Are Further Studies of Breast Cancer Tumor Markers Justified? A Value of Research Analysis

Rahber Thariani PhD1, David Blough PhD1, Norah Lynn Henry MD, PhD1, Bill Barlow Ph.D1, Julie Gralow MD1,2, Scott Ramsey MD PhD1,3, David Veenstra PharmD PhD1
1University of Washington, 2University of Michigan, 3Fred Hutchinson Cancer Research Center,
Center for Comparative Effectiveness Research in Cancer Genomics (CANCERGEN)

INTRODUCTION

In a recent trial a CA 27.29 radioimmunoassay was able to identify patients with breast cancer recurrence 5.3 months before recurrence is clinically established. However, American Society of Clinical Oncology (ASCO) guidelines recommend against the use of these tumor markers to detect recurrence following breast cancer therapy. However, usage estimates for biomarker testing exceed 20% of all cases of early breast cancer. The ASCO recommendation is based on the absence of data showing a survival or other outcome benefits such quality of life, drug toxicity etc. Two prospective trials conducted in the 80s following breast cancer patients with intensive vs. standard follow-up regime showed no significant differences in overall survival. Given newer therapies with improved efficacies and toxicity profiles, earlier detection and treatment of breast cancer recurrence may yield substantial improvements in healthcare outcomes. However, a decision-analytic model was developed with biomarker testing in addition to standard surveillance at follow-up appointments for breast cancer patients every 3 months for five years, resulting in different types of treatment. The ASCO recommendations for breast cancer patients every 3 months for five years were evaluated for a treatment. The affected population was estimated from SEER incidence data and discounted over a 10-year time horizon. We assumed that the 5-year recurrence rate was 25% and all recurrence cases were metastatic in nature. Our results indicate that substantial value to society can be obtained by evaluating the clinical utility of serial tumor marker assessment for early detection of breast cancer recurrence. An analysis was also conducted to determine the impact of different trial sizes. We also explored the impact of different levels of confidence in expert opinion i.e. being equivalent to an existing trial with n=1 to n=50. Note that the sharp edges below are due to convergence errors.

RESULTS

Expected Value of Sample Information (EVSIs)

An emerging field in health economics—value of information (VOI) analysis—quantifies the value of future research, and may be helpful in resource allocation decisions. Based on Bayesian decision theory, these methods provide an analytical framework to assess the societal value obtained by the reduction of uncertainty around a treatment or testing decision. The value of information is a function of 1) the probability of selecting the optimal monitoring strategy based on current vs. future information, 2) the clinical and economic impacts of each strategy, and 3) the size of the population affected. Our results indicate that substantial value to society can be obtained by evaluating the clinical utility of serial tumor marker assessment for early detection of breast cancer recurrence. This value is driven by the current paucity and conflicting information in this area, severity of outcomes, and large population that could be affected. Even small trials focusing on reducing uncertainty in specific parameters, may provide substantial value.