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Opinion

The Threshold of Understanding Drug-Drug Interaction (DDI)

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The disciplinary learning of pharmacology prepares learners to effectively utilize the knowledge gained for a rationalised approach to pharmacotherapeutic management. However, the major challenge to improved ways of thinking and practising lies in the overwhelming and troublesome nature of pharmacology knowledge [1]. Understanding several concepts or learning experiences is reminiscent of travelling through a portal/threshold leading to new avenues of perception that were previously inaccessible, thus guiding learners to a transformed way of understanding [2]. These concepts are known as threshold concepts. In addition to transforming the perception, these concepts remodel the identity of the learner with improved discourse. For instance, medical graduates understanding of 'pain' is a threshold concept as it helps them to transform their thinking and discourse on the professional front [3]. In addition, these concepts are troublesome, integrative, bounded, irreversible, discursive and reconstitutive [4].

Like other disciplines, there are several concepts in pharmacology, that learners find troublesome. Essentially, the prediction about pharmacodynamics interactions requires the learner to have a deeper understanding of the mechanism of action [5]. However, little attention has been given to student assimilation of pharmacological principles governing drug-drug interactions (DDI). For instance, students encounter difficulty in predicting the outcomes for clinical scenarios when object drugs (whose therapeutic action is modified by interaction) are given along with precipitant drugs (drug causing interaction or affecting pharmacokinetic characteristics of object drug) influencing the function of P450 enzymes as inhibitors or inducers respectively [6]. In addition, the concept of drug-drug interaction not only entails students integrating their prior knowledge with current understanding but also requires integration of basic pharmacological principles governing drug mechanism of action, clinical uses and adverse effects of multiple drugs given to a patient. The understanding of pharmacodynamics principles serves to minimize the risk associated with drug-drug interaction for prescription given as adjunctive or interventional therapy and on a recurrent basis [7].

In the light of personalized medicine, the selection of appropriate drugs is customized to the needs of individual patients to minimize the risk of side effects, adverse reactions and drug interactions and maximize the therapeutic effects [8]. Likewise, the customized therapeutic approach to reduce the risk of drugs interactions in individual patient tend to make this concept bound to personalized medicine. The increasingly anticipated type of drug interaction emphasizes how integral it is for all health care professionals to understand the mechanisms of drug interactions and predict the possibility of their occurrence and preferably prevent them [9]. However, understanding the drug-drug interaction is not always linked to anticipation of its occurrence. Therefore, this concept does not seem to completely align with the irreversible nature of the threshold concept framework which signifies that once learned these concepts are unlikely to be forgotten [10]. It is difficult to predict pharmacokinetic drug-drug interactions as they are not anticipated from the clinical effects of the drugs interacted. However, the pharmacodynamics of drug-drug interactions can be predicted based on the clinical response of the drugs involved. With a better understanding of pharmacological concepts, it is easier to anticipate the occurrence of drug-drug interactions [11].

Understanding drug-drug interactions improve learners' discourse viz. contextual understanding of a wider range of concepts and open avenues to new thinking that can be further expressed, reflected upon and communicated [10]. Improved discourse, communication and reflection among health professionals can help to overcome medication errors resulting from concurrent use of drugs in low to high

risks patients. Semi-structured interviews with prescribers from foundation year, special trainees, core medical training doctors acknowledged that they could learn from any error. The errors linked to specific medications or situations like renal impairment and looking for drug interaction make the process meaningful and memorable and help them to improve their drug related concepts [12]. Understanding DDI can reconfigure the learner's prior schema and let him throw away any earlier misconception. For instance, the concomitant use of statins with antibacterial and anti-fungal drugs predisposes to increased risk of adverse effects based on metabolism by cytochrome P450. Concurrent administration of these drugs increases the plasma level of statins leading to a serious type of myopathy, acute kidney injury, and death [13].

DDI can be envisaged as transformative as it prompts health professionals' way of understanding and perception of fundamental pharmacological principles without which they cannot progress in healthcare settings. This transformation may be sudden or prolonged over a significant length of time [10]. Such transformation is reflective of how health professionals think, perceive, apprehend and experience a phenomenon within a discipline such as rationalised prescribing of multiple drugs in high-risk patients.

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