Therapeutic Drug Monitoring: Are we getting it right and optimizing therapy?

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Background

Therapeutic Drug Monitoring (TDM) is the measurement of plasma/blood concentrations of a particular drug and is used to inform individualized optimal drug dosage regimens. To appropriately manage TDM, knowledge of the pharmacology, pharmacokinetics and concentration-effect relationship of the drug/s involved is required as well as an appreciation of the cost involved in laboratory assay techniques.[1]

The TDM Process

Decision to request drug level
↓
Biological sample
↓
The request
↓
Laboratory measurement
↓
Result communication by laboratory
↓
Clinical interpretation
↓
Therapeutic management

TDM leads to improved patient outcomes and when undertaken appropriately reduces costs to the healthcare system. TDM programs are described in different forms in the literature and it is generally acknowledged that these programs are a multidisciplinary function.[1] The role of the pharmacist within TDM is minimally described in the literature.

TDM is currently planned and ordered by medical doctors at Logan Hospital. A gap analysis was performed on TDM at Logan Hospital in 2016 which found that sample timing was poor in relation to steady state and peak/trough concentrations.

Aim

- To evaluate TDM currently undertaken at Logan hospital
- Determine the volume of pathology requests wasted due to poor sample timing
- Determine the cost of assays wasted due to poor sample timing
- Determine the documented role of the pharmacist within the TDM process

Methods

A retrospective audit was conducted on TDM over a 12-month period. Patients were identified using the electronic pathology database (Auslab). Patients were excluded if under the age of 18, the test was in an outpatient setting or within the emergency department. In the audit, progress notes, medication charts and other relevant pathology were reviewed via the electronic pathology program (Auslab) and via the Electronic Clinical Record Management System (ERIC). They were assessed for appropriateness of the timing of collection, compliance to local and recommended TDM guidelines, the appropriateness of the action of the resulting pathology and the documented involvement of the pharmacist.

Results

There were a total of 3,095 tests included in the study covering 11 medications. Of these, 37% were collected at an inappropriate time making interpretation difficult and at a pathology cost of $23,109.43. On average, only 50% of the doses administered to patients after TDM were appropriate based on results and the clinical scenario. There was documented pharmacist advice on the TDM result only 8.6% of the time.

Table One: Number of Inappropriately Times Tests for TDM of Specific Medication

Medication	Inappropriate Tests	Total Number of Tests	Percentage of Inappropriate Tests
Vancomycin	149	547	27%
Gentamicin	156	214	73%
Enoxaparin	10	21	48%
Digoxin	115	259	44%
Clozapine	101	174	58%
Tacrolimus	7	30	23%
Cyclosporine	1	8	13%
Lithium	23	198	12%
APTT	375	1,038	27%
Valproate	57	182	31%
Carbamazepine	17	45	38%
TOTAL	**1,011**	**2,716**	**37%**

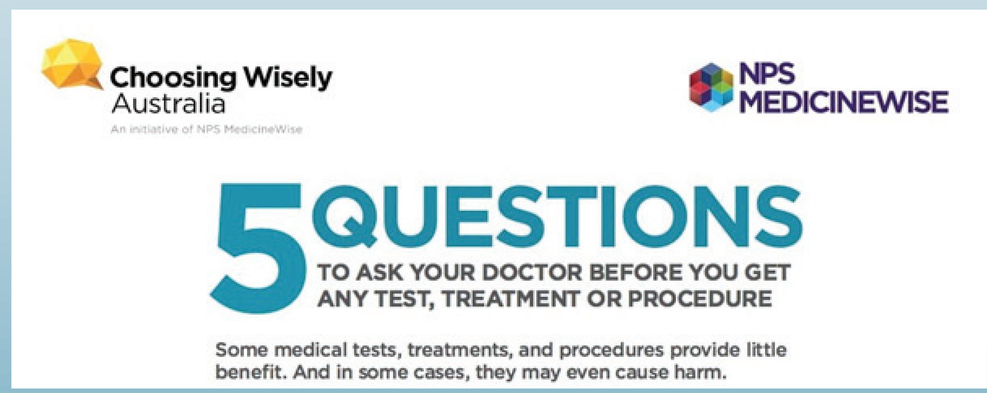
Table Two: Cost of Inappropriately Sampled TDM Assays[2]

Medication	Inappropriate Tests	Cost of Test ($)	Total Cost ($)
Vancomycin	149	18.71	2,787.79
Gentamicin	156	24.59	3,836.04
Enoxaparin	10	57.22	572.20
Digoxin	115	24.57	2,825.55
Clozapine	101	35.64	3,599.64
Tacrolimus	7	14.58	102.06
Cyclosporine	1	83.54	83.54
Lithium	23	33.37	767.51
APTT	375	18.96	7,110.00
Valproate	57	19.18	1,093.26
Carbamazepine	17	19.52	331.84
TOTAL	**1,011**		**23,109.43**

**These pricings are for assays only and do not include other consumables, staff time, patient time and extended length of stay due to inappropriately collected assays.

Conclusion

TDM has a large impact on the therapy and outcome of patients. This audit showed that TDM is currently performed sub-optimally and with an unknown or ad hoc role of the pharmacist. These preliminary results show a review of the current TDM process is required and with their drug and pharmacokinetic knowledge a greater impact and role of the pharmacist is required.



References

1. Gross AS. Best practice in therapeutic drug monitoring. Oxford, UK2001. p. 5-9.
2. Health Support Queensland. Pathology Queensland Pubic Price List 2017

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