Drug-drug interactions: Mechanisms, management, safety.

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Introduction

This review delves into the practical aspects of drug-drug interactions (DDIs) involving novel oral anticoagulants (NOACs). Understanding how NOACs interact with other medications is crucial for safe prescribing, especially considering their narrow therapeutic index and the potential for serious adverse events like bleeding or thrombotic events. The paper highlights common interacting drug classes and offers strategies for risk mitigation in clinical practice [1].

The article discusses the clinical significance of drug-drug interactions mediated by P-glycoprotein (P-gp), an efflux transporter important in drug disposition. It covers how P-gp inhibitors and inducers can alter the pharmacokinetics of substrate drugs, leading to either increased toxicity or reduced efficacy. What this means for practitioners is that careful consideration of concomitant medications affecting P-gp is essential to avoid adverse outcomes [2].

This systematic review provides an overview of cytochrome P450 (CYP450) drug-drug interactions, a major mechanism for pharmacokinetic DDIs. It categorizes interactions by specific CYP enzymes, highlighting key substrates, inhibitors, and inducers. The goal here is to help clinicians predict and manage potential interactions, emphasizing the importance of understanding a patients medication profile in relation to their CYP activity for safer drug therapy [3].

This scoping review explores the landscape of clinical decision support systems (CDSSs) designed to manage drug-drug interactions. It assesses the types of systems available, their functionalities, and their impact on patient safety. The takeaway is that while CDSSs hold significant promise for reducing DDI errors, their effectiveness depends on proper integration, user-friendliness, and up-to-date knowledge bases [4].

The focus here is on how pharmacogenomics can inform and improve the prediction and management of drug interactions. The article explains that genetic variations in drug-metabolizing enzymes like CYP450s and transporters can significantly influence an individuals susceptibility to DDIs. Integrating pharmacogenomic data into clinical practice could lead to more personalized dosing and medication selection, ultimately reducing DDI-related adverse events [5].

This article highlights important drug-drug interactions with antiviral agents used for COVID-19 treatment. Given the urgency and rapid development of these therapies, understanding their DDI potential is critical for patient safety, especially in a population often on multiple concomitant medications. The paper provides practical guidance for clinicians on identifying and managing these interactions to optimize antiviral efficacy and minimize harm [6].

This comprehensive review examines drug-drug interactions specifically in the context of oncology. Cancer patients often receive complex multi-drug regimens, increasing their risk of DDIs, which can affect treatment efficacy, increase toxicity, or lead to treatment delays. The authors provide insights into common interaction mechanisms and emphasize the need for vigilant medication review and specialized DDI management in this vulnerable patient population [7].

This paper addresses clinically significant interactions between herbal remedies and conventional drugs. Many patients use herbal products alongside prescription medications, often without disclosing this to their healthcare providers. The review highlights common herbs implicated in DDIs, mechanisms like CYP450 modulation, and the potential for serious adverse effects, urging clinicians to inquire about herbal use to prevent complications [8].

Focusing on older adults with polypharmacy, this systematic review examines the prevalence and clinical impact of drug-drug interactions in this vulnerable group. Polypharmacy naturally increases the risk of DDIs, and older patients often have altered pharmacokinetics and pharmacodynamics, making them more susceptible to adverse effects. The review emphasizes proactive DDI screening and medication optimization strategies to improve outcomes in geriatric care [9].

This study describes the development and validation of a new classification system for drug-drug interactions. The goal is to provide a more standardized and clinically relevant method for categorizing and assessing the severity of DDIs, which can aid in clinical decision-making and improve the utility of DDI alerts in electronic

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health records. A consistent classification system helps clinicians prioritize and manage interactions effectively [10].

Conclusion

Drug-drug interactions (DDIs) represent a critical concern in clinical practice, impacting patient safety and therapeutic outcomes. This body of work highlights the diverse mechanisms and contexts of DDIs, from specific drug classes like novel oral anticoagulants (NOACs) where interactions can lead to serious adverse events such as bleeding or thrombotic events [1]. Pharmacokinetic interactions are frequently mediated by efflux transporters like P-glycoprotein (P-gp), where modulators can significantly alter drug disposition, and cytochrome P450 (CYP450) enzymes, which are central to drug metabolism, influencing drug efficacy and toxicity [2, 3]. Managing these interactions often involves understanding genetic predispositions through pharmacogenomics, which can inform personalized dosing and medication choices [5]. The scope of DDI risks extends to various patient populations and therapeutic areas, including older adults on polypharmacy who are highly vulnerable to adverse effects [9], cancer patients receiving complex multi-drug regimens [7], and individuals treated with antiviral agents for conditions like COVID-19 [6]. Even seemingly benign substances like herbal remedies can pose significant DDI risks by modulating drug-metabolizing enzymes [8]. To mitigate these complexities, the development and integration of clinical decision support systems (CDSSs) are crucial, though their effectiveness depends on user-friendliness and updated knowledge bases [4]. Efforts are also underway to refine DDI classification systems, aiming for standardized, clinically relevant methods to prioritize and manage interactions effectively within electronic health records [10]. Collectively, these studies underscore the continuous need for vigilance, advanced tools, and personalized approaches to optimize drug therapy and enhance patient safety.

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