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## Innovation and advanced clinical practice in cancer care: Stratifying cancer patients prior to clinical treatment

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It was estimated, that in 2017 there would be 1,688,780 new cancer cases diagnosed and 600,920 cancer deaths in the US (American Cancer Society). Only addressing the four major cancers (colon/lung/breast/prostate) this equates to a 35% death rate of the 2017 estimated new cases. This death rate would indicate that as of 2018, cancer yet remains one of the most challenging diseases to treat. Inefficient treatment modalities could contribute significantly to this unacceptable mortality rate. Furthermore, heterogeneity of virtually all solid and liquid tumor types is known to exist and endure. Cancers derive as monoclonal in origin, due in part, to innate genetic instability, subsequent cell mitosis with generations taking on new characteristics imparting a dynamic phenotype. But, tumors cells are not the only contributors of tumor heterogeneity, the entire microenvironmental constituents and its non-tumorous cells have an absolute influence as well. Thus, there exists a reciprocal and dynamic interaction between tumor cells, microenvironment constituents and non-tumorous cells that produce a well-defined individualistic tumor phenotype. The clinical relevance is that the tumor and its microenvironment heterogeneity contribute significantly to the efficacy of drug therapy. Furthermore, transporter genetic variants cause population-specific differences in drug transport and therefore impart considerable inter-individual variation in pharmacotherapy and thus clinical response to a myriad of agents. Our lab briefly delineates an innovative, improved, and reliable, in-vitro test that employs a more scientific and logical approach to identify drug(s) and drug combinations that may be efficacious against a specific patient's tumor in-vivo. The patient's own tumor mass is fully disaggregated and as such, all cells (microenvironment) that compose the tumor are subjected to cytotoxic/cytolytic agents. We use flow cytometric methodologies and stains that well define nucleated live/dead cell populations. The data garnered from a person's own cancer is utilized to develop a highly individualized therapeutic regimen; using cell death (not cell-growth) as the end-point, which has been shown to be more clinically relevant by correlating to clinical outcomes. Albeit, the entirety our data is not shown, our preliminary studies validate that in-vitro testing does qualify as a tool that can assist and guide oncologists to the most efficacious therapy(s) thereby improving their clinical practice in cancer care. While the divergent heterogeneity of tumor types and its micro environment validates the necessity to individualize/personalize chemotherapy, a randomized controlled clinical trial must be designed to further correlate and validate our studies and to fully appreciate the impact of in-vitro chemoresistance and sensitivity testing on cancer recurrence and survival rates.

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