The Role of Genomics in Understanding Cancer

Genomic Health® 2012 Update
Agenda

- EBCC 2012
- IMPAKT/ESMO® 2012
- ASCO® 2012
- **Oncotype DX®** platform reveals underlying tumor biology across multiple tumor types
  - Invasive Breast Cancer
  - DCIS
  - Colon Cancer
  - Prostate Cancer
The Oncotype DX® Assay Reveals Underlying Tumor Biology

- The Oncotype DX® Breast Cancer Assay quantitatively predicts the likelihood of breast cancer recurrence in women with newly diagnosed, early stage, ER-positive invasive breast cancer and assesses the likely benefit from both hormonal therapy and chemotherapy.
- Studies performed worldwide show that the Recurrence Score® result changes treatment decisions greater than 30% of the time.
- The Oncotype DX assay is the only commercial multigene breast cancer assay incorporated into the ASCO®, ESMO®, St Gallen and NCCN® Guidelines.

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The Recurrence Score® Result Assesses Individual Tumor Biology for ER+ Breast Cancer

Paik  et al.  
Paik  et al. J Clin Oncol. 2006;  

LOW RECURRENCE SCORE DISEASE  
Indolent  
Hormone therapy-sensitive  
Minimal, if any, chemotherapy benefit

HIGH RECURRENCE SCORE DISEASE  
Aggressive  
Less sensitive to hormone therapy  
Large chemotherapy benefit
High Recurrence Score® Result Correlates with Greater Benefit from Chemotherapy (NSABP B-20)

RS, Recurrence Score result

High Recurrence Score® Disease Is Chemo-sensitive Whereas Low Recurrence Score Disease is Not (NSABP B-20)

Node Negative, ER-Positive Invasive Breast Cancer Chemotherapy Benefit

Recurrence Score vs Distant Recurrence at 10 Years
Tam vs Tam + CMF/MF

Average Rate of Distant Recurrence at 10 Years
Breast Cancer Recurrence Score

Absolute Benefit of Chemotherapy (CMF/MF) at 10 Years by Recurrence Score Group

SWOG 8814: Breast Cancer-Specific Survival of Node-Positive Patients by Treatment and Recurrence Score® Group

**BREAST CANCER-SPECIFIC SURVIVAL BY TREATMENT**

- **RS < 18**
  - Stratified log-rank $P = 0.56$ at 10 years
  - 10-yr BCSS: T: 92% vs CAF $\rightarrow$ T: 87%
  - No benefit to CAF over time for low Recurrence Score

- **RS 18-30**
  - Stratified log-rank $P = 0.89$ at 10 years
  - 10-yr BCSS: T: 70% vs CAF $\rightarrow$ T: 81%
  - Interaction $P = 0.021$

- **RS ≥ 31**
  - Stratified log-rank $P = 0.033$ at 10 years
  - 10-yr BCSS: T: 54% vs CAF $\rightarrow$ T: 73%
  - Strong benefit to CAF over time for high Recurrence Score

RS, Recurrence Score result
European Breast Cancer Conference
March 2012

IMPAKT Breast Cancer Conference
May 2012
European Breast Cancer Conference 2012

• Using the 21-gene Breast Cancer Assay in Adjuvant Decision-making in ER-Positive Early Breast Cancer is Cost-Effective: Results of a Large Prospective German Multicenter Study

• The Impact of Chemotherapeutic Regimens On the Cost-Utility Analysis of Oncotype DX® Assay

• Recurrence Score® and Treatment Decisions in Node-Positive, Estrogen Receptor-Positive Breast Cancer Patients in Israel
IMPAAKT/ESMO® 2012:

• Prospective Comparison of Risk Assessment Tools in Early Breast Cancer: Correlation Analysis from the Phase III WSG-Plan B Trial

• Cost-Effectiveness Review of the 21-Gene Breast Cancer Test

• Cost-Effectiveness Evaluation Of The 21-Gene Breast Cancer Test In France
Using the 21-gene Breast Cancer Assay in Adjuvant Decision-Making in ER-positive (ER+) Early Breast Cancer (EBC) is Cost-Effective: Results of a Large Prospective German Multicenter Study

Eiermann W,1 Rezai M,2 Kümmel S,3 Kühn T,4 Warm M,5 Friedrichs K,6 Benkow A,7 Blohmer J7

1 Rotkreuzklinikum, München, 2Luisenkrankenhaus Düsseldorf, 3KlinikenEssen Mitte, Essen, 4Klinikum Esslingen, 5Krankenhaus Holweide, Köln, 6Brustzentrum Hamburg, 7St. Gertrauden-Krankenhaus, Berlin
Overall, the knowledge of the Recurrence Score value resulted in a change in treatment recommendations in 33.1% of invasive breast cancer patients, predominantly from chemohormonal therapy (CHT) to hormonal therapy (HT).
Use of the Oncotype DX® Assay Reduced Adjuvant Chemotherapy Usage

<table>
<thead>
<tr>
<th>Pre-Assay Recommendation</th>
<th>Therapy Actually Administered</th>
<th>Change in Chemotherapy (CT) Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td>All N=366</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No CT</td>
<td>157 (42.9%)</td>
<td>226 (61.7%)</td>
</tr>
<tr>
<td>CT</td>
<td>209 (57.1%)</td>
<td>140 (38.3%)</td>
</tr>
<tr>
<td>N0 N=244</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No CT</td>
<td>127 (52.0%)</td>
<td>161 (66.0%)</td>
</tr>
<tr>
<td>CT</td>
<td>117 (48.0%)</td>
<td>83 (34.0%)</td>
</tr>
<tr>
<td>N+ N=122</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No CT</td>
<td>30 (24.6%)</td>
<td>65 (53.3%)</td>
</tr>
<tr>
<td>CT</td>
<td>92 (75.4%)</td>
<td>57 (46.7%)</td>
</tr>
<tr>
<td>Low RS N=198</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No CT</td>
<td>98 (49.5%)</td>
<td>171 (86.4%)</td>
</tr>
<tr>
<td>CT</td>
<td>100 (50.5%)</td>
<td>27 (13.6%)</td>
</tr>
<tr>
<td>Int RS N=139</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No CT</td>
<td>52 (37.4%)</td>
<td>54 (38.8%)</td>
</tr>
<tr>
<td>CT</td>
<td>87 (62.6%)</td>
<td>85 (61.2%)</td>
</tr>
<tr>
<td>High RS N=29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No CT</td>
<td>7 (24.1%)</td>
<td>1 (3.4%)</td>
</tr>
<tr>
<td>CT</td>
<td>22 (75.9%)</td>
<td>28 (96.6%)</td>
</tr>
</tbody>
</table>

RS, Recurrence Score® result
* Total change in number of chemotherapies applied regardless of pretest recommendation
+ Number of chemotherapies applied in relation to number of patientss with initial chemo recommendation

Eiermann et al. EBCC 2012.
The Oncotype DX Assay Provides Incremental Cost-Effectiveness in Germany

<table>
<thead>
<tr>
<th>Current Clinical Practice</th>
<th>Oncotype DX® Testing</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost per Patient</td>
<td>€10,225</td>
<td>€11,357</td>
</tr>
<tr>
<td>Life Years</td>
<td>16.92</td>
<td>21.75</td>
</tr>
<tr>
<td>Incremental Cost-Efficiency Ratio (€/Life Years)</td>
<td></td>
<td>€274</td>
</tr>
</tbody>
</table>

- Using the Oncotype DX assay to guide chemotherapy decisions was estimated to be associated with:
  - an increase in survival of 4.83 life years (LY) due to the high number of patients reclassified by the Recurrence Score® result as likely to benefit from chemotherapy.
  - an incremental cost-effectiveness ratio of €274/LY from the sick funds’ perspective.
  - an incremental cost-effectiveness ratio of €54/LY from the societal perspective.

Eiermann et al. EBCC 2012.
Conclusions

- Results of this study showed a significant impact of the Recurrence Score® result on adjuvant treatment decision making in ER-positive early invasive breast cancer (EBC) in German clinical practice. These results are consistent with previous cost-effectiveness studies published in other countries.

- The Oncotype DX® assay guided chemotherapy decision-making for ER-positive EBC, resulting in a significant reduction of adjuvant chemotherapy usage and cost-effectiveness compared to current clinical practice.

- One-way sensitivity analyses showed that the results were most sensitive to the cost of chemotherapy and to societal perspective. These results are expected to be conservative as the model does not account for local recurrences and the long-term cost of adverse events.

- These data support the efforts to improve the access of patients with node-negative and node-positive, ER-positive, early-stage invasive breast cancer to the Oncotype DX test.

Eiermann et al. EBCC 2012.
Recurrence Score and Treatment Decisions in Node-Positive, Estrogen Receptor-Positive Breast Cancer Patients in Israel

Stemmer SM,1 Lieberman N,2 Efrat N,3 Geffen DB,4 Steiner M,5 Soussan-Gutman L,6 Merling S,2 Rizel S,1 Klang SH2

1Institute of Oncology, Davidoff Center, Rabin Medical Center, Petach Tiqwa, Affiliated with the Sackler Faculty of Medicine, Ramat Aviv, Israel; 2Clalit Health Services, Tel Aviv, Israel; 3Kaplan Medical Center, Rehovot, Israel; 4Soroka University Medical Center and Ben-Gurion University of the Negev, Be’er Sheva, Israel; 5Carmel Hospital/Lin Medical Center, Haifa, Israel; 6Teva Pharmaceutical Industries Ltd, Netanya, Israel.

Stemmer et al. EBCC 2012.
• Overall, 24.1% of Oncotype DX® assay patients and 70.1% of controls received chemotherapy (adjusted odds ratio, 0.169; p<.0001; adjusted for age, tumor size, grade, and nodal status).
• In the Oncotype DX assay group, all patients in the high Recurrence Score category received chemotherapy; a higher proportion of patients in the intermediate Recurrence Score category received chemotherapy compared with the low Recurrence Score category (p<.0001, all comparisons).

Stemmer et al. EBCC 2012.
Proportions of Patients Receiving Chemotherapy by Recurrence Score Category and Age Group, Tumor Size, Grade, and Nodal Status

Stemmer et al. EBCC 2012.

int, intermediate; micromets, micrometastases; RS, Recurrence Score; y, year.
Only 6 patients were <40 years of age; tumor size information was not available for 3 patients in the intermediate 85 group; grade information was not applicable/unknown for 41 patients in the Oncotype DX group and 77 controls. In cases of multicentric or bilateral disease, the largest tumor and the highest grade were considered for the analysis.
Conclusions

- Our study suggests that since becoming available for node-positive patients in Israel in 2008, Oncotype DX® testing has caused a dramatic shift in the treatment paradigm for N+, ER+, breast cancer patients in Israel, reducing chemotherapy use in this population.
- Our results are consistent with findings from studies in N-, ER+ breast cancer populations around the world that showed that treatment recommendations are often changed after receiving the Recurrence Score® results from chemotherapy plus endocrine therapy to endocrine therapy alone, and with recent studies that showed similar changes in treatment patterns for N+, ER+ breast cancer patients.
- Reducing the proportion of patients receiving chemotherapy has economic implications. A formal health economic analysis is warranted and planned.
Prospective Comparison of Risk Assessment Tools in Early Breast Cancer: Correlation Analysis from the Phase III WSG-Plan B Trial


West German Study Group, Moenchengladbach, Germany; Medizinische Hochschule, Hannover, Germany; University of Cologne, Cologne, Germany, University of Muenster, Muenster, Germany; Genomic Health Inc, Redwood City; Bethesda Clinics, Moenchengladbach, Germany; University of Munich, Munich, Germany

## Central vs Local Grade:
### Comparison from the Phase III WSG-Plan B Trial

<table>
<thead>
<tr>
<th>Local Grade</th>
<th>G1 N (%)</th>
<th>G2 N (%)</th>
<th>G3 N (%)</th>
<th>Overall N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1 N (%)</td>
<td>57 (1.9)</td>
<td>116 (4.0)</td>
<td>16 (0.5)</td>
<td>189 (6.5)</td>
</tr>
<tr>
<td>G2 N (%)</td>
<td>76 (2.6)</td>
<td>1305 (44.6)</td>
<td>482 (16.5)</td>
<td>1863 (63.6)</td>
</tr>
<tr>
<td>G3 N (%)</td>
<td>6 (0.2)</td>
<td>222 (7.6)</td>
<td>647 (22)</td>
<td>875 (29.9)</td>
</tr>
<tr>
<td>Overall</td>
<td>139 (4.7)</td>
<td>1643 (56.1)</td>
<td>1145 (39)</td>
<td>N=2927</td>
</tr>
</tbody>
</table>

- 70% of grade I tumors by local pathology were classified as grade II or III by central pathology.
- 26% of grade III tumors by local pathology were classified as grade I or II by central pathology.

Concordance ~68%

The Correlation Between Grade, PR, ER, uPA, PAI-1 and Ki67 and the Recurrence Score® Result is Weak

Spearman Correlation with RS

Summary

• The concordance between local and central pathology regarding grade is moderate.

• The correlation between Grade, PR, ER, uPA, PAI-1 and Ki67 and the Recurrence Score® result is weak.
Is the 21-Gene Breast Cancer Test (Oncotype DX®) Good Value for Money?

Pronzato P,¹ Plun-Favreau J²

¹Istituto Nazionale per la Ricerca Cancro, Genova, Italia; ²Genomic Health, Inc. Redwood City, CA, USA
Conclusions

- Sixteen cost-effectiveness studies published or presented in twelve countries were identified. Similar methodologies and country specific parameters were utilized to reflect local clinical practices.
- Across the various settings, findings from these studies are consistent and support the cost-effectiveness of using the Oncotype DX® assay over comparators, regardless of local clinical practices. These findings are likely conservative, as they don’t account for all costs associated with chemotherapy.
- Results from these studies suggest that funding the Oncotype DX assay is a cost-effective use of healthcare budget when compared to other invasive breast cancer care interventions.
- The use of molecular diagnostics such as the Oncotype DX assay should be considered within the evolution of oncology patient care.

Pronzato et al. IMPAKT 2012. Abstract 49P.
The Oncotype DX® Assay is Cost-Effective Across International Markets

<table>
<thead>
<tr>
<th>Publication</th>
<th>Reported Findings (ICER in cost per QALY gained)</th>
<th>Country Threshold (Willingness to pay for 1 QALY($))</th>
<th>Country</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lacey L et al. 2011</td>
<td>EUR 9,462</td>
<td>EUR 20,000</td>
<td>Ireland</td>
<td>Cost Effective</td>
</tr>
<tr>
<td>Holt et al. 2011</td>
<td>GBP 6,232</td>
<td>GBP 20,000</td>
<td>UK</td>
<td>Cost Effective</td>
</tr>
<tr>
<td>Klang et al. 2010</td>
<td>USD 10,700</td>
<td>USD 35,000</td>
<td>Israel</td>
<td>Cost Effective</td>
</tr>
<tr>
<td>Tsoi et al. 2010</td>
<td>CAD 63,421</td>
<td>CAD 75,000</td>
<td>Canada</td>
<td>Cost Effective</td>
</tr>
<tr>
<td>Paulden et al. 2011</td>
<td>&gt; CAD 29,000</td>
<td>CAD 75,000</td>
<td>Canada</td>
<td>Cost Effective</td>
</tr>
<tr>
<td>Kondo et al. 2010</td>
<td>USD 3,848</td>
<td>USD 50,000</td>
<td>Japan</td>
<td>Cost Effective</td>
</tr>
<tr>
<td>Lamond et al. 2012</td>
<td>CAD 9,591</td>
<td>CAD 75,000</td>
<td>Canada</td>
<td>Cost Effective</td>
</tr>
<tr>
<td>Madaras et al. 2011</td>
<td>EUR 9,730</td>
<td>EUR 12,600-25,300</td>
<td>Hungary</td>
<td>Cost Effective</td>
</tr>
<tr>
<td>O’Leary et al. 2010</td>
<td>AUS 9,986</td>
<td>AUS 18,000</td>
<td>Australia</td>
<td>Cost Effective</td>
</tr>
<tr>
<td>de Lima Lopez et al. 2011</td>
<td></td>
<td></td>
<td>Singapore</td>
<td>Cost Savings</td>
</tr>
<tr>
<td>Chereau et al. 2011</td>
<td>Improved outcomes (QALYs), reduced costs</td>
<td></td>
<td>France</td>
<td>Cost Savings</td>
</tr>
</tbody>
</table>

Pronzato et al. IMPAKT 2012. Abstract 49P.
The Impact of Chemotherapeutic Regimens on the Cost-Utility Analysis of Oncotype DX® Assay

Madaras B,1 Rózsa P,2 Gerencsér Z,2 Radovics T,3 Láng I,1 Nagy Z,4 Horváth Z1

1B-Belgyógyászati, Onkológiai és Klinikai Farmakológiai Osztály, Országos Onkológiai Intézet, 2MediConcept Kft, 3Semmelweis Egyetem, Általános Orvostudományi Kar, 4Med Gen-Sol Kft

Madaras et al. EBCC 2012.
The Impact of Chemotherapeutic Regimens on the Cost-Utility Analysis of the Oncotype DX® Assay

<table>
<thead>
<tr>
<th>Costs, per patient tested (€)</th>
<th>Actual Treatment</th>
<th>Hypothetical Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oncotype DX Assay</td>
<td>3180</td>
<td>3180</td>
</tr>
<tr>
<td>Change in Use of Chemotherapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Chemotherapy drugs</td>
<td>-390.64</td>
<td>-1438.43</td>
</tr>
<tr>
<td>- Supportive Care</td>
<td>-349.86</td>
<td>-528.59</td>
</tr>
<tr>
<td>- Adverse Events</td>
<td>-32.93</td>
<td>-44.51</td>
</tr>
<tr>
<td>Recurrence Costs</td>
<td>-31.02</td>
<td>-334.97</td>
</tr>
<tr>
<td>Total</td>
<td>2375.55</td>
<td>833.49</td>
</tr>
</tbody>
</table>

QALY gain per Patient Tested

<table>
<thead>
<tr>
<th></th>
<th>Actual Treatment</th>
<th>Hypothetical Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemotherapy Related</td>
<td>0.099</td>
<td>0.147</td>
</tr>
<tr>
<td>Recurrence</td>
<td>0.028</td>
<td>0.158</td>
</tr>
<tr>
<td>Second Primary Cancer</td>
<td>0.045</td>
<td>0.066</td>
</tr>
<tr>
<td>Total</td>
<td>0.171</td>
<td>0.371</td>
</tr>
</tbody>
</table>

Cost/QALY Gained (ICER)  

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Onco DX Assay</td>
<td>13893.67 €</td>
</tr>
<tr>
<td>Recurrence</td>
<td>2248.25 €</td>
</tr>
</tbody>
</table>

Madaras et al. EBCC 2012.
Conclusions

• The ICER associated with using the Oncotype DX® assay in current clinical practice is 13894 €/QALY.

• These results show that the cost-effectiveness associated with using the Oncotype DX assay in Hungary is sensitive and could be enhanced, if all eligible invasive breast cancer patients were given the most effective chemotherapy regimens.

• Sensitivity analyses showed that the cost-effectiveness results were also sensitive to the recurrence rate, the risk categorisation, and the cost of chemotherapy.
Cost-Effectiveness Evaluation of the 21-gene Breast Cancer Test (Oncotype DX®) in France

Chereau E, Laas E, Genin AS, Bendifallah S, Bennett H, Rouzier R

Service de gynécologie, hôpital TENON, Paris
Cost-Effectiveness Evaluation of the 21-gene Breast Cancer Test (Oncotype DX®) in France

- Study results show that using the Oncotype DX assay in the French setting should be associated with cost-savings.

<table>
<thead>
<tr>
<th>Per patient tested</th>
<th>Usual care</th>
<th>Oncotype DX Assay</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discounted cost</td>
<td>€11,804</td>
<td>€11,174</td>
<td>€629</td>
</tr>
<tr>
<td>Discounted life years</td>
<td>13.21</td>
<td>13.33</td>
<td>0.13</td>
</tr>
<tr>
<td>Incremental cost-effectiveness ratio</td>
<td>-</td>
<td>-</td>
<td>Cost-Saving</td>
</tr>
</tbody>
</table>

Chereau et al. IMPAKT 2012. Abstract 26P.
Conclusions

• Study results show that using the Oncotype DX® assay in the French setting should be associated with cost-savings and an estimated improvement in life expectancy (0.13 life year saved in the base case for invasive breast cancer).

• These results are consistent with findings from other countries where the Oncotype DX assay was also shown to have a likely positive impact on the long term outcomes (i.e. avoiding few recurrences) due to the reclassification of patients for chemotherapy following the availability of the Recurrence Score® result.

• These results are likely conservative as some of the costs associated with chemotherapy (e.g. long term side effects such as cardiotoxicity, cognitive impact and secondary leukemia) and local recurrences are not taken into account in the model structure.

• Funding the Oncotype DX assay to allow its integration in the French clinical practice should therefore be a cost-effective use of the French National Health System budget.
American Society of Clinical Oncology
June 2012
ASCO®: Oncotype DX® Assay Reveals Underlying Tumor Biology Across Multiple Tumor Types

- **Invasive Breast**
  - ECOG 2197 10-year follow-up report
  - Final analyses from the Plan B West German Study Group
  - Multiple decision impact and health economic reports
  - Recurrence Score® result distribution in Luminal A/B cancer

- **DCIS**
  - ECOG 5194 clinical and pathologic sub-study

- **Colon**
  - NSABP C-07 validation study in stage II & III patients

- **Prostate**
  - Development study to discriminate aggressive from indolent disease

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10-year Update of E2197: Phase III Doxorubicin/Docetaxel (AT) versus Doxorubicin/Cyclophosphamide (AC) Adjuvant Treatment of LN+ and High-Risk LN- Breast Cancer and the Comparison of the Prognostic Utility of the 21-gene Recurrence Score® (RS) with Clinicopathologic Features


Albert Einstein College of Medicine, Bronx, NY; Dana-Farber Cancer Institute, Boston, MA; Mayo Clinic, Jacksonville, FL; The Angeles Clinic and Research Institute, Santa Monica, CA; Indiana University School of Medicine, Indianapolis, IN; University of California, San Francisco, San Francisco, CA; Sanofi, Bridgewater, NJ; Genomic Health, Redwood City, CA; University of Pittsburgh Cancer Institute, Pittsburgh, PA; Fox Chase Cancer Center, Philadelphia, PA
The Recurrence Score® Result Predicts Risk of Recurrence Irrespective of Nodal Status (10-Year Recurrence Rates)

- There is little difference in recurrence rates for 1 and 0 positive nodes.

The Recurrence Score result was a highly significant predictor of recurrence in chemo-treated patients regardless of nodal status (N- (p=0.003) or N+ (p=0.0007)).

Conclusions

- The Recurrence Score® result was a highly significant predictor of recurrence including node negative and node positive disease ($p < 0.0001$)

- The Recurrence Score result continues to provide information that is complementary to classical clinicopathological features in patients with 0 to 3 positive axillary lymph nodes

- There remains no difference in DFS (77%) or OS (84%) between the two arms of the study, although there continue to be fewer events in the AT arm in the pre-specified ER/PR negative subgroup

Prospective Comparison of Recurrence Score® and Independent Central Pathology Assessment of Prognostic Tools in Early Breast Cancer (BC): Focus on HER2, ER, PR, Ki-67 Results from the Phase III WSG-Plan B Trial

Oleg Gluz, Hans Heinrich Kreipe, Matthias Christgen, Tom Degenhardt, Ronald E. Kates, Cornelia Liedtke, Steven Shak, Michael R. Clemens, Marwa Salem, Susanne Markmann, Bernd Liedtke, Bahriye Aktas, Stephan Henschen, Anke Pollmanns, Petra Krabisch, Christoph Uleer, Doris Augustin, Christoph Thomssen, Ulrike Nitz, Nadia Harbeck

West German Study Group (WSG)
Prospective comparison between the Recurrence Score® result and independent pathology assessment of prognostic markers from the Phase III WSG-Plan B trial in patients with hormone receptor positive early stage invasive breast cancer

- Correlative analyses between the Recurrence Score result and pathology markers were evaluated in tumor specimens from over 2,500 patients
- Ki-67, grade, and ER/PR were evaluated by independent trial pathologists for all tumor specimens

Association Between Recurrence Score® Result and Ki-67 (Plan B Cut-offs)

There is only moderate correlation between the Recurrence Score result and Ki-67.

Conclusions

• There is a wide range of Recurrence Score® results in luminal A and luminal B tumors (by IHC) and in grade I, II, III by both central and local assessment

• High risk by Recurrence Score result implies high risk by other risk assessment parameters, but the converse is not true

• Only moderate correlations were found between the Recurrence Score result and central grade and between Recurrence Score and Ki-67

• There was a high concordance (positive and negative) for ER/PR measured by IHC and by RT-PCR (Oncotype DX® Assay)

As previously demonstrated in multiple studies, the Oncotype DX assay provides an individualized Recurrence Score result that cannot be predicted by traditional clinicopathologic measures.

Gluz O et al, J Clin Oncol 2012; 30 (suppl; abstr 552).
Decision Impact Studies


Using the Oncotype DX assay significantly impacts recommendations because it reveals underlying tumor biology of individual tumors. The results from these studies are consistent with numerous studies from around the world.
Prospective Study of the Oncotype DX® Assay on Treatment Recommendations in France (n=96)

- 36% of invasive patients (95% CI: 27%-47%) had a change in treatment recommendations.
  - 5 (5%) added chemotherapy (CT) and 30 (31%) removed chemotherapy.
  - The proportion of patients recommended chemotherapy decreased from 52% pre-Oncotype DX assay to 26% post-Oncotype DX assay (p<0.001 for McNemar’s test).

Pre-Assay Question: “I am confident in my treatment recommendation prior to ordering the Oncotype DX assay.”

Post-Assay Question: “I am confident in my treatment recommendation after ordering the Oncotype DX assay.”

Among 150 cases with changes in physician confidence recorded, there were increases in physician confidence in 88 (59%), decreases in 9 (6%), and no change in 53 (35%). There were significantly more increases than decreases ($p<0.001$), indicating an overall increase in physician confidence.

---

#### The Oncotype DX® Assay Influenced Physician Confidence in Canada

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Disagree nor Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-Assay</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strongly Disagree</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Disagree</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Neither Disagree nor Agree</td>
<td>0</td>
<td>1</td>
<td>11</td>
<td>50</td>
<td>17</td>
<td>79</td>
</tr>
<tr>
<td>Agree</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>36</td>
<td>15</td>
<td>56</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0</td>
<td>1</td>
<td>18</td>
<td>93</td>
<td>38</td>
<td>150</td>
</tr>
</tbody>
</table>

Davidson et al. ASCO 2012. Abstract 549.
A Prospective Study of the Impact of the Recurrence Score® Assay in Academic Canadian Centers

- Physicians changed their adjuvant chemotherapy recommendation in 45/150 cases (30%; 95% CI 22.8-38.0%):
  - Chemotherapy added: 10% (95% CI 5.7-16.0%)
  - Chemotherapy omitted: 20% (95% CI 13.9-27.3%)
- In 84 cases (56%; 95% CI 47.7-64.1%) there was a change in either the planned chemotherapy and/or endocrine therapy recommendation.
- Further analysis of decision making by tumor grade showed:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Number of Patients</th>
<th>Recurrence Score Range</th>
<th>Rate of Chemotherapy Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>33</td>
<td>0 – 41</td>
<td>21%</td>
</tr>
<tr>
<td>2</td>
<td>82</td>
<td>0 – 52</td>
<td>34%</td>
</tr>
<tr>
<td>3</td>
<td>33</td>
<td>6 – 73</td>
<td>30%</td>
</tr>
</tbody>
</table>

Davidson et al. ASCO 2012. Abstract 549.
Can The Oncotype DX® Recurrence Score® be Used in Luminal A and Luminal B Breast Cancer Patients to Predict the Likely Benefit of Chemotherapy? A Retrospective Study In The Spanish Population.

- Of 84 patients with ER-positive invasive breast cancer:
  - 38 (47.1%) tumors were classified as Luminal A (ki67<14%)
    - Recurrence Score group: Low (61%), Intermediate (34%), High (5%)
  - 46 (51%) were classified as Luminal B (ki67≥14%)
    - Recurrence Score group: Low (61%), Intermediate (22%), High (17%)

- The wide range of Recurrence Score results in both Luminal A and B breast cancer subtypes confirm the important role of the Oncotype DX assay in treatment decision-making.

Correlation Between the DCIS Score™ and Traditional Clinical and Pathologic Features in the Prospectively Designed E5194 Clinical Validation Study


Eastern Cooperative Oncology Group (ECOG)
North Central Cancer Treatment Group (NCCTG)
Genomic Health, Inc (GHI)
Introduction

- The development and clinical validation of the DCIS Score™ result in E5194 was presented in December 2011 at SABCS
  - DCIS Score result predicted the 10-year risk of any ipsilateral breast event (IBE) and invasive IBE
  - Multivariate analyses showed that the DCIS Score result, tumor size and menopausal status were independent predictors of an IBE

- This study evaluated:
  - Association of the clinical and pathologic characteristics with IBE risk
  - Association of the DCIS Score result with clinical and pathologic characteristics
  - Concordance between three independent histologic grade assessments

Multivariable Models of Risk for IBE

<table>
<thead>
<tr>
<th></th>
<th>Hazard Ratio* (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excluding the DCIS Score™ Result</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tumor size</td>
<td>1.54 (1.14, 2.02)</td>
<td>0.01</td>
</tr>
<tr>
<td>Postmenopausal</td>
<td>0.49 (0.27, 0.90)</td>
<td>0.02</td>
</tr>
<tr>
<td>Including the DCIS Score Result</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCIS Score</td>
<td>2.41 (1.15, 4.89)</td>
<td>0.02</td>
</tr>
<tr>
<td>Tumor size</td>
<td>1.52 (1.11, 2.01)</td>
<td>0.01</td>
</tr>
<tr>
<td>Postmenopausal</td>
<td>0.49 (0.27, 0.90)</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Univariate analyses for surgical margins, grade, comedo necrosis, and DCIS pattern, all p-value > 0.46; for tamoxifen, p = 0.09. Since all nonsignificant, none of these factors were included in the multivariate analyses.

Primary Analysis of the Risk for an Ipsilateral Breast Event (IBE)

<table>
<thead>
<tr>
<th>Primary Analysis</th>
<th>Hazard Ratio* (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCIS Score™ Result</td>
<td>2.34 (1.15, 4.59)</td>
<td>0.02</td>
</tr>
<tr>
<td>Tamoxifen use</td>
<td>0.56 (0.24, 1.15)</td>
<td>0.12</td>
</tr>
</tbody>
</table>

*Hazard ratio is for a 50 point difference
Grade Assessment Comparison
Local, Architecture and CAP Classifications

Concordance between Local and David Page Architectural Grade:
213/311 = 68%

Concordance between CAP and David Page Architectural Grade:
116/312 = 37%

*15 patients with unknown architectural (David Page) grade; 1 patient with unknown local grade

Association of Histologic Grade with IBE Risk

Grade, as determined by any assessment, is not predictive of local recurrence.

Association of Histologic Grade with DCIS Score™ Result

There is only moderate correlation between the DCIS Score result and histologic grade.

Association of Categorical Tumor Size with IBE Risk and DCIS Score™ Result

- Categorical log rank p-value = 0.28
- Continuous tumor size statistically significant (p=0.009) in a univariate Cox model
- Spearman’s rank correlation = 0.18 (95% CI = 0.08 to 0.29)

Tumor size as a categorical variable is not a significant predictor of local recurrence risk, however, it is as a continuous variable. There is poor correlation between the DCIS Score result and tumor size.

Association of Menopausal Status with IBE Risk and DCIS Score™ Result

- Log rank p-value = 0.025
- Also significant in multivariate model
- Spearman’s rank correlation = 0.04 (95% CI = -0.14 to 0.07)

Menopausal status is a significant factor in predicting the risk of local recurrence, however, there is no correlation between the DCIS Score result and menopausal status.

Association of Percentage Comedo Necrosis with IBE Risk and DCIS Score™ Result

- Log rank p-value = 0.45
- Spearman's rank correlation = 0.49 (95% CI = 0.41 to 0.57)

Comedo necrosis is not a significant predictor of local recurrence risk. There is only moderate correlation between the DCIS Score result and comedo necrosis.

Association of DCIS Pattern with IBE Risk and DCIS Score™ Result

- Log rank p-value = 0.72
- $R^2 = 0.08$ for DCIS Pattern as a predictor of the DCIS Score result

DCIS pattern is not a significant predictor of local recurrence risk. There is no association between the DCIS Score result and DCIS pattern.

Conclusions: DCIS Score™ Result and Clinical and Pathology Characteristics

- Clinical and pathologic characteristics such as: grade (1990’s or CAP), margin status ≥3 mm, comedo necrosis and histologic subtype were not predictors of IBE risk.
- For each clinical and pathologic characteristic, there was a wide distribution of DCIS Score result values.
- Mandated CAP nuclear grading classified 9% of patients as low, 57% as intermediate and 34% as high grade; there was low concordance between grading systems.
- The DCIS Score result provides independent information on IBE risk beyond clinical and pathologic variables.

Closing Remarks

• Importance of understanding cancer tumor biology to advance the treatment of breast cancer patients

  – The results of the ECOG 2197 10-year update are consistent with the extensive clinical validation of the Oncotype DX® Breast Cancer Assay in both node negative and node positive invasive breast cancer.

  – The Oncotype DX Breast Cancer Assay reveals underlying tumor biology that changes treatment decisions in invasive breast cancer.

  – ECOG 5194 validates the DCIS Score™ result as the strongest independent predictor of local recurrence risk, providing information beyond traditional measures.
Onco
type DX® Colon Cancer Assay

Personalizing Risk Assessment in the Management of Stage II and III Colon Cancer
Development and Validation of the Oncotype DX® Colon Cancer Assay for Use in Stage II/III Colon Cancer

Colon Cancer Technical Feasibility

Development Studies (Surgery)
NSABP C-01/C-02 (n = 270)
Cleveland Clinic (n = 765)

Development Studies (5FU/LV)
NSABP C-04 (n = 308)
NSABP C-06 (n = 508)

Selection of Final Gene List & Algorithm

Standardization and Validation of Analytical Methods

Clinical Validation Study – Stage II Colon Cancer
QUASAR (N = 1436)

Confirmation Study – Stage II Colon Cancer
CALGB 9581 (N = 690)

Clinical Validation Study – Stage II/III Colon Cancer
5FU vs 5FU+Oxaliplatin
NSABP C-07 (N = 892)
Validation of the 12-gene Colon Cancer Recurrence Score® Result in NSABP C-07 as a Predictor of Recurrence in Stage II and III Colon Cancer Patients Treated with 5FU/LV (5FU) and 5FU/LV + Oxaliplatin (5FU+Ox)

O’Connell MJ,1 Lee M,2 Lopatin M,2 Yothers G,1 Clark-Langone K,2 Millward C,2 Paik S,1 Sharif S,1 Shak S,2 Wolmark N1

1National Surgical Adjuvant Breast and Bowel Project, Pittsburgh, PA; 2Genomic Health, Inc., Redwood City, CA

Primary Analysis: Recurrence Score® Result Predicts Recurrence Risk in Stage II & III Colon Cancer Patients in NSABP C-07 (n=892)

### Pre-Specified Primary Analysis: Recurrence Score® Result Predicts Recurrence Risk in Stage II & III Colon Cancer Patients in NSABP C-07 (n=892)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>HR</th>
<th>HR 95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage</strong> (by nodal status)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage III A/B vs II</td>
<td></td>
<td>2.53</td>
<td>(1.70,3.78)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Stage III C vs II</td>
<td></td>
<td>5.29</td>
<td>(3.54,7.90)</td>
<td></td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5FU+Ox vs 5FU</td>
<td></td>
<td>0.76</td>
<td>(0.59,0.98)</td>
<td>0.033</td>
</tr>
<tr>
<td><strong>Recurrence Score result</strong></td>
<td>per 25 units</td>
<td>1.96</td>
<td>(1.50,2.55)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

- Continuous Recurrence Score result is significantly associated with risk of recurrence controlling for effects of treatment and stage (by nodal status)
  - Interaction of Recurrence Score result and nodal status, treatment, and age were not significant (p=0.90, 0.48, and 0.76, respectively)

Recurrence Score® Groups and Treatment in Stage II
Kaplan-Meier Analysis

KM Estimates (95% CI) of 5-year Recurrence Risk

<table>
<thead>
<tr>
<th>Risk Group</th>
<th>N events</th>
<th>N Pts</th>
<th>5FU</th>
<th>5FU + Ox</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low RS Group</td>
<td>10</td>
<td>103</td>
<td>7% (3%, 17%)</td>
<td>12% (5%, 27%)</td>
</tr>
<tr>
<td>Int RS Group</td>
<td>9</td>
<td>94</td>
<td>8% (3%, 22%)</td>
<td>10% (4%, 22%)</td>
</tr>
<tr>
<td>High RS Group</td>
<td>12</td>
<td>67</td>
<td>23% (12%, 42%)</td>
<td>9% (3%, 25%)</td>
</tr>
</tbody>
</table>

Recurrence Score® Groups and Treatment in Stage III A/B

Kaplan-Meier Analysis


<table>
<thead>
<tr>
<th>Risk Group</th>
<th>N events</th>
<th>N Pts</th>
<th>5FU (%)</th>
<th>5FU + Ox (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low RS Group</td>
<td>31</td>
<td>169</td>
<td>19% (12%, 28%)</td>
<td>17% (10%, 27%)</td>
</tr>
<tr>
<td>Int RS Group</td>
<td>38</td>
<td>138</td>
<td>30% (20%, 42%)</td>
<td>19% (11%, 30%)</td>
</tr>
<tr>
<td>High RS Group</td>
<td>40</td>
<td>102</td>
<td>43% (31%, 57%)</td>
<td>31% (20%, 46%)</td>
</tr>
</tbody>
</table>
## Contribution of Recurrence Score® Result Beyond Clinical and Pathologic Covariates

*Pre-specified Multivariate Analysis (n=892)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>HR</th>
<th>HR 95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage (by nodal status)</td>
<td>Stage III A/B vs II</td>
<td>0.97</td>
<td>(0.55, 1.71)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Stage III C vs II</td>
<td>2.07</td>
<td>(1.16, 3.68)</td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>5FU+Ox vs 5FU</td>
<td>0.82</td>
<td>(0.64, 1.06)</td>
<td>0.12</td>
</tr>
<tr>
<td>MMR</td>
<td>MMR-D vs MMR-P</td>
<td>0.27</td>
<td>(0.12, 0.62)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>T-stage</td>
<td>T4 st II &amp; T3-T4 st III vs T3 st II &amp; T1-T2 st III</td>
<td>3.04</td>
<td>(1.84, 5.02)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Nodes examined</td>
<td>&lt;12 vs ≥12</td>
<td>1.51</td>
<td>(1.17, 1.95)</td>
<td>0.002</td>
</tr>
<tr>
<td>Tumor grade</td>
<td>High vs Low</td>
<td>1.36</td>
<td>(1.02, 1.82)</td>
<td>0.041</td>
</tr>
<tr>
<td><strong>Recurrence Score result</strong></td>
<td>per 25 units</td>
<td>1.57</td>
<td>(1.19, 2.08)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Summary

- NSABP C-07, a randomized phase III clinical trial, provided an unique opportunity to test the Recurrence Score® result for prediction of recurrence risk and its relationship with absolute treatment benefit from oxaliplatin in resected colon cancer.
  - The relationship of a marker with treatment benefit can only be evaluated through analysis of large, randomized trials.

- The Recurrence Score result predicts recurrence risk in stage II and III colon cancer patients treated with 5FU or 5FU+oxaliplatin, capturing underlying biology and providing risk information beyond conventional factors.

- With similar relative risk reduction observed for oxaliplatin across the range of Recurrence Score values, the Recurrence Score result enables better discrimination of absolute oxaliplatin benefit as a function of risk.

Conclusions

- As in stage II colon cancer, incorporating the Recurrence Score result into the clinical context can guide adjuvant therapy decisions for certain patients with stage III colon cancer.
  - In particular, for certain stage IIIA/B patients, the finding of low Recurrence Score disease (Recurrence Score result < 30), and thus low recurrence risk and low absolute oxaliplatin benefit, may not justify the risk of potential toxicity from adding oxaliplatin.

- Analysis of new genes as potential predictors of oxaliplatin sensitivity and resistance is in progress.

- Risk stratification through anatomic staging, the Recurrence Score result and potentially other factors may enable clinical trial designs targeted to more homogeneous, well-defined low- and high-risk patient populations in the adjuvant setting.

Effect of Oncotype DX® Colon Cancer Test Results on Treatment Recommendations in Patients With Stage II Colon Cancer

Cartwright T,1 Chao C,2 Lopatin M,2 Bentley T,3 Broder M,3 Chang E3

1. Ocala Oncology, Ocala, FL; 2. Genomic Health, Inc.®, Redwood City, CA; 3. Partnership for Health Analytic Research, LLC, Beverly Hills, CA.
Study Objective and Methods

• Objective
  – Characterize impact of Oncotype DX® Colon Cancer Assay on adjuvant treatment recommendations for stage II colon cancer patients in oncology practices

• Methods
  – Web-based survey developed through cognitive interviews with medical oncologists
  – Each physician respondent asked to retrieve chart on the most recent stage II colon cancer patient for whom Oncotype DX assay was ordered
  – The 34-item questionnaire recorded
    • Patient’s characteristics
    • Documented pre- and post-assay treatment recommendations
    • Oncologist’s general practice patterns
Impact of Oncotype DX® Colon Cancer Assay on Treatment Recommendations in Stage II Colon Cancer

Pre- vs Post-Assay Recommendations (n=92)

Recurrence Score® result led to increase in treatment intensity in 9 patients

Recurrence Score® result led to decrease in treatment intensity in 18 patients

Cartwright et al. ASCO 2012. Abstract 3626.
Summary and Conclusions

- Recurrence Score® results prompted a change in treatment recommendations 29% of the time.
  - 19.6% had a decrease in treatment intensity
  - 9.8% had an increase in treatment intensity
- Use of the Oncotype DX® Colon Cancer Assay may lead to reductions in treatment intensity, contributing to the assay’s cost effectiveness.
- Studies are ongoing to prospectively investigate the impact of the Oncotype DX assay on clinical decisions and to evaluate cost effectiveness in clinical practice.

Cartwright et al. ASCO 2012. Abstract 3626.
Oncotype DX® Prostate Cancer Assay

Personalizing the Management of Prostate Cancer
Development of a Needle Biopsy-Based Genomic Test to Improve Discrimination of Clinically Aggressive from Indolent Prostate Cancer

Klein EA 1, Maddala T 3, Millward C 3, Cherbavaz D 3, Falzarano SM 2, Knezevic D 3, Novotny W 3, Lee M 3, and Magi-Galluzzi C 2

Cleveland Clinic 1Glickman Urological and Kidney Institute and 2Pathology and Laboratory Medicine Institute, Cleveland, OH 3 Genomic Health, Inc., Redwood City, CA

Rationale for Developing a Genomic Assay for Localized Prostate Cancer

• At diagnosis, prognosis of localized prostate cancer is currently based on clinical and pathologic features (e.g. biopsy Gleason grade, PSA, clinical stage) that do not fully account for individual tumor biology and provide only an imprecise estimate of aggressiveness.¹-²

• An actionable and validated genomic test that distinguishes between clinically indolent and aggressive disease at the time of diagnosis could help decide between active surveillance and immediate treatment.

• Development of a genomic test to guide treatment decision-making must address two key challenges:
  • Tumor heterogeneity
  • Limited tissue sampled with prostate needle biopsies

Predictive Genes From Gene Identification Study Also Predict Adverse Pathology When Assayed in Biopsy Tumor Tissue

<table>
<thead>
<tr>
<th>Outcome</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse Pathology</td>
<td>53</td>
<td>32%</td>
</tr>
<tr>
<td>Grade: RP Gleason Score 4+3 or 8+</td>
<td>36</td>
<td>22%</td>
</tr>
<tr>
<td>Stage: Pathology T3 stage</td>
<td>42</td>
<td>25%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gene Group/Pathway</th>
<th># of Genes Evaluated</th>
<th># of Genes Associated with Adverse Pathology*</th>
<th>% of Genes Associated</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>81</td>
<td>58</td>
<td>72%</td>
</tr>
<tr>
<td>Stromal Response</td>
<td>14</td>
<td>14</td>
<td>100%</td>
</tr>
<tr>
<td>Androgen</td>
<td>3</td>
<td>3</td>
<td>100%</td>
</tr>
<tr>
<td>Cellular Organization</td>
<td>22</td>
<td>18</td>
<td>82%</td>
</tr>
<tr>
<td>Proliferation</td>
<td>5</td>
<td>2</td>
<td>40%</td>
</tr>
<tr>
<td>Stress Response</td>
<td>7</td>
<td>2</td>
<td>29%</td>
</tr>
<tr>
<td>Basal Epithelial</td>
<td>4</td>
<td>1</td>
<td>25%</td>
</tr>
</tbody>
</table>

*Associated with grade, stage, or grade and/or stage and controlling the FDR at 10%

Expression of Most Key Gene Groups/Pathways is Similarly Predictive of Adverse Pathology in The Gene Identification and the Gene Refinement Studies

*The average of select genes within each pathway depicted Klein et al. ASCO 2012. Abstract 4560.
Genomic Health’s Research is Focused on Optimizing Cancer Treatment

Breast
Renal
Colon
Prostate