Editorial

Translational Research: Drug Development and its Approval: A Brief Overview

Translational research is not just a process to take research from the bench to bedside and thereby enhance basic and clinical research into practice by translating findings of the fundamental research into medical practice and thereby meaningful health outcomes. Translational research has emerged as one of the major strategies in the first decade of 21 century for drug discovery and development especially when the pipeline of new drug discovery was getting dried up and gene therapy was ahead for failure. Currently drug discovery involves biomarker based translational research through precision medicine utilizing genomics and proteomics.

Clinical research is a systematic study for new drug in human subjects to generate data for verifying the clinical pharmacology (kinetic & dynamic), adverse effects with the objective of determining safety and efficacy in human subjects.The development of safe and effective new drugs is expensive, difficult, and time consuming process. Despite, Pharmaceutical companies are working for the development of new drugs to market, but only 5 in 5000 compounds that may enter for human testing and 1 of these 5 tested clinically could get approved. On an average, new drug costs a company up to 1.5 billion US dollars or more sometimes to get it from laboratory to market. Though, the entire process now takes around 8 to 12 year, availability of advanced technologies or newer concepts like reverse pharmacology and personalized medicine have raised the hopes for faster drug discovery with less failure rate and thereby decrease in costs.

Drug development is the process of bringing a new pharmaceutical drug to the market once a lead compound has been identified through the process of drug discovery. The development of new drugs has been slow, the overall research and development investment has generated important breakthroughs in the fundamental knowledge, necessary to understanding, preventing, diagnosing and treating many diseases. Looking to advance research in basic cellular and molecular biology and in producing novel technologies for new drug development including human genome project, the use of microchip–based robotics for rapidly testing large numbers of potential compounds and identifying novel targets and rationale for unprecedented mechanisms have become more easy. However, these advances have not led to the surge in new drugs as expected. This has led many scientists to reexamine some of the existing strategies for the development of new drugs. New drugs under testing must compete relevantly with existing therapies. Preclinical development comprises of in vitro and in vivo testing in animals' models (for dosing and toxicity) that are chosen based on the intended use defined in the target product profile and are designed to provide the greatest value for predicting how the drug would behave in humans. The process of drug development involves stages of discovery, preclinical development, submission of investigational new drug (IND) application and its review by Food and Drug Administration (FDA). Application of IND in short includes animal study data, pharmacology, toxicity, manufacturing information, clinical protocols, information about investigator etc., prior to receive approval for testing (clinical trials) the drug in humans.

Clinical drug development involves three phases, which successively evaluate the safety and tolerability (Phase-I) in 20 to 100 healthy volunteers, efficacy and side effects (Phase-II) evaluation in up to several hundred patients and comparative efficacy and monitoring of adverse reactions against the currently used drugs (Phase-III) in up to 3000 patients. A number of factors contribute to the costs during clinical testing

viz.: the number of patients, the length of the trial, and type of monitoring. The success of clinical trials for a drug to be effective is mostly dependent on trial design. Recent advances in translational research in some diseases have identified easily measurable biomarkers in the blood that could be tested early in clinical development to save time and cost significantly. Clinical Phase III is followed by submission of New Drug Application (NDA) to FDA for its review and approval to support the intended product label to seek marketing authorization.

Community Health and Statistics play a critical role in all phases of clinical development. Both are important to determine how many patients need to be tested for the results to be statistically significant and to what extent the drug is found to be safe, effective, and free of serious side effects. Once approval is sought from FDA for a new drug for its intended use, it is used in treatment of a significantly large number of patients to generate Post-Marketing Surveillance (Phase-IV) data for drug's effectiveness and potential adverse events that were not evident in the more limited clinical trials. Interestingly, in the translational research cycle, clinical observations of introduced new drug are also communicated back to researchers, who then explore the possibility of either a better version of the drug or entirely a new drug. Nevertheless, the successful development of a single drug through translational research encompasses a complexity of scientific, ethical, legislative, regulatory, financial and practical hurdles that need due attention at several levels to make the process efficient yet effective.

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