (N=488)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of Hereditary Cancer Syndrome</td>
<td>308 (26.0%)</td>
<td>6/124 (4.8%)</td>
</tr>
<tr>
<td>Thrombosis</td>
<td>29 (2.4%)</td>
<td>0/7</td>
</tr>
<tr>
<td>Total</td>
<td>330 (27.9%)</td>
<td>6/131 (4.6%)</td>
</tr>
</tbody>
</table>
Genomic Medicine Model Summary

• Demonstrated that providers are willing to alter their practice based on FHH decision support.

• Demonstrated that FHH collection and application can:
  – Can be a positive experience for patients and providers.
  – Can be implemented without disrupting workflow.
  – MeTree has clinical validity and utility.
Why does this matter in context of health disparities?

Significant disparities within minorities and those of lower SES for:

– Chronic disease risk factors (HTN, HLD, smoking)

– Use of preventive services (mammography)

– Chronic diseases (CAD, DM, cancer)
NIH Cooperative Funding: Genomic Demonstration Project

• Optimize the Genomic Medicine Model
• Perform a Cluster RCT in 5 diverse national healthcare settings to:
  – Assess Adoption and Sustainability
  – Assess Clinical Utility
• Establish a mechanism for integration with EMRs using data standards
Optimize GMM

• Create a web interface

• Interface for tablet and mobile devices
  – Broaden accessibility

• Expand CDS to other common complex diseases
  (CAD, AAA, stroke, hereditary liver disease, hereditary cardiovascular syndromes, diabetes, lung cancer)

• Spanish language version
Optimize continued

• **Patient Education**
  – Add terminology “help text” through MEDLINE PLUS CONNECT
  – Expanded help to address primary vs. metastasis
  – Add recommendations for behavioral changes to diet/exercise.
  – To encourage adherence expanded reports to include reasons why they would want to follow through with the recommendation, along with things to be aware of, as well as additional links for more information

• **Provider Education**
  - Added NNT
  - References to genetic/genomic tests markers, with links to GENE tests
  - Organized according to disease with links to additional information
Acknowledgements

- Geoffrey Ginsburg, MD PhD
- Lori Orlando, MD MHS
- Tiffany Himmel, PhD
- Elizabeth Hauser, PhD
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- Vincent C. Henrich, PhD
- Charles Wilson, MD
Thank you