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Cytochrome P450: Why the same drugs do not work the same way on everyone?

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Although the science related to variation in responses to medication has been developing for decades, the importance and practical application has not translated into clinical practice. The first step in improving outcomes related to individual medication response variation based on gender, and race, is in the examination of evidence that can result in strategies to provide effect medical care. For care to be equitable, culturally congruent, and overall competent, this aspect of patient care demands consideration and illumination. Inter-individual variation in drug response poses a serious problem in the management of patients who are receiving medications to treat or prevent any disease or illness. Bioavailability of drug concentrations can vary more than 600-fold between two individuals with the same weight, using the same drug dosage. Genetic variants can make the difference between an individual being treated with the proper dose of a medication, or even the correct medication. Additionally, due to individual variations in response to drug therapy, this variability can result in toxicity and adverse drug reactions (ADRs). Major factors that account for differences in drug response include cultural practices, race (genetic composition), and gender. These factors merit consideration when determining which medication and dosage will provide appropriate treatment. Persons who are prescribing, administering, or taking medications can make the best decisions with regard to the most effective medication regimen, when they understand fundamental aspects of inter-individual variations and disparities in drug responses. One specific factor genetic factor that accounts for the variation in drug response is Cytochrome p450. Although knowledge about the impact of Cytochrome p450 on individual variations in drug response has been known for decades, the transition to clinical practice has not evolved. Limited knowledge results in blatant disparities in pharmacology among different minority groups and women. Nurses who administer and prescribe medications have a responsibility to their patients to understand the responses to medications that are mediated by this family of enzymes. An overview of the variations seen in drug responses based on genetics is presented with discussion focusing on the current prescriptive practices, and limitations in clinical drug trials. It is estimated that 90% of current prescribed medications are mediated by these enzymes that result in variations based on the individual's phenotype. When considering cultural practices and racial differences, in many cases we are under medicating, overmedicating or using the wrong medication to achieve a specific outcome. Drug guidelines and doses established based on these data involving a predominant group. When medications that are effective in one racial group are given for same illnesses in another racial group, the medications can be not only ineffective, but detrimental. For competent and equitable care, nurses have a responsibility to enhance knowledge of scientific data that supports variation based on race and gender. Only through recognizing the value of the evidence and it implications, can transcultural nursing related to medication prescription and administration truly be competent, skilled, and effective.

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