Impact of Next-generation Sequencing (NGS) on Treatment Decision in the Community Oncology Setting

Lindsey C. Overton, Christopher L. Corles1, R. Marinsh Aguirre5, Vicky J. Asakura, Nancy L. Beegle, Sibel Babu, Mark Chernoff, Stephen G. Divin, David H. Henry, R. Marinsh Aguirre5, Colleen Oliver, Eric Scott Schaefer, Frederik M. Schnell, Dennis Staller, David Lewis Spitz, Vicci Tuchfarber, Robert J. Green2,3,4,5,6,9,10,3,11,12


Abstract

Background: Mutation testing has become standard of care in melanoma, lung, and colorectal cancers. This study evaluated the feasibility of Next generation sequencing (NGS) and introduced a decision support tool to inform treatment decisions in the community oncology setting.

Methods: We conducted a retrospective chart review of a network of community oncology practices whose patients were tested for actionable mutations in AKT1, BRAF, DDR, EGFR, HER2, KIT, NTRK1, NTRK2, NTRK3, PIK3CA, PTEN, GNAS, KRAS, PIK3R1, KDR, NF1, HRAS, PDK1, RAF1, RASopathies, AKT2, ALK, BRAF, BOC, DDR, EGFR, ERBB2, FGFR1, FGFR3, MAP2K1, MET, NFI, NF1, NTRK, NTRK2, NTRK3, PIK3CA, PIK3R1, PTEN, GNA1, GNAQ, GNA12, GNA13, PIK3R2, RAF1, RASSF1A, and PIK3R5. As of 12/31/2014, patient-level data were available for 632 patients. Of these, 59 patients were found to be carbamoyl-phenylalanine (CPA) and or Methyltetrahydrofolate (MTHFR) or NADH oxidase (NADH) deficiency. These data were used to determine if testing was available before the start of any cancer treatments during a patient’s career and to examine if any decisions were influenced by the available mutational test results. Such decisions were defined as enrolment on, or consideration of, a clinically targetted study, or the use of an FDA approved targeted medication, either on or off-label.

Results: Among 632 cases evaluated with NGS, 57% (n=360) were determined to have actionable mutations. Of 59 patients 59 were not included for analysis based on the lack of available clinical data and/or diagnosis of an early stage cancer. Average turnaround for samples was 11 days from receipt to result. This left 301 patients for study (see Table 1). As illustrated in Figure 2, the majority of the patients had lung, colorectal, or breast cancer (59%), but there was significant diversity in the cancer types represented (n=45). Of these, 63 different malignancies included for analysis.

At the time of analysis in May 2014, of the 178 patients that had treatment decisions after the time of NGS testing over one-third of these patients had their treatment impacted by available testing. (see Table 1 for the

Conclusions

When performed in a timely manner, NGS had a significant impact on treatment decision making in patients with advanced cancer. Unfortunately over 25% of the patients died before treatment could be impacted by testing. In total, of those patients who were not impacted by NGS, half were on hospice or dead on hospital. This would suggest that testing may need to be incorporated earlier in order to have a more significant impact. This study showed that NGS is a cost effective with over 80% of patients with different malignancies in the NGS (n=360) group overall survival benefit.

References


Methods

Patients treated at any of twelve oncology practices belong to Cancer Clinics of Excellence (CCE) were evaluated for inclusion in the study. These practices included all that had the infrastructure to perform a mutational genotype, would be made available for research, and the study was conducted under a single IRB-approved protocol.

Inclusion criteria were: age over 18 years, a diagnosis of late stage or metastatic cancer, and availability of genotyping data from an NGS panel. NGS testing was performed at the Knight Diagnostics Laboratories using the GeneTails Solid Tumor Panel. This panel evaluates 27 genes commonly associated with cancer: AKT1, AKT2, AKT3, ALK, BRAF, BOC, DDR, EGFR, ERBB2, FGFR1, FGFR3, MAP2K1, MET, NFI, NF1, NTRK, NTRK2, NTRK3, PIK3CA, PIK3R1, PTEN, GNA1, GNAQ, GNA12, GNA13, PIK3R2, RAF1, RASSF1A, and PIK3R5.

Results

Among 632 cases evaluated with NGS, 57% (n=360) were determined to have actionable mutations. Of 59 patients 59 were not included for analysis based on the lack of available clinical data and/or diagnosis of an early stage cancer. Average turnaround for samples was 11 days from receipt to result. This left 301 patients for study (see Table 1). As illustrated in Figure 2, the majority of the patients had lung, colorectal, or breast cancer (59%), but there was significant diversity in the cancer types represented (n=45). Of these, 63 different malignancies included for analysis.

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Conflicts of Interest

The authors have no conflicts of interest to disclose.