



(REVIEW ARTICLE)



## Role of the clinical pharmacist in therapeutic drug monitoring: Mexico's current situation

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### Abstract

In developed countries, clinical pharmacists perform various activities depending on the available resources and the health system, and TDM represents one of the fundamental responsibilities, this activity is performed according to the specific pharmacotherapy of the patient, and includes the evolution of the disease, risk factors and treatment goals. In Mexico, the practice of clinical pharmacy, is a relatively new discipline, and there is not yet a specialized service that performs monitoring in which pharmacokinetic concepts are applied. Therefore, it is highly important to promote the integration and participation of hospital clinical pharmacists in the individualization of pharmacological therapies, and to acknowledge the benefits that all this provides.

**Keywords:** Pharmacist; Monitoring; Clinical; Pharmacokinetics

### 1. Introduction

Health is a state of complete physical, mental and social well-being, and not merely the absence of diseases or afflictions; it is a state of complete physical, mental and social harmony or well-being, and not merely the absence of diseases. Within this framework, health care providers play a very important role in the struggle for the improvement of health in the population. In terms of optimal health care, it has been proven that commitment and multidisciplinary work of health care experts, such as physicians, nurses, pharmacists, nutritionists, etc., is one of the main goals to achieve society's welfare.

Although in developed countries, the pharmaceutical profession is recognized for its importance in health care, in many developing countries such as Mexico, its role is still underestimated, despite the fact that the pharmaceutical care area is the health care profession that is committed to ensure the safety and effectiveness of medicines. In developed countries, clinical pharmacists perform various activities depending on the available resources and the health system, and Therapeutic Drug Monitoring (TDM) represents one of the fundamental responsibilities, this activity is performed according to the specific pharmacotherapy of the patient, and includes the evolution of the disease, risk factors and treatment goals. In Mexico, the practice of clinical pharmacy, in which the emphasis is on patient care-oriented practice, is a relatively new discipline, since it was not until 1994 when the first educational program was offered at the national level to prepare pharmacists with a focus on patient care needs, specialists in medications and in optimizing the use of those medications. Thus, since late 1990s, the discipline of clinical pharmacy has gradually begun to gain recognition.

Nowadays, several hospitals in our country have hired pharmacists; moreover, these hospitals have clinical biochemistry laboratories in which concentrations of some drugs are quantified, mainly in plasma, serum or blood (anticonvulsant drugs, immunosuppressants, for example), however, unlike in Hispanic countries such as Spain,

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Argentina or Chile, in Mexico there is not yet a specialized service that performs monitoring in which pharmacokinetic concepts are applied to adjust drug doses based on the individual characteristics of the patients.

The determination of drug concentrations must be used to estimate individualized pharmacokinetic parameters, and these should be the basis for the calculation of dosing schedules, although they are not the only parameters to be taken into account, since relevant demographic, pharmacotherapeutic, pathophysiological, clinical and biochemical data should also be included. Therefore, it is highly important to promote the integration and participation of hospital clinical pharmacists in the individualization of pharmacological therapies, and to acknowledge the benefits that all this provides.

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## 2. Pharmaceutics and Pharmacokinetics

TDM refers to the measurement and interpretation of the values of drug concentrations in biological fluids, in order to optimize drug therapy and the clinical outcome of a patient, to minimize the risk of toxicity. It involves adjusting a dosage regimen to a patient, depending on their individual characteristics, trying to maintain the concentration of drugs within the therapeutic range. This monitoring is essential to achieve positive patient outcomes across the continuum care and in every health system practice setting. Examples of outcomes achieved through TDM include: decreased mortality, decreased duration of treatment, decreased length of hospital admissions, decreased morbidity (improvement of disease symptoms or improved recovery), and decreased adverse effects of drug therapy [1].

A reliable and responsive TDM service depends on teamwork between nurses, physicians, pharmacists, and technical staff, but it is the clinical pharmacist who must advise the medical staff on the appropriate use and timing of monitoring and assist with interpretation of the results. Some of the main responsibilities that are part of a clinical pharmacokinetics or drug monitoring service include [2-6]:

- Initial selection of the drug regimen, and this may involve decisions on the drug choice, dose, dosing interval, route of administration, and dosage form of the drug, taking into account factors such as gender, age, body weight, physiological status, renal function, liver function, serum albumin concentration, use of other drugs, and laboratory results.
- Adjustment of dosing regimens according to the results of the concentration measurement of the drugs and the patient's clinical response.
- Evaluation of possible causes of unexpected results, such as patient non-compliance, bioavailability issues of the drugs administered, medication errors, drug-drug interactions or interindividual/pharmacogenetic variability.
- Dose adjustment for patients on renal replacement therapy, either haemodialysis or peritoneal dialysis.
- Communicate information about the patient's specific drug therapy to doctors, nurses and other professional clinicians and patients themselves, both orally and in writing, as well as including documentation of this in the patient's clinical record.
- Provide information and/or training to other pharmacists, doctors, nurses and all other health care professionals on pharmacokinetic principles and appropriate indications for clinical pharmacokinetic monitoring, including the justified and cost-effective use of drug concentration measurements.
- Develop quality assurance programs to document improved patient outcomes and economic benefits resulting from clinical pharmacokinetic monitoring.
- Promote collaborative relationships with other individuals and departments involved in pharmacotherapy monitoring to enhance the development and appropriate use of pharmacokinetic principles in pharmaceutical care.
- Application of pharmacokinetic concepts in the management of patients with acute or chronic intoxications of monitored drugs (e.g., acetaminophen, digoxin, drugs of abuse in urine, etc.).

Understanding the patient's clinical environment and the pharmacological and physicochemical properties of the drug are crucial to the interpretation and use of drug concentration monitoring. This also involves recognition of the several factors that can affect interpretation, and knowledge of issues such as dose, dosing interval, pathologies and concomitant medication, sample type, and timing of sample collection are key to using TDM effectively. Pharmacists' responses to drug information requests should be accurate, complete and timely, as this is the only way to achieve maximum clinical utility and establish the credibility of the information provided. Ongoing communication with the medical and nursing staff, as well as the clinical biochemistry laboratory, should be encouraged and maintained, since this facilitates the integration of the pharmacist in the health care team.

### 3. Conclusion

The benefits of TDM are diverse. This practice has been shown to increase survival, improvement in patients' life quality and contribute to a shorter period of treatment, which translates into less time spent in hospital, as well as a reduction in hospital costs.

However, in spite of the benefits that have been shown, in our country there is still not total integration and recognition of pharmacists, which has led to the fact that, among the pharmaceutical community itself, few of them feel attracted to develop activities related to clinical pharmacokinetics.

TDM does not constitute a routine practice and, in addition, the measurement of drug concentration levels is not carried out in the large majority of hospitals, and in those where it is done, it is only limited to reporting the amount measured.

On the other hand, this practice is clearly multidisciplinary in nature, as it should include not only the quantification of drug concentration levels, but also other aspects already mentioned; this highlight what can be considered the central axis of pharmacokinetic monitoring, the work of the pharmacist who interprets the values obtained in the clinical context of the patient. Having a drug concentration level in isolation only serves to increase the patient's clinical history, wastes financial resources unnecessarily, and can even lead to making the wrong therapeutic decisions. Therefore, it is vitally important to promote the inclusion and participation of pharmacists within the healthcare team and to make the most of all aspects in order to optimize pharmacological therapies.

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### Compliance with ethical standards

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#### *Disclosure of conflict of interest*

The authors declare that there is no conflict of interest.

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