Choosing the Optimal Genomics Assay Provider for Pediatric Solid Cancer Patients

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ABSTRACT

The Pediatric Cancer Precision Genomics Program at Indiana University School of Medicine (IUSM) with Riley Hospital for Children has tested the utility of genomics assays provided by Foundation Medicine, NantOmics, and NANT. To date 118 pediatric patients have been tested by one or more of these providers. Each company provides a unique and unique approach to providing molecular oncology services. Foundation Medicine provides an exome analysis service; NantOmics provides a hybrid-Seq service with an additional targeted gene panel; and NANT provides a hybrid-Seq service with a whole transcriptome analysis. Each of these providers offer unique advantages. Our study aims to compare the performance of these assays, specifically looking at clinical utility, turnaround time, precision, and cost. We compared each company's ability to detect actionable gene mutations, biomarkers, and disease biomarkers. We also aimed to evaluate the utility of each provider's whole transcriptome analysis.

RESULTS

Comparison of the Genomic Assay Capabilities of the Leading Providers. We compared the next of kin of the patient, most providers offer specific advantages. Due to the abundance of data provided, Riley would prefer to have an assay analysis performed by NANT PCR. This is to a specific tumor, followed by NANT. Furthermore, our providers are rapidly progressing and require a quicker turnaround than 3-5 weeks. In these cases, the most recent actionable gene mutations are also well-expressed in biomarkers, which are the only advantage of using FoundationOne for a best pediatric solid tumor.

High Grade Glioma Genes: FoundationOne, FoundationOne Heme or OncoKidsSM. High grade pediatric glioma has been broken shown to be a number of molecular subtypes, each with distinct mutational, phenotypic and outcomes. To identify the relevant genetic information for each patient, the most frequent and unique genetic events in pediatric gliomas are to be sequenced for FoundationOne, FoundationOne Heme and OncoKidsSM. Each panel is compared to the disease characteristics. Theast panel sequences whole coding regions and mutations with other cancer genes and identifies genetic associations with pediatric malignancies. The data provided by NantOmics is useful for molecular diagnosis and selecting mutation-based targeted therapies. Paradigm Diagnostics runs multiple analyses focused on identifying genetic, proteomic and mRna expression biomarkers as well as unique biomarkers that can be used for personalized medicine.

BACKGROUND

The success of precision medicine in providing treatment options for pediatric cancer patients is dependent upon identification of the biomarkers most predictive of a therapeutic response. This is determined by 1) accuracy of the assay, 2) number of relevant biomarkers included in the assay, and 3) correlation between a particular biomarker and clinical response to a drug. No single genomics provider excels at meeting all of these criteria. However, most CUA approved services are provided by companies that provide useful information under most circumstances. The majority of genomics providers test for adult solid tumor gene mutations with adult cancer driving the development of targeted drugs. Adult biased assays can miss pediatric opportunities. Furthermore, targetable gene mutations are less common in pediatric solid tumors. Fortunately, a number of genomics providers offer assays that measure the expression level of RNA and protein biomarkers that can be demonstrated to correlate with drug responses. We call these ‘expression biomarkers,’ which in our experience offer more information than simply genotyping cancer patients than do gene mutation biomarkers. Since the inception of the Precision Genomics Program at Riley Hospital for Children at Indiana University Health in April 2016, we have had opportunities to compare the services of the leading providers of precision genomics tests. A comparison of these services is offered here.

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Platform Comparisons in Actual Patient Cases. In many cases sufficient sample information has been provided to allow more than one provider for comparison. In most cases, one or both providers have identified biomarkers suggestive of therapeutic approaches. A number of specific cases are shown below along with the final therapies determined by the Precision Genomics Tumor Board.

Combining Expression Biomarkers with Genomic Biomarkers Provides Insights into Opportunities for Precision Guided Oncology. Although genomic alterations of targetable genes are generally used as responses for targeted therapy in adult solid tumors, known targetable mutations are less common in pediatric solid tumors. Rather, expression biomarkers can be identified in tumor specimens for pediatric solid tumor patients.

Provider Selection Flow Scheme

Current Genomics Panel Coverage Offered by Paradigm PCDx, NANT NGS Cancer, FoundationOne and OncoKidsSM. For oncologists interested in diagnostic gene coverage, the providers would be ranked NANT NGS Cancer > FoundationOne Heme > OncoKidsSM > PCDx. NANT NGS Cancer > FoundationOne Heme > OncoKidsSM. This ranking is only current if institutional bioinformatic support is available. Otherwise Paradigm would rank first for Precision Medicine. Each provider varies significantly in their ability to interpret their own data to identifying precision-based therapies.