How bioinformatics is changing cancer care

Just as no two patients are alike, no two cancers are alike. Despite advances in cancer treatment, some patients still face a lack of options, especially when it comes to rare, aggressive, or late-stage disease. **Bioinformatics** is changing this, putting highly personalized cancer treatment options in the hands of clinicians. Here's how it works—and how it's transforming the way we treat cancer.

The pathway and impact of cancer-related data

Data

Structured
and **unstructured**
(e.g., lab, EHR, genetics, patient history, lifestyle, etc.)

Patient

- **Patient history:** age, weight, smoker, etc.
- **Tumor makeup:** specific genetic mutation(s)
- Normal tissue may also be sequenced
- CT/MRI scans

Bioinformatics System

Combines state-of-the-art tumor sequencing with powerful cancer data analysis
Example: **IBM Watson™ Genomics from Quest Diagnostics®** combines:

- Quest's state-of-the-art tumor analysis
- The cognitive computing of IBM Watson
- The deep cancer treatment expertise of Memorial Sloan Kettering Cancer Center
- Research support from The Broad Institute of MIT and Harvard

Treatment + Outcomes

Bioinformatics can quickly uncover **highly personalized cancer treatment options**—including options that previously may have remained unidentified

The patient, cancer, treatment type, and effectiveness contribute to a greater understanding and expand the amount of actionable data and insights available to clinicians, **for better decision-making**

Before Bioinformatics

Patient

Presents with cancer type (e.g., colon cancer); treated with chemotherapy usually prescribed for this type of cancer

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By 2025, **genomics could represent the biggest of big data fields** (bigger than Twitter and YouTube)[1]

Cells in a tumor may have 30, 60, or even 200 somatic mutations that can **significantly alter the proteins the mutated genes produce**[2]

Broad, hybrid capture-based next-generation sequencing identifies actionable genomic alterations in lung adenocarcinomas **otherwise negative for such alterations by other genomic testing approaches**[3]

Greater cancer insight with cutting-edge technology from Quest Diagnostics

IBM Watson Genomics from Quest Diagnostics combines Quest's state-of-the-art tumor analysis with the cognitive computing of IBM Watson and the deep cancer treatment expertise of Memorial Sloan Kettering Cancer Center. The test identifies:

Single nucleotide variants | Insertions and deletions | Copy number variations | Select rearrangements in 50 genes

References

1. Stephens ZD, Lee SY, Faghri F, et al. Big data: astronomical or genomical? *PLOS Biology*. 2015;13(7):e1002195.
2. Harley L. A disease of the genome. *Front Line Genomics Magazine*. Oct 2016.
3. Drilon A, Wang L, Arcila ME, et al. Broad, hybrid capture-based next-generation sequencing identifies actionable genomic alterations in "driver-negative" lung adenocarcinomas. *Clinical Cancer Research*. 2015. DOI: 10.1158/1078-0432.CCR-14-2683.

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