(PER-PAT 301)

KEMENTERIAN KESIHATAN MALAYSIA
PERKHIDMATAN PATOLOGI

HOSPITAL .....

UNTUK KEGUNAAN MAKMAL
LAB No.

1. Nama :		2. No. Pendaftaran:	
3. No. K/P.:		4. Jantina: ☐ Lelaki ☐ Perempuan	
5. Umur:	6. Keturunan:	7. Wad/Klinik:	
8. Tarikh Masuk Wad:	9. Pekerjaan:	10. Taraf Perkahwinan:	11. ☐ Bayar ☐ Percuma

12. No. Laporan Dahulu:

14. Ringkasan Klinikal, Penemuan Pembedahan dan Riwayat Keluarga:

15. Diagnosis:

13. Butiran Penting:

	Ya	Tidak
Jaundice	☐	☐
Lymphadenopathy	☐	☐
Hepatomegaly	☐	☐
Splenomegaly	☐	☐
Bleeding Tendency	☐	☐
H/O Transfusion	☐	☐

Haematinics .....
.....
.....

Drug/Chemical History

.....
.....

Data Makmal Terdahulu

Hb .....
Platelet .....
TWDC .....

16. Kategori Permohonan/Jenis Ujian:

Patologi Kimia		Klinikal		Hematologi	
B. Sugar	☐	Bld. Count	☐	FBP	☐
B. Urea	☐	ESR	☐	BM Asp	☐
S. Elec	☐	BFMP	☐	Hb.Analysis	☐
B. Gases	☐	U. Sugar	☐	Coagulation	☐
S. Billirubin	☐	U. Alb.	☐		
LFT	☐	U. ME	☐		
Se. Creatinine	☐	Stool ME	☐		

Histo/Saitologi
Specimen

Mikro/Immunologi	
Specimen	Ujian

Lain-lain .....
.....
.....

17. Pengambilan Specimen: Tarikh: ☐☐☐☐☐☐ Masa: ☐☐☐☐

18. Nama Doktor: .....

19. Tarikh: .....

.....
Tandatangan dan Cop Doktor

LAPORAN 'SILA LIHAT SEBELAH'

HOSPITAL / KLINIK KESIHATAN .....
CLINICAL PHARMACOKINETICS SERVICE
Therapeutic Drug Monitoring (TDM) Request Form

Pharmacy Ref No:

Note :
- *3 – 5 ml of blood sample is needed for analysis of 1 – 3 drugs.*
- *Use plain tubes for all the drugs except for Cyclosporin/Tacrolimus/Sirolimus/Everolimus (EDTA tube).*
- *Correct information is crucial as interpretation of results is dependent on the information provided.*

Date Received :
Time Received :

PATIENT PROFILE

Name	:	Ward/Unit	:	RN / IC	:
Age	:	Gender	: M F	Race	:
Weight (kg)	:	Height (cm)	:	DOA	:

CLINICAL SUMMARY AND DIAGNOSIS

PATIENT CONDITION

❑ Oedema ❑ Liver Disease ❑ Dehydration
❑ Dialysis ❑ Burn ❑ Others

INDICATION FOR REQUEST

❑ Therapeutic Monitoring ❑ Non-compliance
❑ Suspected Toxicity ❑ Others .....

LATEST LAB RESULTS

Parameters	Date	Results *(unit)*	Parameters	Date	Results *(unit)*
Blood Urea			Temperature		
Na^+ / K^+			WBC		
Creatinine			ALT / AST / ALP		
Albumin			HR		
Culture & Sensitivity					

CONCURRENT MEDICATIONS

Drug Analysis *(Tick ✓ where appropriate)*		Present Dose Regimen	Dose Started		Monitoring Date			
					/ /	/ /	/ /	/ /
					Predose / Post 1 / C_0	Last Dose Given	Postdose / Post 6 / C_2	Random
			Date	Time	Time	Time	Time	Time
	Amikacin							
	Benzodiazepine							
	Carbamazepine							
	Cyclosporin							
	Digoxin							
	Ethanol							
	Everolimus							
	Gentamicin							
	Lithium							
	Methotrexate							
	Mycophenolic acid							
	Paracetamol							
	Phenobarbitone							
	Phenytoin							
	Salicylate							
	Sirolimus							
	Tacrolimus							
	Theophylline							
	Valproic acid							
	Vancomycin							

REFER TO TDM SERUM SAMPLING GUIDELINES *(refer back page)*

For injectable drug being analysed :
Infusion rate : .....
Duration of Infusion : .....

REQUESTED BY:

Doctor's Signature : _____ Name & Stamp : _____ Date :

FOR PHARMACY USE ONLY

Drug analysis	*Result*	*Therapeutic Range*	*Calculated Pharmacokinetic Parameters*		Time Finished :
			K_e :	C_{min} new :	
			$t_{1/2}$:	C_{max} new :	Test done by :
			T :	CrCl :	
			C_{max} :	C_{pss} :	
			Vd :		

Pharmacist's Assessment & Recommendation :

Informed : DR / SN .....on ..... at .....am/pm

Pharmacist's signature & stamp

TDM SERUM SAMPLING GUIDE

DRUG		STEADY STATE *(Time to monitor plasma concentrations)*		SAMPLING TIME		THERAPEUTIC RANGE *(*The target reference ranges may vary based on institutional references & indication)*	SAMPLE STABILITY IN BLOOD
		SINGLE DAILY DOSING	MULTIPLE DOSING	SINGLE DAILY DOSING	MULTIPLE DOSING		
AMINOGLYCOSIDE	AMIKACIN	2^{nd} dose	3^{rd} or 4^{th} dose	**1st sample** Post 2 hours **2nd sample** Post 6 hours (or any two post sampling at least 2 $t_{1/2}$ apart)	**Pre** 0 – 30 min before dose **Post** 30 min after 30 min infusion completed	**Trough:** SDD: <1 mcg/ml; Neonates: <5mcg/ml; MDD & Dialysis : <10mcg/ml #**Peak:** Neonates, MDD: 20-30 mcg/ml; SDD : *60 mcg/ml	8 hours
	GENTAMICIN					**Trough:** SDD, Neonates & synergistic: <1 mcg/ml; MDD & Dialysis: <2mcg/ml #**Peak:** Neonates : 5-12 mcg/ml; MDD : 5-10 mcg/ml; SDD: *10-30 mcg/ml; Synergy: 3-5 mcg/ml #adjustable according to indication	4 hours
		Impaired Renal Function: After 24 hours (after 1^{st} stat dose) or Pre-HD					
VANCOMYCIN		**Normal Renal Function :** 4^{th} dose **Impaired Renal Function :** After 24 hours (after 1^{st} stat dose) **Continuous Infusion:** Take a sample after 12 – 24 hours of starting the continuous infusion		**Trough level:** 30mins before dose **Peak level:** 1 hour after the infusion completed		**Trough:** Non-complicated infection : 10 – 15 mcg/ml; Complicated infection : 15 – 20 mcg/ml **Peak:** 25 – 40 mcg/ml **Continuous Infusion:** 15 – 25 mcg/ml **AUC_{24}/MIC:** 400-600 mg.h/L	4 hours
CARBAMAZEPINE		**Initiation :** 2-3 weeks (Induction Phase) **MD :** 2-5 days after initiation and dose changes		**Pre:** 0 – 30mins before dose		4 – 12 mcg/ml	8 hours
PHENOBARBITAL		**Without LD :** 2-3 weeks **After LD :** 2-3 hours after administration		**Pre:** 0 – 30mins before dose		**Epilepsy :** 15 – 40 mcg/ml **Refactory status epileptics :** > 70mcg/ml (up to 100mcg/ml)	8 hours
PHENYTOIN		**With LD :** Oral: 24 hours; IV : 2 hours (if rapid therapiutic concentration is needed) **Without LD :** 7 – 10 days		**Pre:** 0 – 30mins before dose		10-20 mcg/ml	8 hours
VALPROIC ACID		2- 4 days		**Pre:** 0 – 30mins before dose		**Epilepsy :** 50 – 100 mcg/ml **Psychiatric Disorder :** 50 – 125 mcg/ml	2 days
THEOPHYLLINE		Adults : 2days Children : 1 – 2 days Infants : 1 – 5 days Newborn : 120 hrs (5 days) Premature neonates : 150 hrs (6 days)		**Pre:** 0 – 30mins before dose		Apnoea/Bradycardia in neonates : 5 – 10 mcg/ml Asthma/COAD : 10 – 20 mcg/ml	8 hours
DIGOXIN		**Without LD :** 7 – 14 days **With LD :** 12 – 24 hours **ESRD :** 15 – 20 days		**Pre:** 0-30mins before dose **Post:** Oral : At least 6 hours after dose; IV : At least 4 hours after dose		CHF : 0.5 – 0.9 ng/mL AF : 0.8 – 2 ng/mL	8 hours
CYCLOSPORINE (EDTA tube)		3-5 days		C^o: Immediatley before next dose C_2 : 2 hours after dose		According to drug indication **General Therapeutic Range:** C0~100-500mcg/L; C2~600 - 1700mcg/L	7 days
TACROLIMUS (EDTA tube)		3 – 5 days		Pre: 0 – 30mins before dose		5 – 20 ng / ml	7 days
SIROLIMUS (EDTA tube)		Adults : 5 – 7days Children : 3 – 5 days		Pre: 0 – 30mins before dose		4 – 24 ng/ml	8 days
METHOTREXATE		24 - 48 hours		24hr or 48hr post infusion		Variable – Refer to specific protocols	2 days (Room temp)
SALICYLATE		**Therapeutic :** 5 – 7 days **Toxicity :** 4 hours after ingestion		Therapeutic: 1 – 3 hours after dose Toxicity : 4 hours after ingestion		**Rheumatic Fever :** 250 – 400 mcg/ml **Anti-inflammatory :** 150 – 300 mcg/ml	8 hours
PARACETAMOL		**Toxicity :** 4 hours after ingestion		Toxicity : 4 hours after single acute ingestion OR Unknown Ingestion Time : 2 sample at 2 hours interval		Refer Rummack Matthew Nomogram	8 hours
LITHIUM		4 – 5 days		**Pre:** 12 hours after dose (twice daily dosing) **Pre:** 24 hours after dose (once daily dosing)		0.5 – 1.5 mmol/L	24 hours

References:
i) Martindale 33th Ed. 2002, ii) Basic Clinical Pharmacokinetic (Winter) 2010, iii) Drug Information Handbook 10th Ed. 2003, iv) British National Formulary, Vol. 70 Sept 2015, v) Micromedex(R) Healthcare Series 2018, vi) Infectious Disease Society of America, vii) Drug Doses, Frank Shank, 17th Edition 2017, vii) https://journals.lww.com/drug-monitoring/Abstract/2000/08000/Stability_of_Sirolimus_Rapamycin_in_Whole_Blood.10.aspx, viii) https://journals.lww.com/drug-monitoring/Abstract/2003/02000/In_Vitro_Stability_Study_of Methotrexate_in_B;ood.12.aspx, ix) Gidwani Lithium Stability Study 2018, x) Clinical Therapeutic/Vol.22, SUPP.L.B, 2000 Measurement of Sirolimus in Whole Blood Using High-Performance Liquid Chromalography with Ultraviolet Detection, D.W. Holt et. al., xi)Stability of Tacrolimus (FK 506) and Cyclosporin G in Whole Blood, T.M. Annesley. et. al,. TDM 17:361-365 1995 Lippincott-Raven Publishers, Philadelphia.