Individualized pharmacotherapy: Safety, genomics, monitoring.

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Introduction

This case report details a pediatric kidney transplant patient experiencing tacrolimus toxicity due to CYP3A5 polymorphism and drug-drug interactions with voriconazole and clarithromycin. It highlights the critical role of pharmacogenetic testing and therapeutic drug monitoring in individualized immunosuppressant therapy to prevent adverse events and achieve optimal outcomes in complex clinical scenarios.[1]

This case examines the challenge of rivaroxaban dosing in a morbidly obese patient undergoing knee arthroplasty, where standard dosing might lead to subtherapeutic levels. The report emphasizes the need for individualized pharmacokinetic monitoring and dose adjustments in special populations to ensure effective anticoagulation and prevent thrombotic events without increasing bleeding risk.[2]

This case describes a patient who developed a rare pembrolizumab-induced myositis and myasthenia gravis overlap syndrome, highlighting the complex immune-related adverse events associated with immune checkpoint inhibitors. It underscores the importance of prompt recognition and management of these toxicities in oncology patients to mitigate severe outcomes and ensure continued treatment efficacy.[3]

This case illustrates a severe QTc prolongation caused by venlafaxine in a patient with impaired CYP2D6 metabolism and a potential drug interaction. It emphasizes the critical role of pharmacogenomics and thorough medication review in psychiatric pharmacology to prevent life-threatening cardiac adverse events, especially in patients with predisposing factors for altered drug metabolism.[4]

This case report demonstrates the application of opioid pharmacogenomics in optimizing pain management for a patient, revealing how genetic variations influence drug response and adverse effects. It highlights the utility of genetic testing in guiding personalized opioid selection and dosing to improve efficacy and minimize risks in chronic pain settings.[5]

This case highlights the successful application of vancomycin therapeutic drug monitoring (TDM), guided by a clinical pharmacist, in a critically ill patient receiving continuous veno-venous hemodiafiltration. It emphasizes the pharmacist's role in complex pharmacokinetic assessments and dose adjustments to achieve target drug concentrations, ensuring antimicrobial efficacy and preventing nephrotoxicity in challenging clinical scenarios.[6]

This report details a pediatric patient who developed severe hyperglycemia and diabetic ketoacidosis following olanzapine initiation, illustrating a serious metabolic adverse effect of antipsychotics in vulnerable populations. The case underscores the need for vigilant monitoring of metabolic parameters in children and adolescents on atypical antipsychotics and careful consideration of alternative treatments.[7]

This case describes a critical drug-drug interaction between voriconazole and carbamazepine in an intensive care patient, leading to subtherapeutic antifungal levels and potential treatment failure. It highlights the complex pharmacokinetic challenges in critically ill patients and emphasizes the importance of meticulous medication reconciliation and proactive management of drug interactions to ensure therapeutic efficacy and patient safety.[8]

This case report details a patient developing dapsone-induced methemoglobinemia and hemolytic anemia, further complicated by a sulfa allergy, illustrating a severe and rare adverse drug reaction. It underscores the importance of considering genetic predispositions (like G6PD deficiency) and patient allergies when prescribing drugs with known hematological toxicities, emphasizing the need for careful monitoring and immediate intervention.[9]

This case describes a patient with renal impairment who developed daptomycin-induced eosinophilic pneumonia, a rare but serious adverse effect. It highlights the altered pharmacokinetics of renally excreted drugs in patients with kidney dysfunction, emphasizing the need for diligent dose adjustments and monitoring for unusual adverse reactions to ensure drug safety and efficacy in this vulnerable population.[10]

Conclusion

The collected case reports highlight critical aspects of personalized

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medicine, drug safety, and efficacy across diverse clinical scenarios. Several cases underscore the significant impact of pharmacogenomics, where genetic variations in enzymes like CYP3A5 and CYP2D6 influence drug metabolism, leading to adverse events such as tacrolimus toxicity in transplant patients or venlafaxine-induced QTc prolongation. Drug-drug interactions represent another major theme, vividly illustrated by complex interactions involving voriconazole, clarithromycin, and carbamazepine, which can result in subtherapeutic drug levels, treatment failure, or heightened toxicity. The data consistently emphasizes the necessity of individualized dosing strategies, particularly for special populations. Examples include morbidly obese patients requiring precise rivaroxaban adjustments for effective anticoagulation, and individuals with renal impairment needing daptomycin dose modifications to prevent unusual adverse reactions like eosinophilic pneumonia. Additionally, the reports detail severe adverse drug reactions, ranging from pembrolizumab-induced myositis and myasthenia gravis overlap syndrome to olanzapine-induced severe hyperglycemia in pediatric patients and dapsone-induced methemoglobinemia complicated by sulfa allergy. Therapeutic drug monitoring, often guided by clinical pharmacists, is consistently presented as a vital tool for ensuring optimal drug concentrations, mitigating risks, and achieving effective treatment outcomes in complex and critically ill patients, even those undergoing continuous hemofiltration. These cases collectively advocate for a proactive, patient-specific approach to pharmacotherapy, integrating genetic insights, vigilant monitoring, and careful consideration of drug interactions and patient-specific physiological factors.

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