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Metastatic Breast Cancer: Using Conjoint Analysis to Analyze Patient Preferences

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Metastatic Breast Cancer: Using Conjoint Analysis to Analyze Patient Preferences

Patients with metastatic breast cancer face difficult trade-offs between toxicity and efficacy. Techniques from other fields can help analyze trade-off preferences.

Description: As a project of the Advocacy Core of the Indiana University DoD Center of Excellence for Individualization of Therapy in Breast Cancer, Research Advocacy Network and CBWhite conducted research using Conjoint Analysis (CA) to analyze the preferences of metastatic breast cancer patients. Three advocacy organizations: Living Beyond Breast Cancer, Metastatic Breast Cancer Network, and BCMets listserv released the online survey. Questions designed to elicit views on the trade-off between benefit and side effects and biomarker tests were answered by over 400 women. The results were analyzed using CA methods which presents pairs of hypothetical treatments, each defined by benefit and side effect likelihoods. In each question, respondents select a preferred treatment or no treatment. Analysis of patterns allows prediction of selecting treatment for any combination of benefit and side effect.

Results:

- Preference curves show greater preference for higher benefit and lower side effect likelihoods. Range is from 92% for "best" combination (60% benefit/20% side effect) to 12% for "worst" combination (10% benefit/90% side effect).
- Benefit appears more influential than side effect; selecting treatment drops more quickly as benefit diminishes and more slowly as side effect increases.

	Prediction of % Selecting Treatment for Each Combination of Benefit and Side Effect Likelihood				
	Likelihood				
Benefit	**20%**	**40%**	**60%**	**75%**	**90%**
60%	92	88	76	65	49
40%	87	75	54	47	39
20%	53	42	33	26	23
10%	37	35	25	14	12

Subgroup analysis shows differences depending on age, side effect, and presence of children.

Using conjoint analysis to predict impact of biomarkers shows:

- 19% to 27% may change treatment decision if biomarker predicts 30% vs 50% benefit likelihood
- 10% to 18% may change treatment decision if biomarker predicts 30% vs 50% side effect likelihood

Conclusion: Conjoint analysis can be used to quantify patient preference with respect to benefit and side effect trade-offs. Predictions and usefulness will be improved by designing conjoint analysis based on specific treatment research questions that have particular side effect profiles. Biomarker influence can be modeled using conjoint data.

KEY QUESTIONS/AIMS OF THE PROJECT

- How would information from biomarkers influence patient decision making?
- How do patients weigh the risks and benefits of treatment during decision making?

PROCESS

- Focus Groups
- Survey Development
- Pretest
- Survey Revision
- Data Collection
  - Living Beyond Breast Cancer (about 200)
  - Metastatic Breast Cancer Network (about 100)
  - BCMets listserv (about 100)
- Data Analysis
- Report

DEMOGRAPHICS

In summary, the respondents can be described as follows:

- Relatively young
- Three-quarters have children, although this includes those with adult offspring
- About two-thirds are married
- High level of education and income
- White

CANCER PROFILE

Respondents were asked about their original cancer diagnosis and experiences to provide a basis for comparing subgroups. Their cancer "stats" show:

- Many (almost a third) were diagnosed over ten years ago although, for two-thirds, metastasis was discovered within the last 5 years
- About 60% have no family history or mutation
- Wide range on chemo regimens (from 10% who say "none" to 18% who say "six or more")
- Current situation (to capture place in the cancer journey) is predominated by the 70% who selected the same response – in treatment, disease evident and stable or responding

CONJOINT ANALYSIS

Conjoint analysis is a specialized market research technique often used to better understand the needs or values of respondents.

Respondents saw 12 questions in which they could choose between two hypothetical treatments (each described by a likelihood of benefit and a likelihood of side effect) OR indicate that, if these were their only two choices, they would choose NOT to have treatment. A sample question is shown below:

By including the box representing the choice NOT to have treatment, we are able to estimate the threshold at which a respondent will or will not have treatment.

For the objectives of this analysis, we have used the conjoint model to:

- Examine the benefit-toxicity trade-off in the situation in which only one treatment is available (what percent of respondents are predicted to take the treatment versus not).
- Attempt to mimic the biomarker choices to see what conjoint analysis predicts the impact of the various spreads (e.g., 30% versus 50%) to be.

We can also use the conjoint model to see which treatment, if any, a person is expected to choose if more than one is available.

SURVEY FINDINGS

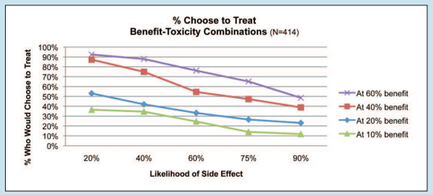
Benefit-Toxicity Trade-off

The chart below shows the predicted likelihood of choosing a treatment with the characteristics specified.

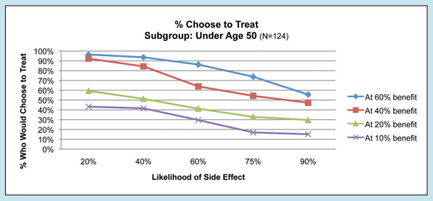
- As expected, likelihoods are higher for higher benefit or lower toxicity.
- Benefit appears more influential than side effect; selecting treatment drops more quickly as benefit diminishes and more slowly as side effect increases.

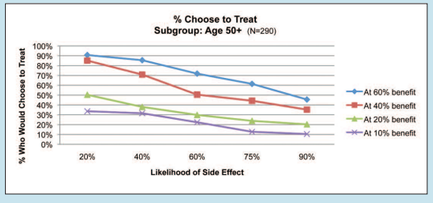
It is also notable that:

- Each curve has a slightly different shape. For instance, at very low benefit (10%), even a doubling of side effect (from 20% to 40%) has little impact.
- 40% seems to be an important threshold on both sides. That is, likelihood of taking treatment moves up quite a bit as choices reach 40% likelihood of benefit and as choices get down to 40% likelihood of toxicity.



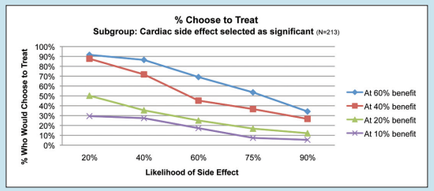
Respondents under age 50 are more likely to treat in virtually any scenario (as defined by benefit and side effect) than respondents over age 50.

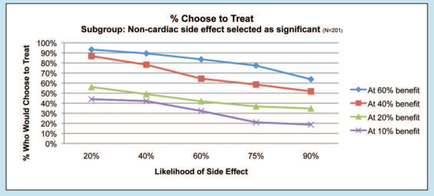




Respondents who were considering a cardiac side effect are less likely to treat than those considering other side effects in most scenarios.

- They are similar in the likelihood to treat when the side effect likelihood is low (at 20%).
- The shapes of the curves, indicating the reduction in likelihood to treat as side effect likelihoods worsen, differ. Those considering cardiac side effects are more likely to move towards "no treatment" as side effect likelihoods worsen. While this is not surprising, it indicates that we will observe different results depending on which side effect a respondent is thinking about.



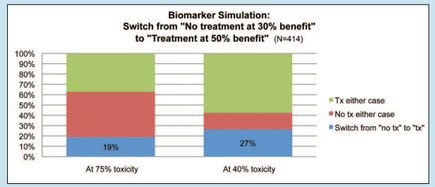


Respondents with no children have similar responses as women with children 12 and over, while respondents with younger children (under age 12) are more likely to treat in virtually every scenario.

Benefit-Toxicity Trade-offs as a Predictor of Biomarker Influence

Biomarker Predicting Benefit:

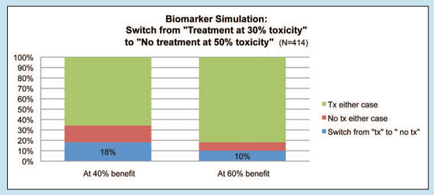
To see how the conjoint model could be used to predict influence of biomarker, consider a hypothetical biomarker that could predict 30% likelihood of benefit or 50% likelihood of benefit. We used the conjoint model to predict how many patients would change their treatment decision if they knew they would be in the 30% versus the 50% group. First, we ran the model at 40% toxicity, varying the benefit from 30% to 50%. Next, we ran the model at 75% toxicity, again varying the benefit from 30% to 50%.



The model shows anywhere from 19% to 27% of respondents switching from no treatment to treatment as benefit likelihood increases.

Biomarker Predicting Toxicity:

Another hypothetical biomarker predicts toxicity, predicting 30% versus 50% likelihood of side effect. We used the conjoint model to predict how many patients would change their treatment decision if they knew they would be in the 30% versus 50% group. First, we ran the model at 40% benefit, varying the toxicity from 30% to 50%. Next, we ran the model at 60% benefit, again varying the toxicity from 30% to 50%.



The model shows anywhere from 10% to 18% of respondents switching from treatment to no treatment as toxicity likelihood increases.

CONCLUSIONS

- This effort has shown a high degree of interest in biomarkers and a great desire for information.
- Respondents' open-end statements express frustration, both with toxicity and the feeling of guesswork or trial-and-error.
- Patients are eager for the type of information that biomarkers are intended to provide.
- The conjoint model gives us an exciting basis to measure and predict patient decision-making in a rigorous manner.
- Conjoint analysis can be used to quantify patient preference with respect to benefit and side effect trade-offs.
- Predictions and usefulness will be improved by designing Conjoint Analysis based on specific treatment research questions that have particular side effect profiles.
- Biomarker influence can be modeled using conjoint data.

FUTURE DIRECTIONS

In the future, we envision:

- Conducting this research with a more representative population (women of color, and women with lower income and/or educational levels)
- Varying the severity and duration of the side effect and, perhaps, the type of benefit, to see how the results change
- Designing a conjoint analysis survey with a specific treatment as the basis, to provide more specific benefits and toxicities to test; and, therefore, providing results with more clinical and research applicability

Supporting Agencies
Center of Excellence for Individualization of Therapy in Breast Cancer at Indiana University, George Sledge, MD, Principal Investigator (Award #W81XWH-04-0468)