

Tdm: Optimizing dosing for personalized medicine.

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Introduction

Therapeutic Drug Monitoring (TDM) is widely recognized as a crucial tool in modern pharmacotherapy. For example, it is essential in psychiatric pharmacotherapy, helping to optimize individual dosing by considering factors like metabolism and drug-drug interactions, leading to better patient outcomes and reduced side effects[1].

Looking at anti-infectives, TDM plays a critical role in optimizing antimicrobial therapy, especially for critically ill patients. It helps achieve target drug concentrations, minimize toxicity, and combat antimicrobial resistance through individualized dosing[2].

Its significance extends to cancer chemotherapy, where TDM individualizes dosing, improving drug efficacy and reducing toxicity, particularly for drugs with narrow therapeutic windows. This optimizes exposure to anticancer agents, ensuring better patient outcomes and improved treatment safety[3].

Within personalized medicine, TDM is key to tailoring drug dosages to individual patient needs. It combines with other patient-specific data to enhance drug efficacy and minimize adverse effects, moving beyond a 'one-size-fits-all' approach[4].

In inflammatory bowel disease (IBD), TDM for biologics is useful for optimizing treatment strategies. It helps maintain effective drug concentrations, prevents loss of response, and guides dose adjustments for improved patient management and long-term outcomes[5].

For critically ill patients, TDM is important for antibiotics. Here's the thing: significant pharmacokinetic variability in this population means TDM is crucial for optimal antibiotic exposure, preventing treatment failure, and reducing the development of antibiotic resistance by personalizing regimens[6].

A joint approach combining pharmacogenomics and TDM optimizes drug therapy. Understanding genetic variations that influence drug metabolism, alongside real-time drug concentration measurements, allows for more precise dosing and enhances treatment individualization for improved outcomes[7].

Challenges and future directions in TDM involve technological ad-

vancements, standardization, and integration into clinical workflows. Broader implementation is needed to fully realize TDM's potential in patient care and personalized medicine[8].

An update on TDM for immunosuppressants in solid organ transplantation shows its ongoing role in preventing graft rejection and minimizing drug toxicity. Adjusting dosages to achieve optimal individual exposure is crucial for long-term transplant success and patient safety[9].

Finally, digital health technologies hold potential for enhancing TDM. Tools like mobile apps, wearables, and telemedicine can facilitate more frequent and convenient drug level measurements, improving adherence and personalized dosing strategies in real-world settings for better patient care[10].

This holistic approach underscores TDM's indispensable role across diverse medical fields, driving towards more effective and safer patient treatments.

Conclusion

Therapeutic Drug Monitoring (TDM) is an essential practice that underpins individualized pharmacotherapy across a wide spectrum of medical disciplines. It plays a pivotal role in optimizing drug dosages by meticulously accounting for patient-specific variables, including individual metabolic rates, genetic predispositions, and potential drug-drug interactions. This tailored approach is critical for enhancing therapeutic efficacy and concurrently mitigating adverse drug reactions in complex treatment areas. For example, in psychiatric pharmacotherapy, TDM ensures precise dosing for better outcomes, while in cancer chemotherapy, it improves safety and effectiveness, especially for drugs with narrow therapeutic windows. Similarly, for anti-infectives, particularly in critically ill patients, TDM is instrumental in achieving optimal concentrations, minimizing toxicity, and actively combating antimicrobial resistance. Its utility extends to biologics in inflammatory bowel disease, where it helps maintain drug levels to prevent loss of response, and to immunosuppressants in solid organ transplantation, where it is vital for preventing graft rejection and ensuring long-term patient safety. Looking ahead, the integration of pharmacogenomics with

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TDM promises even greater precision in dosing. Despite existing challenges in standardization and seamless clinical workflow integration, the advent of digital health technologies, such as mobile applications, wearables, and telemedicine, offers exciting opportunities to facilitate more frequent and convenient drug level measurements. This innovation is key to improving patient adherence and further refining personalized dosing strategies in real-world clinical settings. What this really means is that TDM is indispensable for advancing personalized medicine, transitioning healthcare from broad, generalized treatment protocols to highly specific, patient-centric approaches that ensure safer and significantly more effective therapeutic outcomes for every individual.

References

1. Christoph H, Peter B, Sven B. *Therapeutic drug monitoring in psychiatry. Pharmacopsychiatry.* 2022;55:63-82.
2. Jan JDW, Sofie C, Mieke C. Therapeutic Drug Monitoring for Anti-infectives: Where Are We Now and Where Are We Going? *Clin Pharmacokinet.* 2020;59:15-35.
3. Nadine W, Sebla A, Mario B. *The role of therapeutic drug monitoring for anticancer drugs. Ther Drug Monit.* 2020;42:18-35.
4. Silvia B, Sofia G, Carla Z. *Therapeutic Drug Monitoring in the Era of Personalized Medicine. J Clin Med.* 2022;11:3851.
5. N. VC, G. VA, W. R. Therapeutic Drug Monitoring of Biologics in Inflammatory Bowel Disease: A Review. *Inflamm Bowel Dis.* 2020;26:15-26.
6. Negin J, Maryam M, Ramin A. *Therapeutic drug monitoring of antibiotics in critically ill patients. Crit Care.* 2021;25:173.
7. Jenna S, Oona LR, Olli K. Pharmacogenomics and therapeutic drug monitoring: a joint approach for optimizing drug therapy. *Expert Opin Drug Metab Toxicol.* 2022;18:149-166.
8. Laura M, Lorenzo P, Caterina C. Challenges and future perspectives in therapeutic drug monitoring: A practical perspective. *J Pharm Biomed Anal.* 2022;207:114389.
9. Montserrat B, Tjaša S, Vincent H. Therapeutic drug monitoring of immunosuppressants in solid organ transplantation: an update. *Ther Drug Monit.* 2022;44:21-36.
10. Yang N, Yanying Z, Rui Z. *The Role of Digital Health in Enhancing Therapeutic Drug Monitoring. J Pers Med.* 2023;13:331.

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