Florida Breast Cancers: Genetic Testing and Counseling

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Florida Cancer Data System Annual Meeting

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Clinical Geneticist, Moffitt Cancer Center
Overview

B-GREAT/BEST
- Among population-based sample of young Black women, evaluate:
  - Identification
  - Access/uptake of testing
  - BRCA mutation frequency
  - Cancer Risk Management

You-GRADE
- Among population-based sample of young women (non-Blacks), evaluate:
  - Identification
  - Access/uptake of testing
  - Delivery of genetic services
  - Cancer Risk Management
Breast Cancer in Young Black Women

Lower incidence of breast cancer among black women, yet they are at a higher risk of:

- Being diagnosed at a younger age
- Dying from the disease

One of the hallmarks of \( BRCA1/2 \)-associated breast cancer is young age of onset

- 6% of women with breast cancer before age 40 (AHRQ Evidence Synthesis, Nelson et al, 2013)

Thus, \( BRCA1/2 \) may account for a proportion of breast cancers in young Black women

Cancer Risks

- Breast cancer: 7%
- Second breast cancer: 10%
- Ovarian cancer: 2%

BRCA mutation vs General Population:
- Breast cancer: Up to 70%
- Second breast cancer: Up to 64%
- Ovarian cancer: Up to 44%
Longstanding disparities in BRCA genetic testing rates...

Table 1. Ethnicity of Tested Individuals

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western European</td>
<td>36,235  (78.3)</td>
</tr>
<tr>
<td>Central European</td>
<td>4066    (8.8)</td>
</tr>
<tr>
<td>Latin American</td>
<td>1936    (4.2)</td>
</tr>
<tr>
<td><strong>African</strong></td>
<td>1767    (3.8)</td>
</tr>
<tr>
<td>Asian</td>
<td>1183    (2.6)</td>
</tr>
<tr>
<td>Native American</td>
<td>597     (1.3)</td>
</tr>
<tr>
<td>Middle Eastern</td>
<td>492     (1.1)</td>
</tr>
<tr>
<td>Total</td>
<td>46,276  (100)</td>
</tr>
</tbody>
</table>

US Population: 13.2% African American

Receipt of *BRCA* testing

- Prior population-based studies of high risk women with breast cancer
  - 40-50% received genetic counseling and/or *BRCA* testing
  - African Americans represented 10% or less of the sample

- Review of >10,000 oncology patient charts across the US:
  - Genetic Counseling or Testing recommended in ~50% of breast cancer patients with “hereditary risk”

Cancer Risk Management

• Garcia et al, 2014:
  • 305 BRCA carriers in an integrated healthcare system (Kaiser Permanente)
    • RRSO: 74%
    • RRM: 44%

Among those without RRM, Rapid decline in MRI over 5 years:
- Year 1: 35%
- Year 5: 3%

Objectives

Recruit a population-based sample of Black women diagnosed with invasive breast cancer ≤50 in 2009-2012 in Florida in order to:

• Estimate access to BRCA testing services (prior to study participation)

• Identify BRCA mutations
Overview of Recruitment

Patient information obtained from FCDS (Florida State Cancer Registry)

Informational package sent to potential participants

For participants that are interested, enrollment package sent

Secure Informed Consent secured/Medical Record Release signed/Questionnaire completed

Genetic Counseling Session/Specimen collection

BRCA testing (full sequencing, MLPA)
Overview of Recruitment Efforts

Eligible women with whom contact established 882

Consented 456

Completed Baseline Survey 440

Saliva Sample Obtained 408

BRCA test results complete 396

Not Consented 426

Declined 182

Showed Interest but not consented 244

• 1/3 without health insurance
Factors associated with genetic counseling and BRCA testing in a population-based sample of young Black women with breast cancer

D. Cragun\textsuperscript{1} · D. Bonner\textsuperscript{1} · J. Kim\textsuperscript{1} · M. R. Akbari\textsuperscript{2} · S. A. Narod\textsuperscript{2} · A. Gomez-Fuego\textsuperscript{1} · J. D. Garcia\textsuperscript{1} · S. T. Vadaparampil\textsuperscript{3} · Tuya Pal\textsuperscript{1}

Evaluate the prevalence of and factors associated with:

1) Referral to genetic counseling (GC)
2) Receipt of genetic services (including GC attendance and/or BRCA testing)
Generalizability of Sample

No significant differences in Demographic and Clinical Variables between study participants and all living individuals within the sampling frame

<table>
<thead>
<tr>
<th></th>
<th>Participants N = 440</th>
<th>Non-participants N = 1207</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age at cancer diagnosis (SD)</td>
<td>42.10 (6.09)</td>
<td>42.61 (6.37)</td>
<td>0.15</td>
</tr>
<tr>
<td>Stage (n (%))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Localized</td>
<td>230 (52.3)</td>
<td>580 (48.1)</td>
<td>0.08</td>
</tr>
<tr>
<td>Regional</td>
<td>182 (41.4)</td>
<td>502 (41.6)</td>
<td></td>
</tr>
<tr>
<td>Distant</td>
<td>21 (4.8)</td>
<td>95 (7.9)</td>
<td></td>
</tr>
<tr>
<td>Unstaged</td>
<td>7 (1.6)</td>
<td>30 (2.5)</td>
<td></td>
</tr>
<tr>
<td>Histologic subtype (n (%))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ductal</td>
<td>347 (78.9)</td>
<td>976 (80.9)</td>
<td>0.47</td>
</tr>
<tr>
<td>Lobular</td>
<td>25 (5.7)</td>
<td>48 (4.0)</td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
<td>29 (6.6)</td>
<td>84 (7.0)</td>
<td></td>
</tr>
<tr>
<td>Other/unknown</td>
<td>39 (8.9)</td>
<td>99 (8.2)</td>
<td></td>
</tr>
<tr>
<td>ER/PR/HER2 receptor status known (n (%))</td>
<td>291 (66.1)</td>
<td>776 (64.3)</td>
<td>0.49</td>
</tr>
<tr>
<td>Receptor status (n (%))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triple negative</td>
<td>78 (26.8)</td>
<td>188 (24.2)</td>
<td>0.39</td>
</tr>
<tr>
<td>Non-triple negative</td>
<td>213 (73.2)</td>
<td>588 (75.8)</td>
<td></td>
</tr>
<tr>
<td>Married or cohabiting (n (%))</td>
<td>173 (39.3)</td>
<td>524 (43.4)</td>
<td>0.26</td>
</tr>
<tr>
<td>Yes</td>
<td>260 (59.1)</td>
<td>659 (54.6)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>7 (1.6)</td>
<td>24 (2.0)</td>
<td></td>
</tr>
<tr>
<td>Insurance at diagnosis (n (%))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not insured</td>
<td>47 (10.7)</td>
<td>114 (9.4)</td>
<td>0.79</td>
</tr>
<tr>
<td>Private insurance</td>
<td>245 (55.7)</td>
<td>709 (58.7)</td>
<td></td>
</tr>
<tr>
<td>Medicaid</td>
<td>73 (16.6)</td>
<td>192 (15.9)</td>
<td></td>
</tr>
<tr>
<td>Medicare</td>
<td>21 (4.8)</td>
<td>45 (3.7)</td>
<td></td>
</tr>
<tr>
<td>Military or Indian public health services</td>
<td>16 (3.6)</td>
<td>34 (2.8)</td>
<td></td>
</tr>
<tr>
<td>Other insurance</td>
<td>33 (7.5)</td>
<td>94 (7.8)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>5 (1.1)</td>
<td>19 (1.6)</td>
<td></td>
</tr>
<tr>
<td>Employment at diagnosis (n (%))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>51 (11.6)</td>
<td>133 (11.0)</td>
<td>0.62</td>
</tr>
<tr>
<td>Employed</td>
<td>275 (62.5)</td>
<td>732 (60.6)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>114 (25.9)</td>
<td>342 (28.3)</td>
<td></td>
</tr>
<tr>
<td>Metropolitan (n (%))</td>
<td>422 (95.9)</td>
<td>1159 (96.5)</td>
<td>0.92</td>
</tr>
</tbody>
</table>

a There were 16 individuals included with “non-participants” who consented but did not complete the baseline survey

b Valid percentages are shown based on those individuals where information for all three receptors was known
Referral and Access

N=440

51%

Referred and/or accessed

Genetic Counseling/Testing Predating study enrollment

N=440

- 152 (35%) referred for GC
- 91 (21%) attended GC
- 159 (36%) tested

- Refer
- Attend
- Test

66 (15% of 440)
+ Refer
+ Attend
+ Test

216 (49%)
- Refer
- Attend
- Test
Factors Associated with BRCA Testing Prior to Study Enrollment

- Diagnosed ≤ age 45
  - OR=2.0

- Triple Negative
  - OR=1.7

- College Graduate
  - OR=2.1

- Genetic Counseling Referral
  - OR=2.2

- Income ≥ $35,000
  - OR=7.9

- Private Insurance
  - OR=2.0

- Receipt of Genetic Counseling and/or Testing
  - OR=2.8
Overview of Recruitment Efforts

Eligible women with whom contact established: 882

Consented: 456
- Completed Baseline Survey: 440
  - Saliva Sample Obtained: 408
    - BRCA test results complete: 396

Not Consented: 426
- Declined: 182
- Showed Interest but not consented: 244
A High Frequency of BRCA Mutations in Young Black Women With Breast Cancer Residing in Florida

Tuya Pal, MD¹; Devon Bonner, BS¹; Deborah Cragun, PhD¹; Alvaro N.A. Monteiro, PhD¹; Catherine Phelan, MD, PhD¹; Lily Servais, MS²; Jongphil Kim, PhD¹; Steven A. Narod, MD³; Mohammad R. Akbari, MD, PhD³; and Susan T. Vadaparampil, PhD, MPH¹

- Pre- and Post-test genetic counseling offered to all participants

- BRCA testing (n=396) through:
  - full gene sequencing and MLPA
  - 12.4% (49) with mutations
  - 8 recurrent mutations (accounted for 49% of all pathogenic variants)
  - 40% of carriers had no first or second degree relative with breast or ovarian cancer

Results suggest that it might be appropriate to offer BRCA testing to all Black women with breast cancer <50
What have we learned?

• Opportunity to study receipt of genetic testing services in an unselected and underserved population
  • 1/3 of our participants have had BRCA testing predating study enrollment – yet all meet NCCN criteria for evaluation for inherited cancer predisposition
  • Contributing factors: Socioeconomic, Physician referral patterns

Need to develop multi-faceted approach to address differential access and utilization to reduce growing healthcare disparities in genetics

• BRCA mutations prevalence
  • 12.4% is higher than expected – suggests contribution to the high prevalence of breast cancer observed in young Black women

• Role of other genes?
  • Several BRCA-neg participants have striking family histories
Overview

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- Among population-based sample of young Black women, evaluate:
  - Identification
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  - BRCA mutation frequency
  - Cancer Risk Management

**You-GRADE**
- Among population-based sample of young women (non-Blacks), evaluate:
  - Identification
  - Access/uptake of testing
  - Delivery of genetic services
  - Cancer Risk Management
STUDY OBJECTIVES:
Among Young Black, Hispanic, and Non-Hispanic White breast cancer survivors, we compared:
• Receipt of BRCA testing
• Uptake of preventive surgery among BRCA mutation carriers

Participants recruited through the Florida State Cancer Registry

Population-based Cross-sectional Study
Florida State Cancer Registry
Breast cancer survivors
Diagnosed < age 50 between 2009-2012

Blacks
n=440

Hispanics
n=284

Non-Hispanic Whites
n=897
Disparities in receipt of BRCA testing

n=158 of 440 n=176 of 284 n=583 of 897

% Tested

100% 90% 80% 70% 60% 50% 40% 30% 20% 10% 0%

Black women

n=158 of 440

*p=0.025* controlling for:
- meeting NCCN criteria
- SES-related variables
- provider referral
<table>
<thead>
<tr>
<th>Barriers</th>
<th>Facilitators/Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cost and insurance concerns (41.4%)</td>
<td>1. Insurance covered all or most of it (70.3%)</td>
</tr>
<tr>
<td>2. Lack of provider recommendation (35.8%)</td>
<td>2. To benefit my family's future (67%)</td>
</tr>
<tr>
<td>3. Belief that genetic testing would not be helpful because they already had breast cancer (18.5%)</td>
<td>3. Provider recommendation (55%)</td>
</tr>
</tbody>
</table>
## Logistic Regression

**Outcome:** Accessed Genetic Testing

<table>
<thead>
<tr>
<th>Independent Variables (dichotomous)</th>
<th>Adjusted OR&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosed ≤ age 45</td>
<td>4.9**</td>
</tr>
<tr>
<td>Family history breast cancer</td>
<td>2.1**</td>
</tr>
<tr>
<td>Family history ovarian cancer</td>
<td>1.9**</td>
</tr>
<tr>
<td>Triple negative</td>
<td>1.7*</td>
</tr>
<tr>
<td>Private insurance at diagnosis</td>
<td>3.1**</td>
</tr>
<tr>
<td>Annual household income ≥ $25,000</td>
<td>2.3**</td>
</tr>
<tr>
<td>College graduate</td>
<td>1.6*</td>
</tr>
<tr>
<td>White or Hispanic (vs. Black)</td>
<td>4.8**</td>
</tr>
</tbody>
</table>

Statistically significant at: *p <0.025; ** p<0.001

<sup>a</sup> Also adjusted for: marital/partner status (p=.47), having children (*p=0.025); time since diagnosis to survey completion (p=0.52)
Proportion BRCA+

<table>
<thead>
<tr>
<th>% BRCA carriers</th>
<th>Black women (n=28 of 158)</th>
<th>Hispanic women (n=13 of 176)</th>
<th>White, non-Hispanic (n=51 of 583)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.7%</td>
<td>7.4%</td>
<td>8.7%</td>
<td></td>
</tr>
</tbody>
</table>
Differences in Cancer Risk Management Practices among BRCA Carriers

¾ still in treatment – too early to have screening

- Black (N=28)
- Hispanic (N=13)
- Non-Hispanic White (N=51)

96% 100% 98%

Bilateral mastectomy
Limitations

• Same sampling frame, however data collected as part of two studies which differed as follows:
  • Testing
  • Recruitment dates

• Snapshot in time with limited sample size of carriers
  • Follow-up over time important
  • Requires further investigation

• Practice changing events since 2013 necessitate comparisons in a more recent sample
  • BRCA patent
  • Technological advances/NGS
  • Affordable Care Act
  • Celebrity disclosures
Among Young women with breast cancer, compared to Young NHW and Hispanics, Blacks have:

- Lower rates of BRCA testing
- Higher frequency of BRCA mutations
- Lower uptake of ovarian cancer risk management
• Our findings are concerning given that the benefit from genetic testing comes from **ACTING** on the test results.

• **BRCA** testing and cancer risk management should be a **CHOICE**
  • Need to understand reasons for our findings:

• Highlights need to ensure access to testing and cancer risk management practices across **ALL** populations.
Initiative to address disparity related to hereditary breast cancer in Black women

- Breast Cancer Genetics Research and Education for African American Team (B-GREAT)

- T is for ‘team’
Overview of Research Activities through the Florida State Cancer Registry

Patient information obtained from FCDS (Florida State Cancer Registry)
- Informational package sent to potential participants
  - For participants that are interested, enrollment package sent
    - Informed Consent Signed
      - Genetic Counseling Session/Specimen collection

Current B-GREAT Outreach and Education Projects

• Brochure Dissemination

• Website Development (www.bgreatinitiative.org)

• Attendance at Community Events

• FL Breast Cancer Support Group Directory (large proportion of support groups added based on input from CAP)

http://www.bgreatinitiative.com/flbrcasupportgroups.htm
Lay Brochure

>25,000 disseminated to date
Florida African American (AA) Population by County, 2011

AA Population Count:
- < 50,000
- 50,000 - 150,000
- 150,001 - 300,000
- 300,001 - 500,000

B-GREAT brochure dissemination
What’s next?

• Improve access to genetic counseling and testing
  • RCT to evaluate a behavioral intervention
• Evaluate genetic and non-genetic factors associated with outcomes
  • Inherited breast cancer
  • Tumor phenotype
  • Access
  • Lifestyle/SES
• Implementation of genomic sequencing across the population to test 2 approaches to testing while studying factors related to:
  • Participants
  • Providers
  • Family members
  • Laboratory interface for support
Acknowledgements

BEST Team

Co-Investigators:
- Susan Vadaparampil, PhD, MPH
- Jongphil Kim, PhD
- Deborah Cragun, PhD, CGC

Study Team
- Devon Bonner
- Jennifer Garcia
- Ann Tezak

Collaborators
- Steven Narod, MD
- Mohammad Akbari, PhD, MD

Community Advisory Panel
- Cheryl Clinton
- Linda Paige
- Joyce Austin
- Deneen Wyman
- Gwendolyn Dawson
- Peggie Sherry
- Evora Pimento
- Benita Hayes
- Gloria Wood
- Sue Friedman
- Khaliah Fleming
- Valerie Poindexter

ICARE/You-GRADE Team

Co-Investigators
- Deborah Cragun, PhD, CGC
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- Catherine Phelan, PhD, MBBS
- Jongphil Kim, PhD

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- Emily Robinson
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- Ailyn Valladares
- Ann Tezak
- Courtney Lewis
- Cristi Radford
- Deanna Almanza
- Dana Ketcher

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Thank you for your attention!

Questions?