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Guest Editorial

Biomedical Informatics: From Clinical Data to Personalized Medicine

Advances in computational techniques and parallel hardware support have driven the science of informatics towards innovation that is defining future approaches to information and knowledge management in biomedical research, clinical care and public health. The biomedical informatics is defined as the branch of medicine that combines biology with computer science or the science of information applied to, or studied in the context of biomedicine. To summarize, Biomedical Informatics is a developing body of knowledge or a set of techniques concerning with organizational management (acquire, store, analyze, maintain, retrieve, communicate, Display and apply) of information to improve patient care, education, medical research and administration by timely and reliable decision making.

The biomedical science is basically different from informatics because biomedical science seeks to answer questions concerning biomedical issues, such as genetic factors that may affect a disease. Within biomedical science, informatics has attained importance due to the increasing amount of information, both research and clinical, required to solve important problems. Biomedical informatics involves a core set of methodologies that can provide a foundation for crossing the "translational barriers" associated with translational medicine. The fundamental aspects of biomedical informatics (e.g., bioinformatics, clinical informatics, and public health informatics) may be essential in helping improve the ability to bring basic research findings to the bedside, evaluate the efficacy of interventions across communities, and enable the assessment of the eventual impact of translational medicine innovations on health policies.

Bioinformatics is essential for management of data in modern biology and medicine which led a paradigm shift in biological research to use the computers, software tools and computational models in a large scale. Bioinformatics deals with voluminous biomedical and genomic data to initiate research on the development of novel techniques for the integration of biological and clinical data to translate it into knowledge on proactive, predictive, preventive and participatory health. Evolvement of next generation sequencing techniques along with Bioinformatics analysis to detect single nucleotide polymorphisms and variations on differential gene expression in patients and healthy individuals aided significantly in disease diagnosis and therapeutic target discovery. The *in silico* analysis to identify drug targets, subunit vaccines have gained momentum for combating major infectious diseases. The sequence (UniProt), structure (The Protein Databank) and small molecule databases (ZINC, LigandInfo, PubChem) in association with molecular modeling algorithms have been successful in quick identification of potential lead molecules for experimental validation against diseases such as cancer, diabetes, Alzheimer's *etc*. Never the less the online Literature databases have helped to pursue advanced and updated biomedical research. The end product of bioinformatics is newly found knowledge from these integrative efforts that can be disseminated to biomedical scientists, clinicians to implement in patient care.

Clinical Informatics is the application of informatics and information technology to deliver healthcare services. Clinical informatics includes a wide range of topics ranging from clinical decision support to visual images (e.g. radiological, pathological, dermatological, ophthalmological, etc); from clinical documentation to provider order entry systems; and from system design to system implementation and adoption issues. The computational technologies used to develop infrastructure for hospital information system (Electronic Clinical Records, Billing transactions, Ordering Systems), Knowledge Management (evidence based medicine, personalized medicine and Literature database), Clinical decision support system and communication system (Telemedicine, Teleradiology) etc. Biomedical informatics would streamline patient data analysis for research activity which in turn could be utilized for better patient care.

Public Health Informatics is the application of informatics in areas of public health, including surveillance, prevention, preparedness, and health promotion.

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Public health informatics enables the development and use of interoperable information systems for public health functions such as biosurveillance, outbreak management, electronic laboratory reporting and prevention. It also include patient-focused informatics, health literacy and consumer education. The focus is on information structures and processes that empower consumers to manage their own health--for example health information literacy, consumer-friendly language, personal health records, and Internet-based strategies and resources.

Personalized medicine is a broad and rapidly advancing field of health care that is informed by each person's unique clinical, genetic, genomic, and environmental information.

Personalized medicine depends on multidisciplinary health care teams and integrated technologies (e.g., clinical decision support) to utilize our molecular understanding of disease in order to optimize preventive health care strategies. Human genome information now allows providers to create optimized care plans at every stage of a disease, shifting the focus from reactive to preventive health care.

Integration of Biomedical informatics knowledge brings in personalized medicine which would revolutionize the way physician would devise a strategy for treatment in near future. The biomedical informatics and translational medicine closely associated to bring bench biology to clinical care and research in the form of personalized medicine.

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