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Mini Review

Personalised Medicine and Pharmacogenomics

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Abstract

One of the newest methods of precision medicine is pharmacogenomics, which adjusts drug selection and dosage based on a patient's genetic characteristics. International scientific consortia have recently released a number of pharmacogenetic guidelines; however there has been little success in implementing them in clinical settings. To remove the current obstacles to the use of pharmacogenomic research, numerous coordinated multinational activities are in progress. However, the observed clinical diversity in the therapy outcome can only be partially explained by the currently available validated pharmacogenomic indicators (Van Hove CL et al., 2008). There is a need for fresh approaches to research, such as the examination of the immune system's pharmacogenomic involvement and previously overlooked uncommon genetic variations, which are said to be responsible for a significant portion of the inter-individual variability in drug metabolism. We compiled a number of articles on pharmacogenomics in this special issue, spanning a wide range of topics. These include researching new pharmacogenomics markers to improve therapeutic efficacy and safety, developing tools or infrastructure to support this process, implementing pharmacogenomics in clinical practise, and the effects of rare genetic variants (Xinkuan Wu et al., 2016).

Keywords: Human genetics, Personalized medicine, Pharmacogenomics, Pharmacology

INTRODUCTION

Pharmacogenomics, also known as pharmacogenetics, is the branch of science that looks at how a person's genes influence how they react to pharmaceuticals. Its long-term objective is to assist physicians in choosing the medications and dosages that are ideal for every patient. It falls under the category of precision medicine, which tries to treat every patient uniquely (Morteza RT et al., 2013). Currently, doctors mostly base prescription recommendations on a patient's age, weight, sex, liver function, and renal function. Some medications include gene mutations that influence how people react, according to studies. In these situations, medical professionals can decide which drug and dosage is ideal for each patient (Proudfoot AT 2009).

The ultimate goal of precision medicine is to perfectly match each treatment action with the molecular profile of the patient. Modern sequencing technologies have propelled the research of human genetics for the past twenty years, resulting in a clearer comprehension of the connection between genetic diversity and human health. Precision medicine has made extensive use of genetics, and one such application is pharmacogenomics-informed pharmacotherapy, which adjusts drug choice and dosage based on a patient's genetic characteristics (Desai SN et al., 2008). International scientific consortia working to develop medical guidance for the clinical application of pharmacogenomics have been able to develop treatment guidelines as a result of the recognised role that pharmacogenomic variation plays in therapeutic efficacy and safety to date. Particularly, validated recommendations for a number of drug-gene interactions have been published by the Clinical Pharmacogenetics Implementation Consortium (CPIC) and the Dutch Pharmacogenetics Working Group (DPWG). Pharmacogenomics is still not widely used in ordinary clinical care, nevertheless (Hend MT et al., 2014). A variety of significant obstacles have been noted, ranging from fundamental pharmacogenomics research to implementation. To advance our understanding of pharmacogenomics, it is necessary to investigate previously

unrecognised uncommon genetic variations and to confirm their functional and clinical effects through the creation of pre-clinical models and in silico techniques (Saif Q et al., 2015).

DISCUSSION

Pharmacogenomics is the study of how the genome affects how well a medicine works. Pharmaco- + genomics are a combination of pharmacology and genomics, as indicated by the name. Pharmacogenomics examines how a person's genetic make-up affects how they react to medications. By relating DNA mutations (including single-nucleotide polymorphisms, copy number variations, and insertions/deletions) to pharmacokinetic (drug absorption, distribution, metabolism, and elimination), pharmacodynamic (effects mediated through a drug's biological targets), and/or immunogenic endpoints, it addresses the influence of acquired and inherited genetic variation on drug response in patients. In order to ensure maximal effectiveness with a minimum of side effects, harmacogenomics strives to create rational methods to optimise drug therapy with respect to the genotype of the patient. It is envisaged that by using pharmacogenomics, pharmaceutical pharmacological therapies can depart from the so-called "one-dose-fits-all" strategy (Kingsley CK et al., 2016). Pharmacogenomics also aims to do away with the trial-and-error method of prescribing by allowing doctors to take into account the patient's genes, how these genes function, and how this might affect the effectiveness of the patient's present or future treatments (and where appropriate, explain why past treatments failed). With such strategies, precision medicine and even personalised medicine, in which medications and treatment combinations are tailored to specific patient subgroups, are on the horizon. It aims to improve treatment outcomes, increase efficacy, and minimise the occurrence of drug toxicities and adverse drug reactions (ADRs), whether used to explain a patient's response to a treatment or lack thereof, or operate as a prediction tool. Alternative therapies that would best meet a patient's needs can be suggested for those who don't respond therapeutically to a given treatment (Ashaye OA et al., 2006). Two alternative sources of input can be utilised to produce pharmacogenomic recommendations for a specific drug: genotyping or exome or whole genome sequencing. In addition to detecting mutations that result in an early stop codon, sequencing yields a great deal additional information.

CONCLUSION

Two excellent literature evaluations are included in this special issue as well. Implementation and cardiology are the main topics of Davila-Fajardo's modification. The significant interindividual variability of the medications employed in this therapeutic environment is reflected in highly impacting under- or over-treatment, which adversely affects the patients' safety. As in the case of warfarin, the drug and dose selection is frequently crucial, and strict clinical monitoring is needed to change the course of treatment. It is possible to incorporate clinical and genetic data in predictive pharmacogenetic algorithms, and there are numerous gene-drug interactions that have been verified by significant prospective clinical trials (Ebeye OA et al., 2007). Studies on the cost-effectiveness of applying PGx data to dose modification were also undertaken. In conclusion, comparable to simvastatin testing, PGx tests for clopidogrel in high-risk patients and warfarin in patients including all indications could start to be used in routine clinical practise. Only patients who still don't reach the INR after a set amount of treatment should have acenocoumarol. The method may enhance the choice of acenocoumarol dosage for patients starting therapy with this medication, particularly in patients receiving extremely high doses. To certify that the PGx test for acenocoumarol is prepared for usage, additional research is required. The contribution of high-throughput technologies, including as microarrays and next-generation sequencing, to the pharmacogenomics and pharmacotranscriptomics of paediatric acute lymphoblastic leukaemia (ALL) was summarised by Pavlovic and colleagues.

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