Oncology

Benefits of in-house genomic sequencing

Improved outcomes enabled by rapid, community-based cancer biomarker testing

An evolving diagnostic landscape

Modern cancer care relies heavily on biomarker testing for diagnosis of disease, as well as selection of effective therapies. As the number of actionable biomarkers continues to increase, serial single-gene testing has become less practical due to its large specimen requirements, long turnaround time, and lack of comprehensive coverage, giving rise to next-generation sequencing (NGS) as a necessary standard of care in oncology. A sequencing-based approach helps ensure all relevant biomarkers can be captured at once, making the most of limited sample tissue while also decreasing critical time-to-results.

A valuable new tool for oncology care

Despite the overwhelming need for NGS, many hospitals are reliant on outsourcing to specialized reference laboratories to perform this service, leading to long turnaround times for results, and potentially initiating suboptimal treatment regimens for cancer patients. Recent advances in automation of NGS, however, have allowed hospitals to bring this valuable technology in-house, facilitating faster results and better coordination of care. Community health care institutions can now deliver comprehensive NGS results as quickly and easily as common tests like immunohistochemistry (IHC), right from their own pathology department.

Selecting the right first-line therapy improves survival

The initial decision on which therapy should be used to treat a cancer patient has been shown to have an outsized impact on survival. In a recent study of 525 non-small cell lung cancer (NSCLC) cases, patients who were put on biomarker-directed first-line treatment with a tyrosine kinase inhibitor (TKI) showed up to 35% higher probability of survival after two years than those who were put on a first-line chemotherapy and/or immunotherapy regimen in the absence of genomic profiling results [1] (Figure 1).

Patients put on biomarker-directed first-line TKI therapy also showed 22% higher probability of survival after 2 years relative to patients who were initially on a first-line chemotherapy and/or immunotherapy regimen and later switched to second-line TKI therapy after genomic profiling results were made available. These findings suggest faster test results may provide clinicians the opportunity to choose optimal first-line therapy for those patients whose tumors harbor actionable genomic alterations.

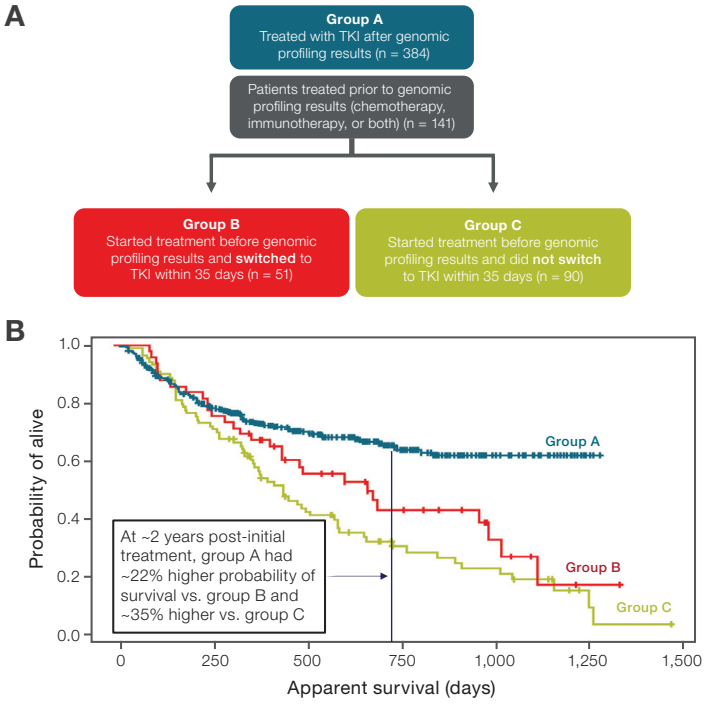

Figure 1. Treatment regimens and apparent survival curves of NSCLC patients [1]. (A) Treatment regimens of the three groups. **(B)** Apparent survival curves of each group. Group B (n = 51), which switched to TKI treatment within 35 days, demonstrated a median apparent survival (AS) of 672 days. Group C (n = 90), which did not switch, demonstrated a median AS of 437 days. A median AS was not reached for group A (control group, n = 384), because survival extended beyond the data cut-off date in more than half of patients.

Transforming cancer care with rapid NGS

Median turnaround time of 3 days in community setting

Faster results by testing closer to the patient

To help ensure that patients have the best opportunity for optimal first-line treatment, it is important to obtain biomarker test results quickly, which can be facilitated by testing locally. In a study of 1,162 cancer cases, in-house NGS biomarker testing was found to deliver results 9 days faster on average than send-out to a reference laboratory [2]. In another study of 578 cases, a community hospital using an in-house NGS system was able to achieve a median turnaround time of only 3 days [3] (Figure 2). Sixty-six (11%) of the reports were issued simultaneously with diagnosis. These data suggest that by keeping NGS testing in-house, clinicians can receive vital biomarker information more quickly and make the optimal treatment decision for their patients up front.

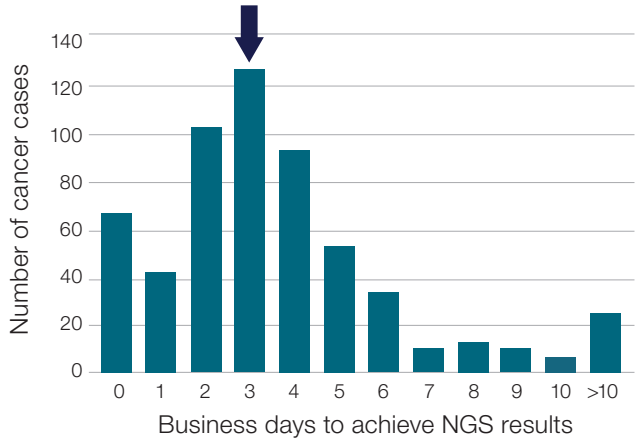

Figure 2. Time taken to obtain NGS results on cancer samples at a community hospital [3]. The arrow is showing the median time (3 days).

Not all NGS is created equal

Different technologies exist for NGS; however, there are distinct tradeoffs to consider in utilizing one over another. An in-house NGS technology known as amplicon-based NGS can accept very low sample inputs while providing higher success rates than an alternative, hybrid capture–based NGS. One study revealed failure rates as high as 22% for hybrid capture–based NGS from a reference laboratory, due to sample constraints [4]. In contrast, a separate study of a laboratory using amplicon-based NGS cited a failure rate of only 5.8% [5] (Figure 3). When considering the impact testing failures may have on therapeutic decisions, amplicon-based NGS has been shown to be a reliable means for obtaining valuable cancer biomarker test results when tissue quantity may be limited.

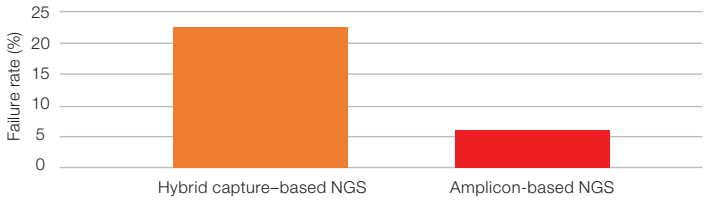

Figure 3. Failure rate of hybrid capture–based and amplicon-based NGS methodologies [4,5].

Conclusion

As cancer treatment becomes more reliant on biomarker testing, next-generation sequencing (NGS) will continue to play an important role in guiding therapeutic decisions. Due to advances in automation and integration of sequencing instrumentation, NGS is now more accessible than ever, even for community-based institutions. By bringing this valuable technology in-house, hospitals can deliver results faster and ultimately provide more optimal care to cancer patients.

References

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