

Innovative informatics solution for cancer research

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Emerging therapies to treat cancer and prevent its recurrence are based on detection of cellular and genomic changes within the tumor tissue. These therapies intend to identify those changes that will respond to highly selective drugs. It is an assumption that these changes arise from pathogenetic mechanisms of malignancy. Genomic and epigenetic variations that may not seem significant or relevant to cancer patients, when only the tumor tissue is considered, may prove important in improving the accuracy of cancer diagnosis, prognosis and prevention of recurrence.

Emerging studies are showing the relevance of including molecular footprints, detailed genomic analysis and impact of bio-hazard and other environmental attributes that contributes to cancer. There is a growing need to analyze the changes in environmental exposures due to occupations and residences in the lifetime before and after the cancer diagnosis in order to better evaluate prognosis and risk of cancer recurrence.

Maine Institute of Human Health and Genetics (whose principal investigator is Dr Janet Hock) and Persistent Systems are working on one such information technology solution, named User Gateway, that attempts to link these disparate elements of a patient's life to support comprehensive statistical analysis for population-based research, public health innovation, and clinical applications.

Survey data on lifestyles, residential, military service and occupational history are linked to clinical data, extracted data from pathology reports, maps of potential carcinogens in the physical environment and industrial exposures that contribute to risk of cancer and other diseases. The queries can ask for information around individuals with common behaviors, histories or exposures and orient the information according to space and time. In the prototype, we established a rich data set of 89 cases that required surgery for their cancer; collected blood and resected tumor tissue and linked these over time and geography to shape files on the physical environment and industrial uses in Maine, a state that has among the highest rates of cancer in the US.

With increasing focus on next generation sequencing, commoditization of gene sequencing is a possibility in the near future. Integrated analyses of a patient's demographic, clinical, genomic, lifestyle, and environmental attributes becomes imperative

in order to determine the composite of risks contributing to that person's cancer and, thus, for more effective cancer control and prevention.

India has huge cultural and geographical disparities in human health. Lifestyle and environmental factors play a pivotal role in diagnosis and treatment therapies in the context of diverse cultures in India. Integrative analyses for better population-based management of cancer control and prevention require innovative tools that are relevant and easy-to-use, irrespective of the culture and the country.