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Pharmacogenomics in practice: a review and implementation guide

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Considerable efforts have been exerted to implement Pharmacogenomics (PGx), the study of interindividual variations in DNA sequence related to drug response, into routine clinical practice. In this article, we first briefly describe PGx and its role in improving treatment outcomes. We then propose an approach to initiate clinical PGx in the hospital setting. One should first evaluate the available PGx evidence, review the most relevant drugs, and narrow down to the most actionable drug-gene pairs and related variant alleles. This is done based on data curated and evaluated by experts such as the pharmacogenomics knowledge implementation (PharmGKB) and the Clinical Pharmacogenetics Implementation Consortium (CPIC), as well as drug regulatory authorities such as the US Food and Drug Administration (FDA) and European Medicinal Agency (EMA). The next step is to differentiate reactive point of care from preemptive testing and decide on the genotyping strategy being a candidate or panel testing, each of which has its pros and cons; then work out the best way to interpret and report PGx test results with the option of integration into electronic health records and clinical decision support systems. After test authorization or testing requirements by the government or drug regulators, putting the plan into action involves several stakeholders, with the hospital leadership supporting the process and communicating with payers, the pharmacy and therapeutics committee leading the process in collaboration with the hospital laboratory and information technology department, and healthcare providers (HCPs) ordering the test, understanding the results, making the appropriate therapeutic decisions, and explaining them to the patient. We conclude by recommending some strategies to further advance the implementation of PGx in practice, such as the need to educate HCPs and patients, and to push for more tests' reimbursement. We also guide the reader to available PGx resources and examples of PGx implementation programs and initiatives.

KEYWORDS

guidelines, implementation, pharmacogenomics, practice, pharmacogenetics

1 Introduction

Interindividual variability in drug response is driven by several extrinsic and intrinsic factors, with genetic variations being increasingly recognized among these factors that lead to changes in the activity or availability of drug-metabolizing enzymes (DMEs), receptors, channels, and other proteins involved in drug pharmacokinetics (PK) and pharmacodynamics (PD) (Thummel and Lin, 2014). Consequently, the term

Pharmacogenomics Teaching Guide

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Table of Contents Pharmacogenomics Teaching Guide

1. Understanding the eBook Pharmacogenomics Teaching Guide
 - The Rise of Digital Reading Pharmacogenomics Teaching Guide
 - Advantages of eBooks Over Traditional Books
2. Identifying Pharmacogenomics Teaching Guide
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Pharmacogenomics Teaching Guide
 - User-Friendly Interface
4. Exploring eBook Recommendations from Pharmacogenomics Teaching Guide
 - Personalized Recommendations
 - Pharmacogenomics Teaching Guide User Reviews and Ratings
 - Pharmacogenomics Teaching Guide and Bestseller Lists
5. Accessing Pharmacogenomics Teaching Guide Free and Paid eBooks
 - Pharmacogenomics Teaching Guide Public Domain eBooks
 - Pharmacogenomics Teaching Guide eBook Subscription Services
 - Pharmacogenomics Teaching Guide Budget-Friendly Options
6. Navigating Pharmacogenomics Teaching Guide eBook Formats

- ePub, PDF, MOBI, and More
- Pharmacogenomics Teaching Guide Compatibility with Devices
- Pharmacogenomics Teaching Guide Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Pharmacogenomics Teaching Guide
 - Highlighting and Note-Taking Pharmacogenomics Teaching Guide
 - Interactive Elements Pharmacogenomics Teaching Guide
- 8. Staying Engaged with Pharmacogenomics Teaching Guide
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Pharmacogenomics Teaching Guide
- 9. Balancing eBooks and Physical Books Pharmacogenomics Teaching Guide
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Pharmacogenomics Teaching Guide
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Pharmacogenomics Teaching Guide
 - Setting Reading Goals Pharmacogenomics Teaching Guide
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Pharmacogenomics Teaching Guide
 - Fact-Checking eBook Content of Pharmacogenomics Teaching Guide
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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