



# **Pharmacy Information System (PhIS) and Clinic Pharmacy System (CPS)**

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## **Full Based User Manual TDM Calculator**

|                    |                                      |
|--------------------|--------------------------------------|
| <b>Version</b>     | <b>: 8<sup>th</sup> EDITION</b>      |
| <b>Document ID</b> | <b>: FB_U. MANUAL_TDM CALCULATOR</b> |



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Application reference: PhIS & CPS v1.8.1

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## 1.0 Introduction

### 1.1 Overview of PhIS

Pharmacy Information System or better known as PhIS, is a complete and comprehensive system that integrates pharmacy related services geared towards pharmacy excellence. PhIS implementation would transform most of current manual process to electronic system would benefit facility end user in the health care sector.

There are 12 modules to assist services delivery by the health care sector which comprises of:

1. Order Management
2. Inpatient Pharmacy
3. Outpatient Pharmacy
4. Medication Counselling
5. Ward Pharmacy
6. Pharmacy Inventory
7. Manufacturing of Cytotoxic Drug Reconstitution, Parenteral Nutrition, IV Admixture & Eye Drop , Radiopharmaceuticals and Extemporaneous
8. Adverse Drug Reaction & Drug Allergic (ADR & DAC)
9. Clinical Pharmacokinetics Services (TDM)
10. Drug Information & Consumer Education (DICE)
11. Medication Therapy Adherence Clinic (MTAC)
12. Data Mining (PhARM)

### 1.2 Purpose and Objectives

This user manual outlines the TDM Calculator module and its key features and functionalities. The primary objective is to guide user through the process of completing PhIS application process.

User will understand the following activities in details:

- Calculator for Vancomycin
- Calculator for Gentamicin
- Calculator for Valproic Acid

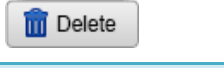
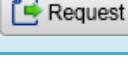
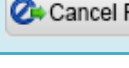
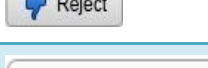
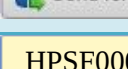
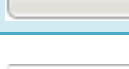
### 1.3 Organized Sections

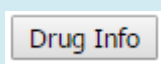
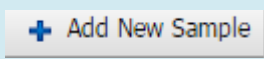
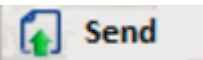
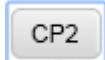
These are the sections within this document:

- Section 1: Introduction
- Section 2: Application Standard Features
- Section 3: Calculator for Vancomycin
- Section 4: Calculator for Gentamicin
- Section 5: Calculator for Valproic Acid
- Section 6: Acronyms
- Section 7: Links to Clinical Modules

## 2.0 Application Standard Features

### 2.1 PhIS Legend

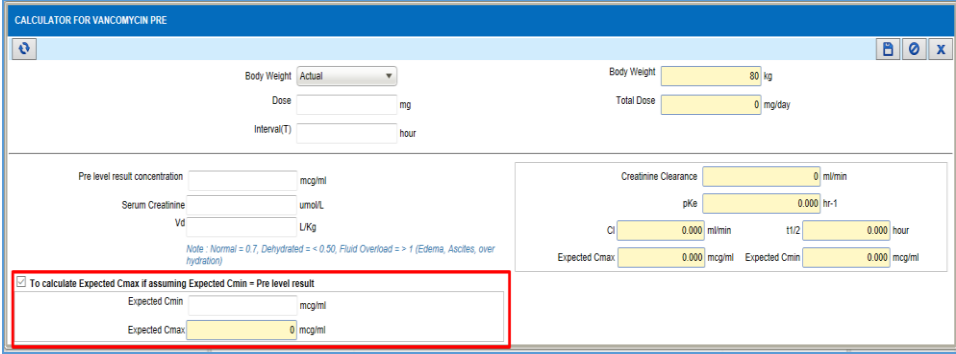
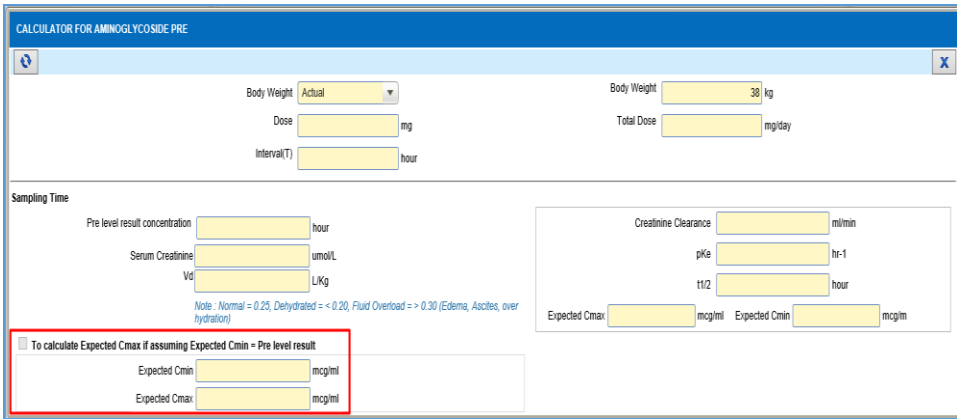
| Standard Legend                                                                     |                                    |                                                                                      |                                        |
|-------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------|
|    | Login to PhIS                      |     | Logout from PhIS                       |
|    | Change Login Password              |     | Reset Login Screen                     |
|    | Expand Menu                        |     | Collapse Menu                          |
|    | Display Home Tab                   |     | Expand Module                          |
|    | Collapse Module                    |     | Close All Open Tabs                    |
|    | Refresh Screen                     |     | Search Record                          |
|   | Add/Create New Record              |    | Show Help                              |
|  | Print                              |   | Mandatory Field                        |
|  | Calendar Icon                      |   | Search Icon                            |
|  | Close Window                       |   | Radio Button                           |
|  | Checkbox                           |   | Edit Record                            |
|  | Cancel                             |   | Delete Record                          |
|  | Save                               |  | Export and Open Report in Excel Format |
|  | Add Item to the list               |   | Delete Item from the list              |
|  | Request for Approval               |  | Cancel the Request                     |
|  | Approve Transaction                |   | Reject Transaction                     |
|  | Send for Approval                  |  | Dropdown Box                           |
|  | Automatically Display/Retrieve Box |  | Empty Text Box                         |

| Therapeutic Drug Monitoring Module Legend                                         |                  |                                                                                    |                   |
|-----------------------------------------------------------------------------------|------------------|------------------------------------------------------------------------------------|-------------------|
|  | To Acknowledge   |   | Drug Info         |
|  | To Do New Order  |   | To Verify         |
|  | Cancel the Order |  | To Add New Sample |
|  | To send request  |   | Ward Pharmacy     |
|                                                                                   |                  |                                                                                    |                   |
|                                                                                   |                  |                                                                                    |                   |

**Note**

To learn more about Login Information, kindly click [Login Information](#) module for descriptive steps.

## 2.2 Latest Enhancement and Updates

| Latest Functions                                                                                                                                                                                                                                                                                                                                                                                                                                     | Page                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <p>TDM Calculator for:<br/>New Calculator for Vancomycin (PRE only)</p>  <ul style="list-style-type: none"> <li>Added check box to activate the calculator.</li> <li>Added Expected Cmin - Free text field</li> <li>Added Expected Cmax – Formula:<br/> <math display="block">= \text{Expected Cmin} / (\text{EXP}(-pK_e * \text{Interval}(T)))</math> </li> </ul> | <p><a href="#">6</a></p>  |
| <p>New Calculator for Aminoglycoside Pre</p>  <ul style="list-style-type: none"> <li>Added check box to activate the calculator.</li> <li>Added Expected Cmin - Free text field</li> <li>Added Expected Cmax – Formula:<br/> <math display="block">= \text{Expected Cmin} / (\text{EXP}(-pK_e * \text{Interval}(T)))</math> </li> </ul>                          | <p><a href="#">10</a></p> |

### 3.0 Calculator for Vancomycin

To view the calculator in the system, perform the steps below:

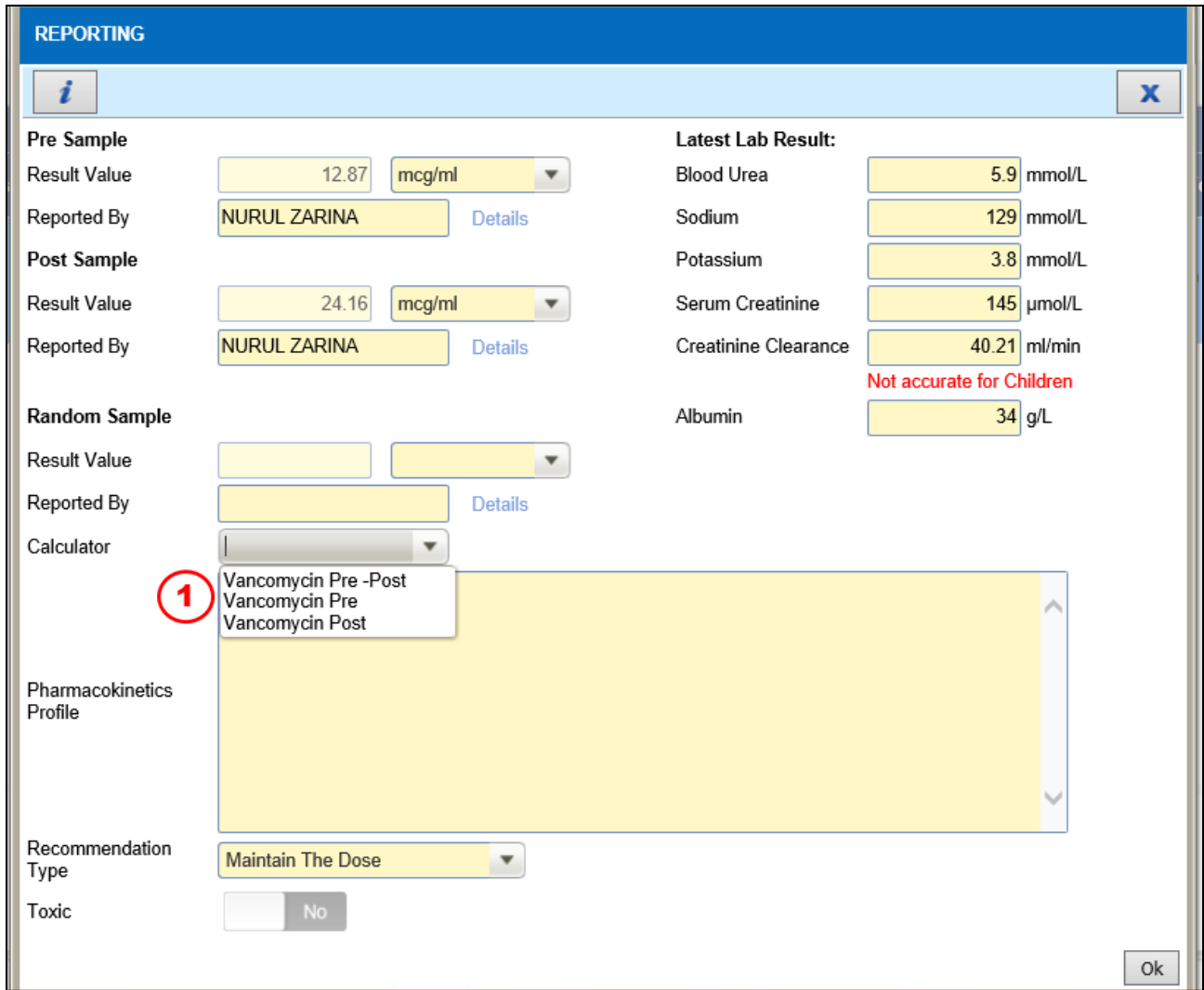


Figure 3.0-1 Pre Calculator for Vancomycin Detail

#### STEP 1

Select calculator from dropdown box example:

- Vancomycin in Pre
- Vancomycin in Post
- Vancomycin in Pre-Post

#### Note

- Choose the calculator and fill the result in the box as per Figure 3.0-1. Sample Details consists of:
  - Calculator for **Vancomycin Pre**
    - a. Dose medication in mg
    - b. Interval Time
    - c. Pre level result concentration
    - d. Serum Creatinine
    - e. Vd
    - f. Expected Cmax if assuming Expected Cmin = Pre level result

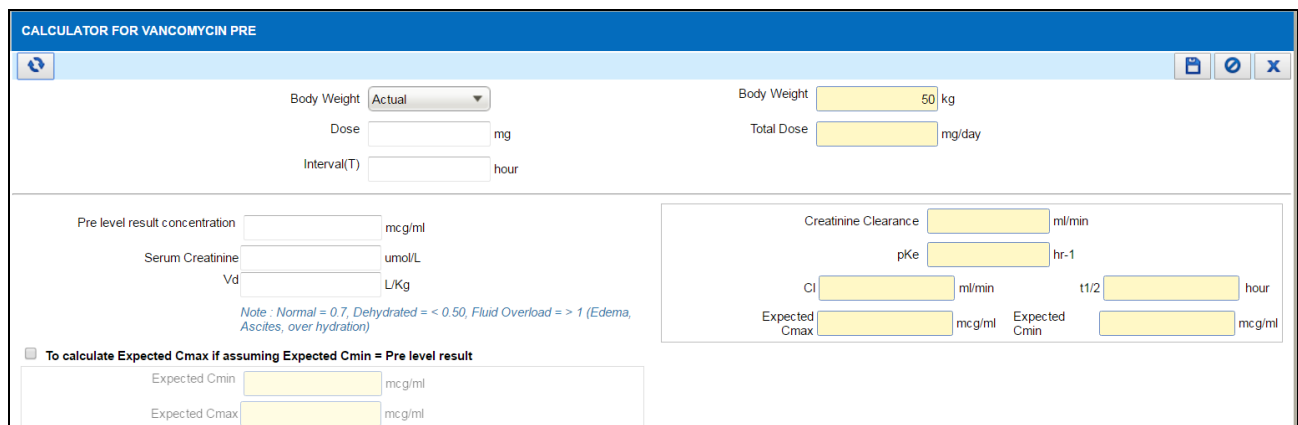
➤ Calculator for **Vancomycin Post**

- Dose medication in mg
- Interval Time
- Sampling Time: Duration between time after complete infusion and post sampling(t)
- Serum level: Post level result concentration, Serum Creatinine
- New dose and Cmin based on desired Cmax
- Expected Cmin and Cmax based on new suggested dose

➤ Calculator for **Vancomycin Pre & Post**

- Dose medication in mg
- Interval Time
- Sampling Time: Duration between time after complete infusion and post sampling(t) and Duration between completion time of pre and post sampling (t2-t1)
- Serum level: Pre level result concentration, Post level result concentration and Serum Creatinine
- Vd, Ke and t1/2
- Area Under Curve (AUC) Over 24hrs
- New dose and Cmin based on desired Cmax
- Expected Cmin and Cmax if Vd varies
- Expected Cmin and Cmax based on new suggested dose

- After save the calculator, the result will appear at the Pharmacokinetics Profile box
- Calculator is optional only user can direct type at the Pharmacokinetics Profile box without using the calculator as per Figure 3.0-1



**CALCULATOR FOR VANCOMYCIN PRE**

Body Weight:  kg  
 Dose:  mg  
 Interval(T):  hour  
 Total Dose:  mg/day

Pre level result concentration:  mcg/ml  
 Serum Creatinine:  umol/L  
 Vd:  L/Kg

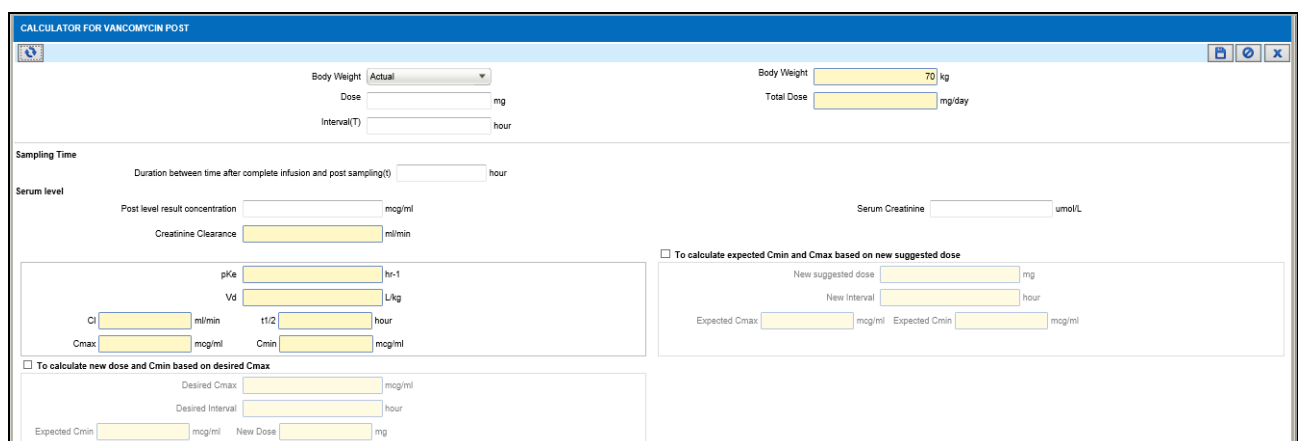
Creatinine Clearance:  ml/min  
 pKe:  hr-1  
 CI:  ml/min  
 t1/2:  hour  
 Expected Cmax:  mcg/ml  
 Expected Cmin:  mcg/ml

Note : Normal = 0.7, Dehydrated = < 0.50, Fluid Overload = > 1 (Edema, Ascites, over hydration)

☐ To calculate Expected Cmax if assuming Expected Cmin = Pre level result

Expected Cmin:  mcg/ml  
 Expected Cmax:  mcg/ml

Figure 3.0-2 Pre Calculator for Vancomycin Detail



**CALCULATOR FOR VANCOMYCIN POST**

Body Weight:  kg  
 Dose:  mg  
 Interval(T):  hour  
 Total Dose:  mg/day

Sampling Time: Duration between time after complete infusion and post sampling(t):  hour

Serum level: Post level result concentration:  mcg/ml  
 Serum Creatinine:  umol/L  
 Creatinine Clearance:  ml/min

pKe:  hr-1  
 Vd:  L/kg  
 CI:  ml/min  
 t1/2:  hour  
 Cmax:  mcg/ml  
 Cmin:  mcg/ml

☐ To calculate expected Cmin and Cmax based on new suggested dose

New suggested dose:  mg  
 New interval:  hour  
 Expected Cmax:  mcg/ml  
 Expected Cmin:  mcg/ml

☐ To calculate new dose and Cmin based on desired Cmax

Desired Cmax:  mcg/ml  
 Desired interval:  hour  
 Expected Cmin:  mcg/ml  
 New Dose:  mg

Figure 3.0-3 Post Calculator for Vancomycin Detail

**CALCULATOR FOR VANCOMYCIN PRE & POST**

Body Weight:

Dose:  mg

Interval(T):  hour

Body Weight:  kg

Total Dose:  mg/daily

**Sampling Time**

Duration between time after complete infusion and post sampling(t):  hour

Duration between completion time of pre and post sampling (2-t1):  hour

**Serum level**

Pre level result concentration:  mcg/ml

Post level result concentration:  mcg/ml

Serum Creatinine:  umol/L

Creatinine Clearance:  ml/min

☐ To calculate Vd, Ka and t1/2

Ka:  hr<sup>-1</sup>

Vd:  L/kg

Cl:  ml/min

t1/2:  hour

Cmax:  mcg/ml

Cmin:  mcg/ml

☐ To calculate Area Under Curve (AUC) Over 24hrs

Vd:  L/kg

MIC:  mg/L

Note MIC < 2mg/L AUC > 400

AUC:

☐ To calculate new dose and Cmin based on desired Cmax

Desired Cmax:  mcg/ml

Desired Interval:  hour

Expected Cmin:  mcg/ml

New Dose:  mg

☐ To calculate expected Cmin and Cmax if Vd varies

Vd:  L/kg

Expected Cmax:  mcg/ml

Expected Cmin:  mcg/ml

☐ To calculate expected Cmin and Cmax based on new suggested dose

New suggested dose:  mg

Every Hour:  hour

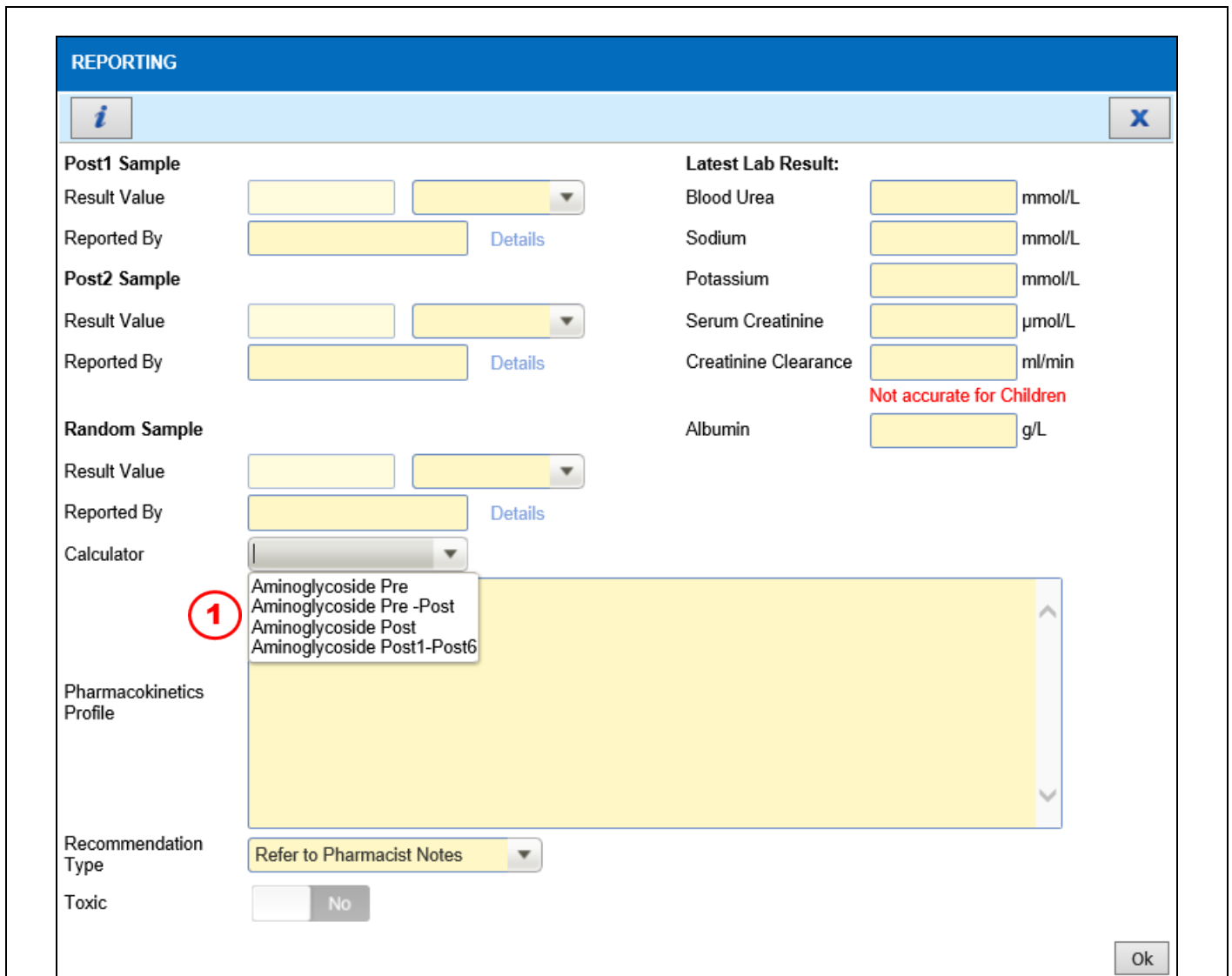
Expected Cmax:  mcg/ml

Expected Cmin:  mcg/ml

**Figure 3.0-4 Pre & Post Calculator for Vancomycin Detail**

## 4.0 Calculator for Gentamicin / Amikacin

To view the calculator in the system, perform the steps below:



**REPORTING**

**Post1 Sample**

Result Value

Reported By  Details

**Post2 Sample**

Result Value

Reported By  Details

**Random Sample**

Result Value

Reported By  Details

Calculator

Pharmacokinetics Profile

Recommendation Type

Toxic  No

**Latest Lab Result:**

Blood Urea  mmol/L

Sodium  mmol/L

Potassium  mmol/L

Serum Creatinine  µmol/L

Creatinine Clearance  ml/min

Albumin  g/L

**Not accurate for Children**

Ok

Figure 4.0-1 Calculator for Gentamicin / Amikacin

### STEP 1

Select calculator from dropdown box example:

- Aminoglycoside Pre-Post
- Aminoglycoside Pre
- Aminoglycoside Post
- Aminoglycoside Post 1- Post 6

### Note

- Choose the calculator and fill the result in the box as per Figure 4.0-1. Sample Details consists of:
  - Calculator for **Aminoglycoside Pre**
    - a. Dose medication in mg
    - b. Interval Time
    - c. Pre level result concentration
    - d. Serum Creatinine
    - e. Vd
    - f. Expected Cmax if assuming Expected Cmin = Pre level result

➤ Calculator for **Aminoglycoside Post**

- Dose medication in mg
- Interval Time
- Sampling Time: Duration between time after complete infusion and post sampling(t)
- Serum level: Post level result concentration, Serum Creatinine
- Vd, Ke and t1/2
- New dose and Cmin based on desired Cmax
- Expected Cmin and Cmax based on new suggested dose

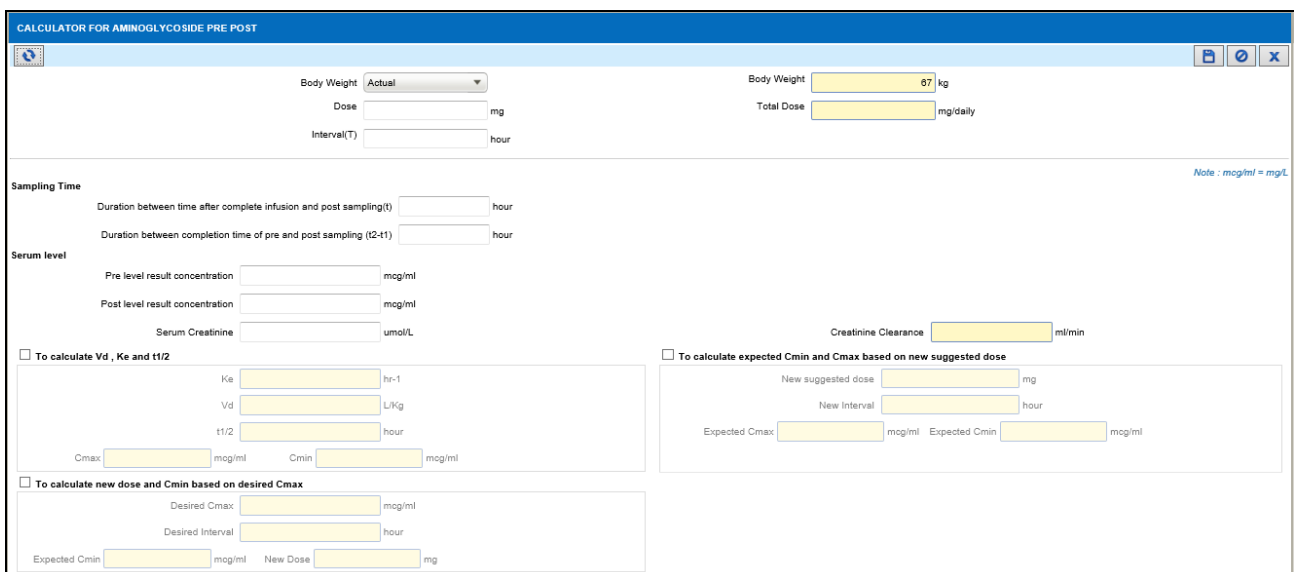
➤ Calculator for **Aminoglycoside Pre & Post**

- Dose medication in mg
- Interval Time
- Sampling Time: Duration between time after complete infusion and post sampling(t) and Duration between completion time of pre and post sampling (t2-t1)
- Serum level: Pre level result concentration, Post level result concentration and Serum Creatinine
- Vd, Ke and t1/2
- New dose and Cmin based on desired Cmax
- Expected Cmin and Cmax based on new suggested dose

➤ Calculator for **Aminoglycoside Post 1 & Post 6**

- Dose medication in mg
- Interval Time
- Sampling Time: Duration between time after complete infusion and post 1 sampling(t) and Duration between completion time of post6 and post1 sampling (t6-t1)
- Serum level: Post 1 level result concentration, Post 6 level result concentration and Serum Creatinine
- Vd, Ke and t1/2
- New dose and Cmin based on desired Cmax
- Expected Cmin and Cmax based on new suggested dose

- After save the calculator, the result will appear at the Pharmacokinetics Profile box
- Calculator is optional only user can direct type at the Pharmacokinetics Profile box without using the calculator as per Figure 4.0-1



**CALCULATOR FOR AMINOGLYCOSIDE PRE POST**

Body Weight:  kg  
 Dose:  mg  
 Interval(T):  hour  
 Total Dose:  mg/daily

Sampling Time  
 Duration between time after complete infusion and post sampling(t):  hour  
 Duration between completion time of pre and post sampling (t2-t1):  hour

Serum level  
 Pre level result concentration:  mg/ml  
 Post level result concentration:  mg/ml  
 Serum Creatinine:  umol/L  
 Creatinine Clearance:  ml/min

☐ To calculate Vd, Ke and t1/2  
 Ke:  hr<sup>-1</sup>  
 Vd:  L/kg  
 t1/2:  hour  
 Cmax:  mg/ml  
 Cmin:  mg/ml

☐ To calculate expected Cmin and Cmax based on new suggested dose  
 New suggested dose:  mg  
 New Interval:  hour  
 Expected Cmax:  mg/ml  
 Expected Cmin:  mg/ml

☐ To calculate new dose and Cmin based on desired Cmax  
 Desired Cmax:  mg/ml  
 Desired Interval:  hour  
 Expected Cmin:  mg/ml  
 New Dose:  mg

Note : mg/ml = mg/L

Figure 4.0-2 Calculator for Aminoglycoside Pre-Post Detail

**CALCULATOR FOR AMINOGLYCOSIDE PRE**

Body Weight Actual ▼ Body Weight  kg  
Dose  mg Total Dose  mg/day  
Interval(T)  hour

**Sampling Time**

Pre level result concentration  hour  
Serum Creatinine  umol/L  
Vd  L/Kg  
Note : Normal = 0.25, Dehydrated = < 0.20, Fluid Overload = > 0.30 (Edema, Ascites, over hydration)

Creatinine Clearance  ml/min  
pKe  hr-1  
t1/2  hour  
Expected Cmax  mcg/ml Expected Cmin  mcg/ml

☐ To calculate Expected Cmax if assuming Expected Cmin = Pre level result

Expected Cmin  mcg/ml  
Expected Cmax  mcg/ml

**Figure 4.0-3 Calculator for Aminoglycoside Pre Detail**

**CALCULATOR FOR AMINOGLYCOSIDE POST**

Body Weight Actual ▼ Body Weight  kg  
Dose  mg Total Dose  mg/daily  
Interval(T)  hour

**Sampling Time**

Duration between time after complete infusion and post sampling(t)  hour  
Note : mcg/ml = mg/L

**Serum level**

Post level result concentration  mcg/ml  
Serum Creatinine  umol/L  
Creatinine Clearance  ml/min

☐ To calculate Vd, Ke and t1/2

Vd  L/Kg  
pKe  hr-1  
t1/2  hour  
Cmax  mcg/ml Cmin  mcg/ml

☐ To calculate expected Cmin and Cmax based on new suggested dose

New suggested dose  mg  
New Interval  hour  
Expected Cmax  mcg/ml Expected Cmin  mcg/ml

☐ To calculate new dose and Cmin based on desired Cmax

Desired Cmax  mcg/ml  
Desired Interval  hour  
Expected Cmin  mcg/ml New Dose  mg

**Figure 4.0-4 Calculator for Aminoglycoside Post Detail**

**CALCULATOR FOR AMINOGLYCOSIDE POST1 & POST6**

Body Weight Actual ▼ Body Weight  kg  
Dose  mg Total Dose  mg/daily  
Interval(T)  hour

**Sampling Time**

Duration between time after complete infusion and post1 sampling(t)  hour  
Duration between completion time of post6 and post1 sampling (t6-t1)  hour  
Note : mcg/ml = mg/L

**Serum level**

Post 1 level result concentration  mcg/ml  
Post 6 level result concentration  mcg/ml  
Serum Creatinine  umol/L  
Creatinine Clearance  ml/min

☐ To calculate Vd, Ke and t1/2

Ke  hr-1  
Vd  L/Kg  
t1/2  hour  
Cmax  mcg/ml Cmin  mcg/ml

☐ To calculate expected Cmin and Cmax based on new suggested dose

New suggested dose  mg  
New Interval  hour  
Expected Cmax  mcg/ml Expected Cmin  mcg/ml

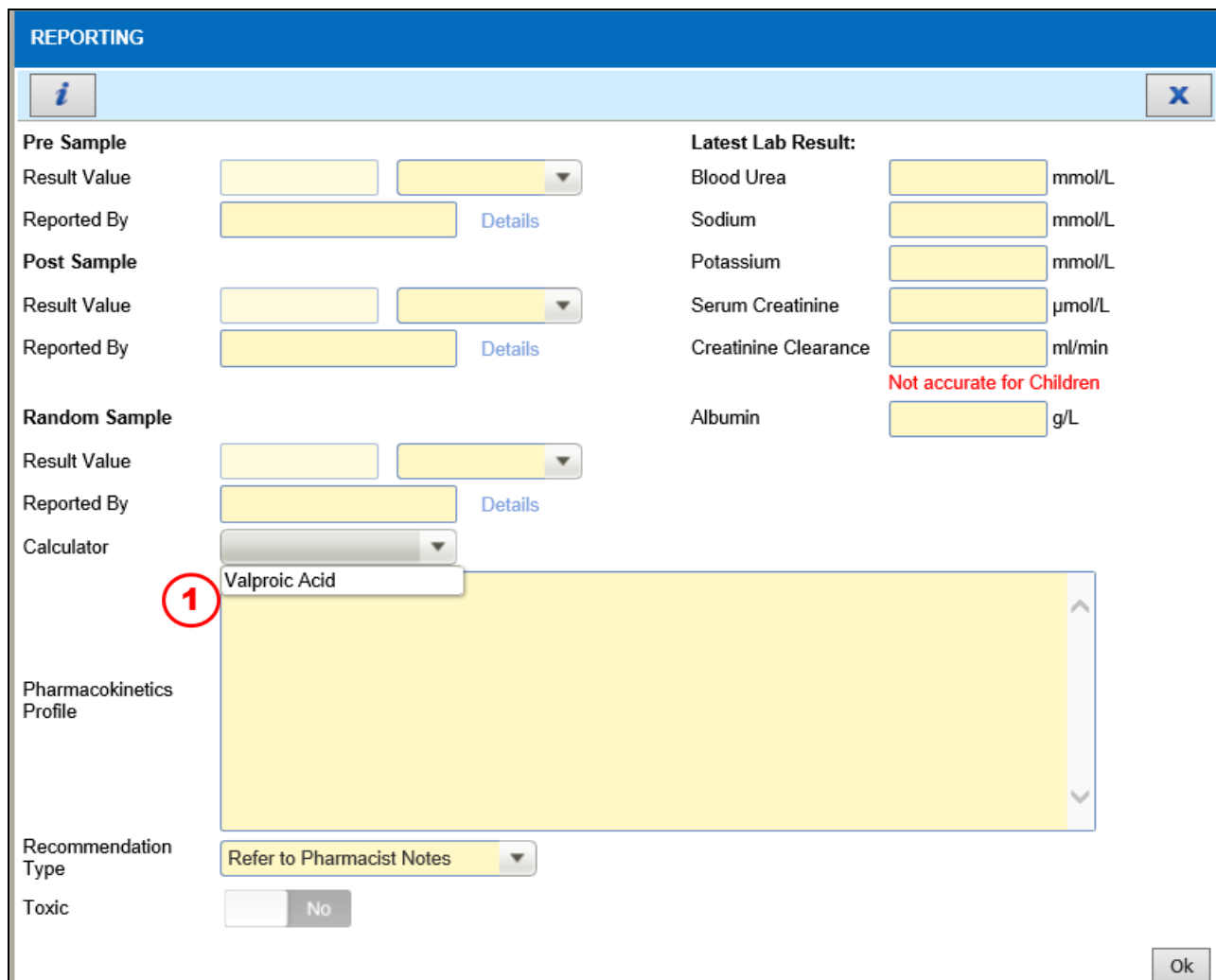
☐ To calculate new dose and Cmin based on desired Cmax

Desired Cmax  mcg/ml  
Desired Interval  hour  
Expected Cmin  mcg/ml New Dose  mg

**Figure 4.0-5 Calculator for Aminoglycoside Pre 1-Post 6 Detail**

## 5.0 Calculator for Valproic Acid

To view the calculator in the system, perform the steps below:



**REPORTING**

**Pre Sample**

Result Value

Reported By  [Details](#)

**Post Sample**

Result Value

Reported By  [Details](#)

**Random Sample**

Result Value

Reported By  [Details](#)

Calculator  **Valproic Acid**

**Latest Lab Result:**

Blood Urea  mmol/L

Sodium  mmol/L

Potassium  mmol/L

Serum Creatinine  µmol/L

Creatinine Clearance  ml/min  
*Not accurate for Children*

Albumin  g/L

**Pharmacokinetics Profile**

Recommendation Type  **Refer to Pharmacist Notes**

Toxic ☐ No

**1**

**Ok**

Figure 5.0-1 Calculator for Valproic Acid

### STEP 1

Select calculator from dropdown box example:

- Valproic Acid

### Note

- Choose the calculator and fill the result in the box as per Figure 5.0-1. Sample Details consists of:
  - **Valproic Acid** calculator
    - Dose medication in mg
    - Interval (T) in Hours
    - Total Dose in mg/day
    - Choose between monotherapy or polytherapy
      - ✓ **Monotherapy**- single or combination therapies of different enzyme activities
      - ✓ **Polytherapy** - combination therapies of similar enzyme activities
    - Cp Measured in mcg/ml
    - Constant Cl in mg/kg/hr
    - Vd , Ke and t1/2 based on Cl
    - New Maintenance Dose (NMD) based on I, Cp measured and Cp desired
    - Cpss level based on current dose and Cl

- Expected  $C_p$  based on  $Cl$  and New Suggested Dose (NSD)
- After save the calculator, the result will appear at the Pharmacokinetics Profile box
- Calculator is optional only user can direct type at the Pharmacokinetics Profile box without using the calculator as per Figure 5.0-1

**CALCULATOR FOR VALPROIC ACID**

Body Weight: Actual 44 kg

Dose: mg

Interval(T): hour

Total Dose: mg/day

Select Calculator :

☐ Monotherapy ☒ Polytherapy

Note: single or combination therapies of different enzyme activities.

☐ To calculate  $V_d$ ,  $K_e$  and  $t_{1/2}$  based on  $Cl$

$C_p$  measured: mg/ml

Note:  $mg/ml = mg/L$

Clearance  $CP$  measured: L/day

$K_e$ : L/hr

$Cl$ : L/hr

Constant  $V_d$ : L/kg

Note:  $0.1 - 0.5 L/kg$

$V_d$ : L/kg

$K_e$ : hr<sup>-1</sup>

$t_{1/2}$ : hour

☐ To calculate New Maintenance Dose (NMD) based on  $Cl$ ,  $C_p$  measured and  $C_p$  desired

$C_p$  desired: mg/ml

Note:  $mg/ml = mg/L$

$Cl$ : L/day

New Dose: mg/day

☐ To calculate  $C_{pss}$  level based on current dose and  $Cl$

Constant  $Cl$ : ml/kg/hr

Note: Adult=8 ml/kg/hr Children (< 12years 11month) = 13 ml/kg/hr

Clearance (Population): L/day

$K_e$ : L/hr

$Cl$ : L/hr

$C_{pss}$ : mg/ml

Note:  $mg/ml = mg/L$

☐ To calculate Expected  $C_p$  based on  $Cl$  and New Suggested Dose(NSD)

$Cl$ : L/day

NSD: mg/day

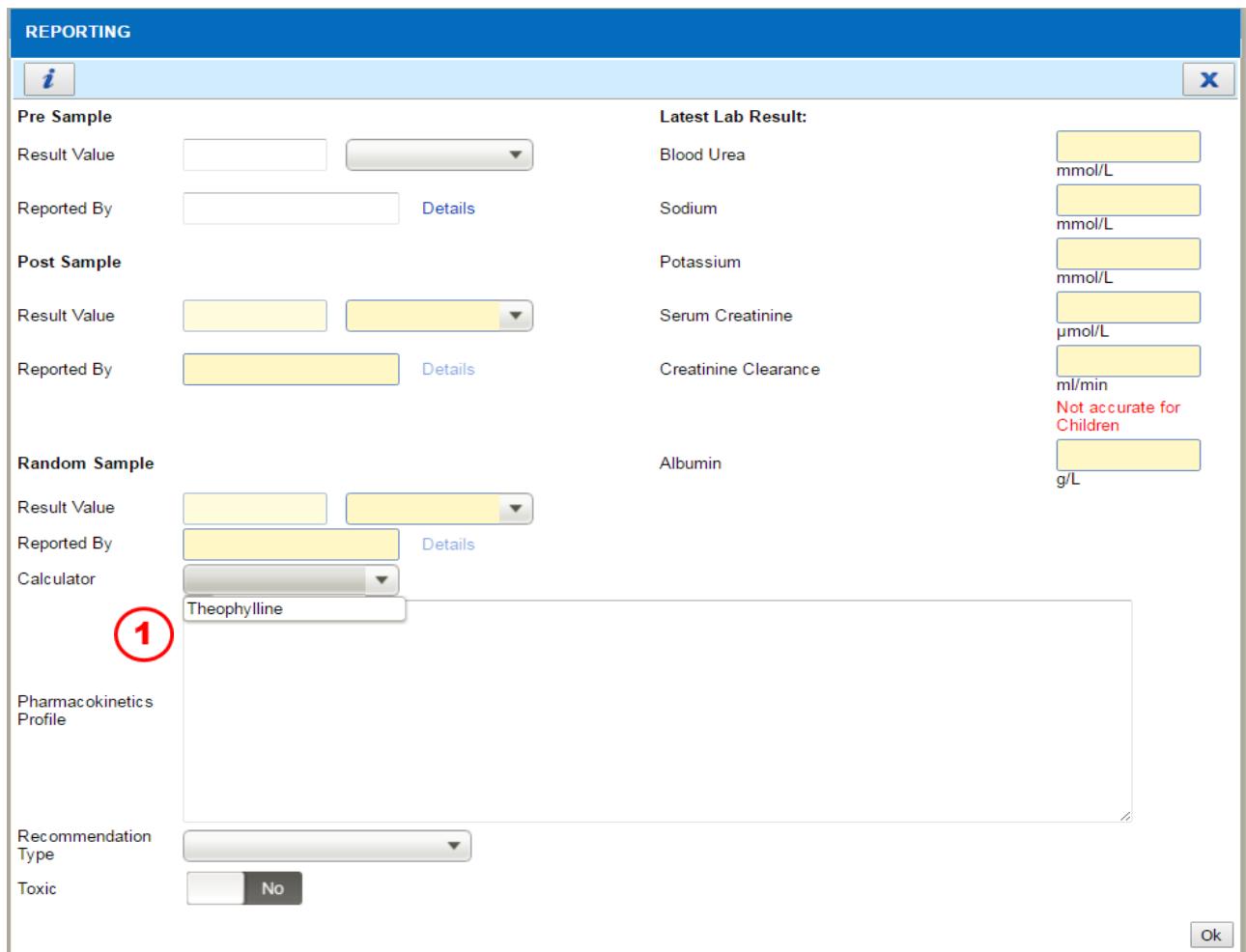
Expected  $C_p$ : mg/ml

Note:  $mg/ml = mg/L$

Figure 5.0-2 Calculator for Valproic Acid Detail

## 6.0 Calculator for Aminophylline / Theophylline

To view the calculator in the system, perform the steps below:



**REPORTING**

**Pre Sample**

Result Value    
Reported By  [Details](#)

**Post Sample**

Result Value    
Reported By  [Details](#)

**Random Sample**

Result Value    
Reported By  [Details](#)  
Calculator   
**1** Theophylline

**Latest Lab Result:**

Blood Urea  mmol/L  
Sodium  mmol/L  
Potassium  mmol/L  
Serum Creatinine  µmol/L  
Creatinine Clearance  ml/min  
Not accurate for Children  
Albumin  g/L

**Pharmacokinetics Profile**

Recommendation Type   
Toxic ☐ No

**Figure 6.0-1 Calculator for Aminophylline / Theophylline**

### STEP 1

Select calculator from dropdown box example:

- Aminophylline / Theophylline

### Note

- Choose the calculator and fill the result in the box as per Figure 6.0-1. Sample Details consists of:

➤ **Theophylline** calculator

- Choose between oral or iv

#### Oral

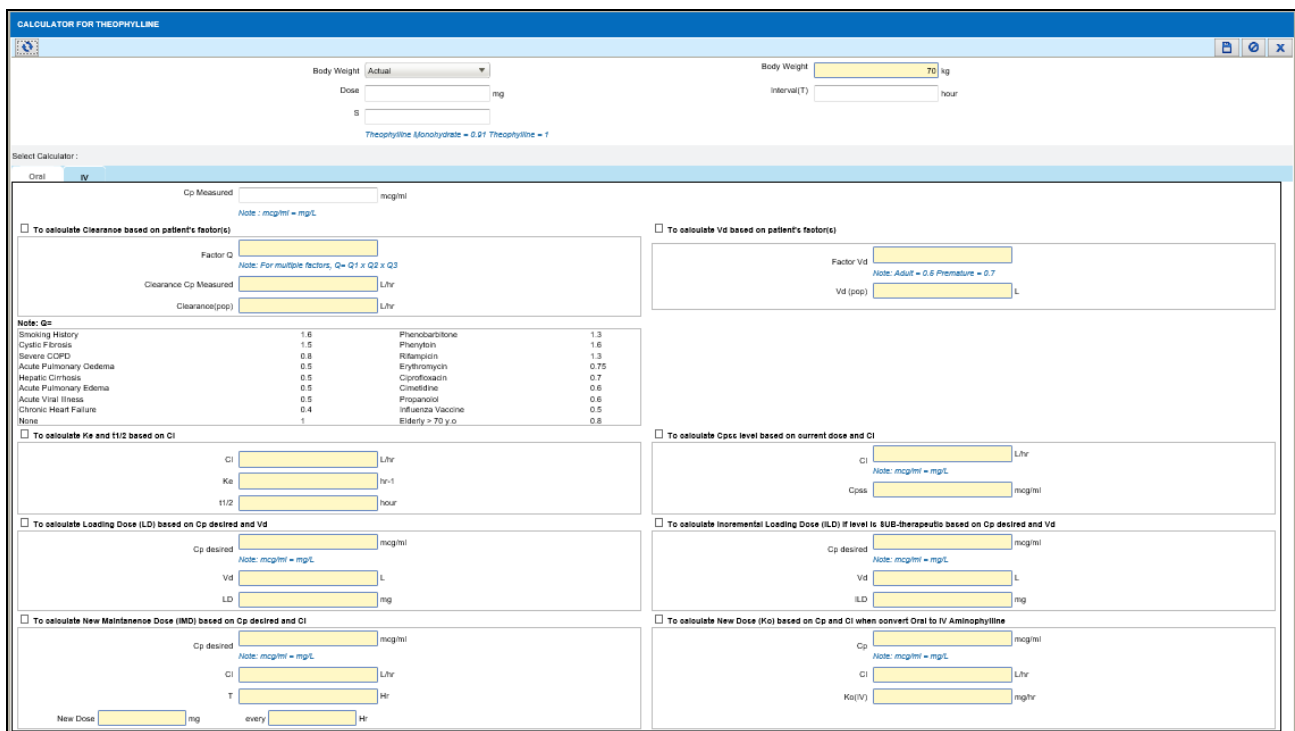
- Dose medication in mg/hr
- Cp measured in mcg/ml
- Clearance based on patient's factor(s)
- Ke and t<sub>1/2</sub> based on CI
- Loading Dose (LD) if NO Theophylline given within 24 hours
- Loading Dose (LD) if NO Theophylline given within 24 hours
- Withhold Therapy Period (T) if level is SUPRA-therapeutic based on Cp desired and Ke
- IV Aminophylline to Oral
- Cpss level based on current dose and CI

- j. Loading Dose (LD) if Theophylline given within 24 hours
- k. Incremental Loading Dose (ILD) if level is SUB-therapeutic based on  $C_p$  desired and  $V_d$
- l. Infusion rate ( $K_0$ ) based on  $C_p$  desired and  $CI$

**Intravenous (iv)**

- a. Dose medication in mg
- b. Interval (T) in hours
- c.  $C_p$  measured in mcg/ml
- d. Clearance based on patient's factor(s)
- e.  $K_e$  and  $t_{1/2}$  based on  $CI$
- f. Loading Dose (LD) based on  $C_p$  desired and  $V_d$
- g. Incremental Loading Dose (ILD) if level is SUB-therapeutic based on  $C_p$  desired and  $V_d$
- h. New Maintenance Dose (IMD) based on  $C_p$  desired and  $CI$
- i.  $C_{pss}$  level based on current dose and  $CI$
- j. New Dose ( $K_0$ ) based on  $C_p$  and  $CI$  when convert Oral to IV Aminophylline

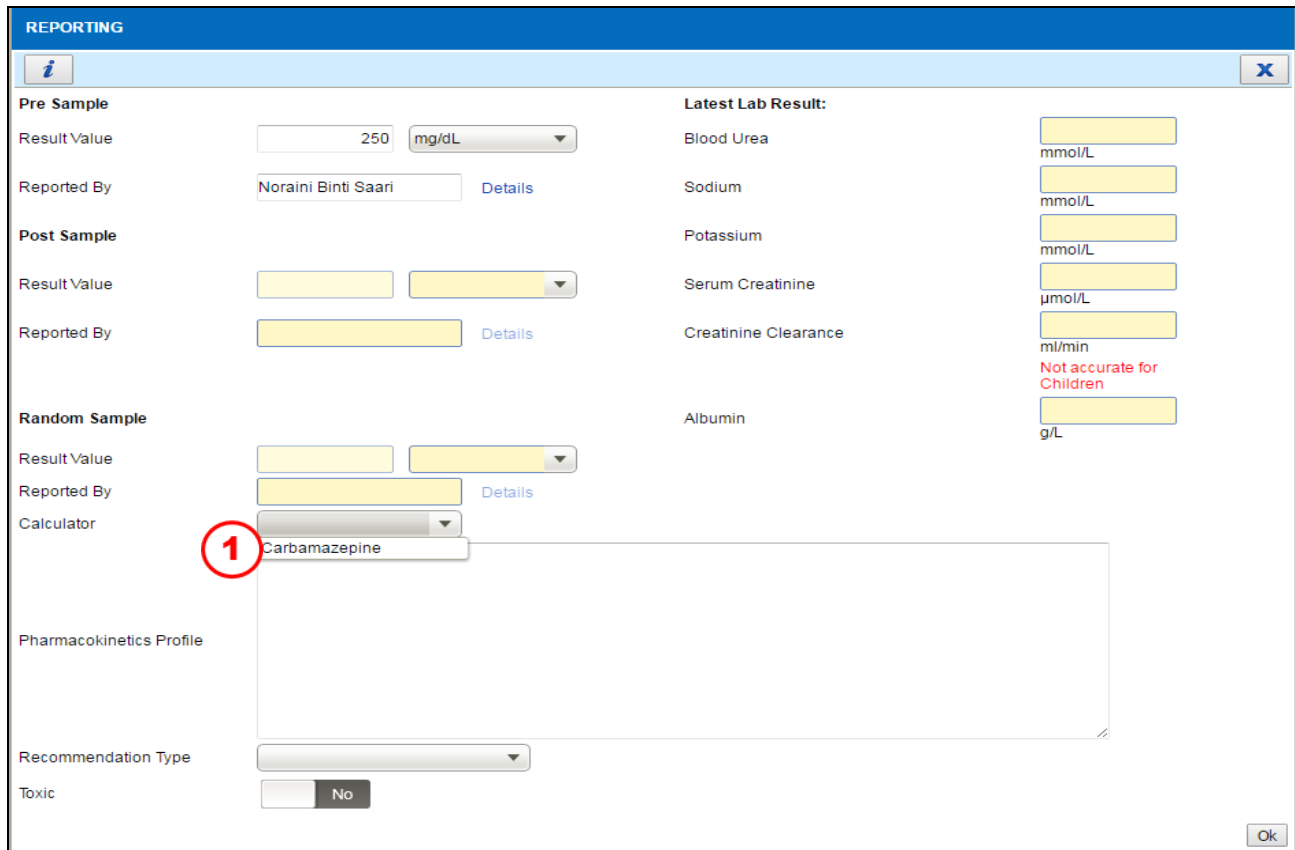
- After save the calculator, the result will appear at the Pharmacokinetics Profile box.
- Calculator is optional only user can direct type at the Pharmacokinetics Profile box without using the calculator as per Figure 6.0-1



**Figure 6.0-2 Calculator for Theophylline for Drug Aminophylline**

## 7.0 Calculator for Carbamazepine

To view the calculator in the system, perform the steps below:



The screenshot shows a web-based reporting interface. At the top is a blue header bar with the word 'REPORTING'. Below this is a light blue bar with an information icon and a close button. The main content area is divided into several sections:

- Pre Sample:** Includes fields for 'Result Value' (250 mg/dL), 'Reported By' (Noraini Binti Saari), and a 'Details' link.
- Post Sample:** Includes fields for 'Result Value' and 'Reported By', both with empty input boxes and dropdown menus, and a 'Details' link.
- Random Sample:** Includes fields for 'Result Value' and 'Reported By', both with empty input boxes and dropdown menus, and a 'Details' link.
- Calculator:** A dropdown menu is highlighted with a red circle and the number '1'. It currently shows 'Carbamazepine'.
- Latest Lab Result:** A list of lab results with empty input boxes and units: Blood Urea (mmol/L), Sodium (mmol/L), Potassium (mmol/L), Serum Creatinine (μmol/L), Creatinine Clearance (ml/min), and Albumin (g/L). A red note 'Not accurate for Children' is visible next to the Creatinine Clearance field.
- Pharmacokinetics Profile:** A large empty text area for notes.
- Recommendation Type:** A dropdown menu.
- Toxic:** A toggle switch currently set to 'No'.

An 'Ok' button is located at the bottom right of the interface.

Figure 7.0-1 Calculator for Carbamazepine

### STEP 1

Select calculator from dropdown box example:

- Carbamazepine

### Note

- Choose the calculator and fill the result in the box as per Figure 7.0-1. Sample Details consists of:
  - **Carbamazepine** calculator
    - Dose medication in mg
    - Interval Time in Hours
    - Total Dose in mg/day
    - Choose between monotherapy or polytherapy
      - ✓ **Monotherapy**- single or combination therapies of different enzyme activities
      - ✓ **Polytherapy** - combination therapies of similar enzyme activities
    - Cp Measured in mcg/ml
    - Vd , Ke and t1/2
    - New Maintenance Dose (NMD) based on Cp measured and Cp desired
    - Cpss level based on current dose and Cl
    - Expected Cp based on New Suggested Dose

- After save the calculator, the result will appear at the Pharmacokinetics Profile box.
- Calculator is optional only user can direct type at the Pharmacokinetics Profile box without using the calculator as per Figure 7.0-1

**CALCULATOR FOR CARBAMAZEPINE**

Body Weight: Actual 70 kg

Dose:  mg

Interval(T):  Hr

Total Dose:  mg/day

Select Calculator:

☐ Monotherapy ☒ **Polytherapy**

Note: single or combination therapies of different enzyme activities.

Cp Measured:  mg/ml

Note: *mcg/ml = mg/L*

Clearance CP measured: 0.000 L/day

≈ 0.000 L/hr

Clearance (Population): 107.520 L/day

≈ 4.480 L/hr

☐ To calculate Vd, Ke and t1/2

Cl:  L/hr

Vd:  L/hr

Ke:  hr<sup>-1</sup>

t1/2:  hour

☐ To calculate Cpss level based on current dose and Cl

Cl:  L/hr

Note: *mcg/ml = mg/L*

Cpss:  mcg/ml

☐ To calculate New Maintenance Dose (NMD) based on Cp measured dan Cp desired

Cp Desired:  mg/L

Note: *mcg/ml = mg/L*

Cl:  L/day

New Dose:  mg/day

☐ To calculate Expected Cp based on New Suggested Dose

Cl:  L/day

Note: *mcg/ml = mg/L*

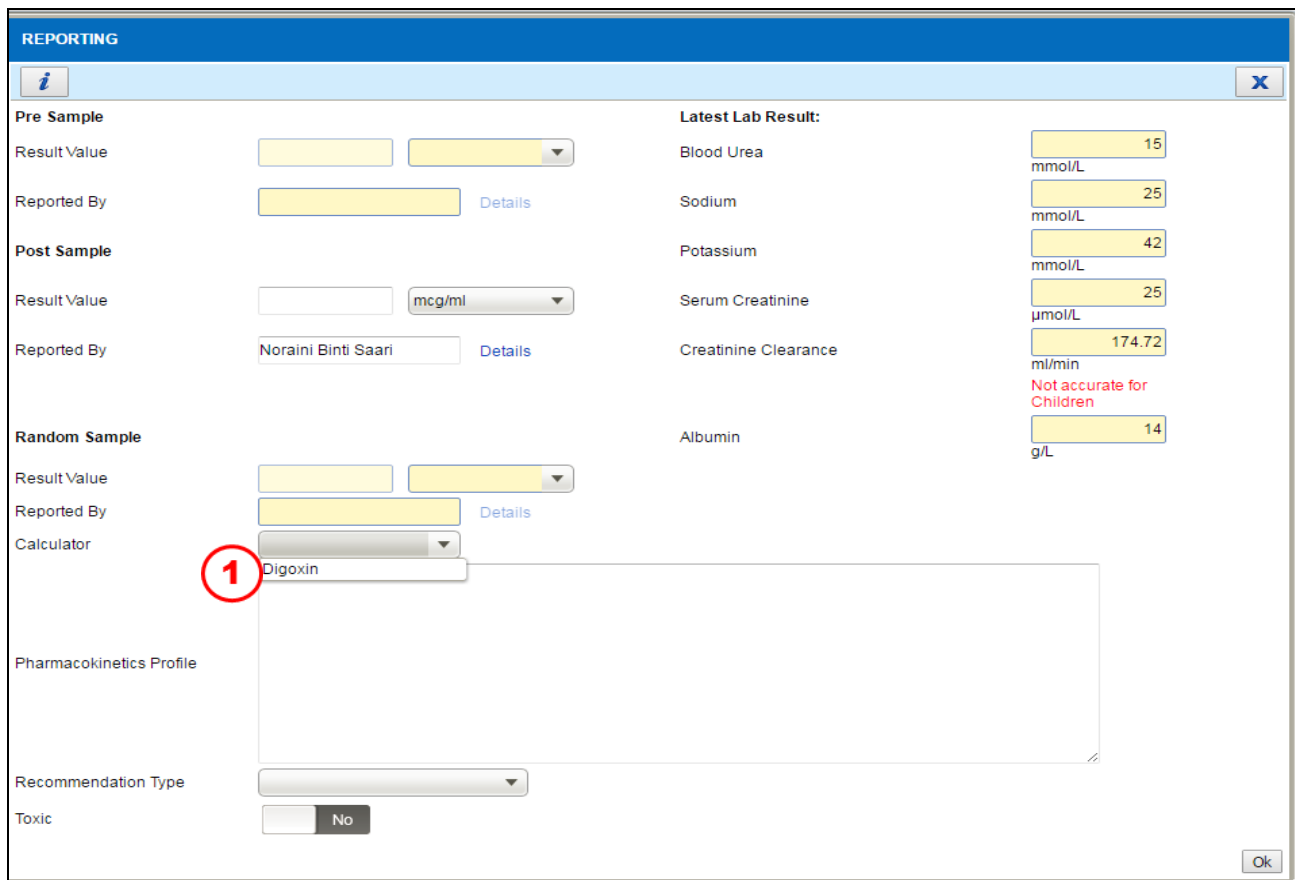
Suggested dose:  mg/day

Expected Cp:  mg/L

Figure 7.0-2 Calculator for Carbamazepine for Drug Carbamazepine

## 8.0 Calculator for Digoxin

To view the calculator in the system, perform the steps below:



**REPORTING**

**Pre Sample**

Result Value:

Reported By:  [Details](#)

**Post Sample**

Result Value:

Reported By: Noraini Binti Saari [Details](#)

**Random Sample**

Result Value:

Reported By:  [Details](#)

Calculator:  **1** Digoxin

Pharmacokinetics Profile

Recommendation Type:

Toxic:  No

**Latest Lab Result:**

|                      |        |        |
|----------------------|--------|--------|
| Blood Urea           | mmol/L | 15     |
| Sodium               | mmol/L | 25     |
| Potassium            | mmol/L | 42     |
| Serum Creatinine     | μmol/L | 25     |
| Creatinine Clearance | ml/min | 174.72 |
| Albumin              | g/L    | 14     |

Not accurate for Children

Ok

Figure 8.0-1 Calculator for Digoxin

### STEP 1

Select calculator from dropdown box example:

- Digoxin

### Note

- Choose the calculator and fill the result in the box as per Figure 8.0-1. Sample Details consists of:
  - **Digoxin calculator**
    - Total Dose in mg/day
    - Serum Creatinine in umol/L
    - Choose patient condition:
      - ✓ Without CHF and not renally impaired
      - ✓ Without CHF and renally impaired
      - ✓ With CHF and not renally impaired
      - ✓ With CHF and renally impaired
    - Cp Measured in mcg/ml
    - Ke and t1/2 based on Cl
    - Vd based on Patient's Factor(s)
    - Cpss level based on current dose and Cl
    - Expected Cp based on Cl and New Suggested Dose
    - Loading Dose(LD) based on Vd and Cp desired
    - New Maintenance Dose(NMD) based on Cl and Cp desired

- After save the calculator, the result will appear at the Pharmacokinetics Profile box.
- Calculator is optional only user can direct type at the Pharmacokinetics Profile box without using the calculator as per Figure 8.0-1

**CALCULATOR FOR DIGOXIN**

Body Weight:  kg  kg

Total Dose:  mg/day

Serum Creatinine:  umol/L

Creatinine Clearance:  ml/min

F:  Note: Tablet = 0.7; Elixir = 0.8; Soft Gelatin capsule / Injection = 1

Select Patient's Condition:

☐ Without CHF and not renally impaired ☐ Without CHF and renally impaired ☐ With CHF and not renally impaired ☐ With CHF and renally impaired

Cp measured:  ng/ml

Note: mcg/ml = mg/L  $\times 10^{-2}$  mcg/ml =  $10^{-2}$  mg/L

☐ To calculate CI based on Patient's Factor(s)

Factor CI:  Note: None = 1 Quinidine = 0.5 Amiodarone = 0.50 Versipam = 0.75 Clinically hypothyroid = 0.7 Clinically hyperthyroid = 1.3

Clearance CP measured:  L/day

Clearance (Population):  L/day

☐ To calculate Ke and t1/2 based on CI

CI:  L/day

Ke:  hr-1

t1/2:  hour

☐ To calculate Cpss level based on current dose and CI

CI:  L/day

Cpss:  mg/L

=  ng/ml

☐ To calculate Expected Cp based on CI and New Suggested Dose (NSD)

CI:  L/day

New Suggested dose:  mg/day

Expected Cp:  mg/L =  ng/ml

☐ To calculate Vd based on Patient's Factor(s)

Factor Vd:  Note: None = 1 Quinidine = 0.7 Clinically hypothyroid = 0.7 Clinically hyperthyroid = 1.3

Vd (pop):  L

☐ To calculate Loading Dose(LD) based on Vd and Cp desired

Cp Desired:  ng/ml

LD:  mg/day

☐ To calculate New Maintenance Dose(NMD) based on CI and Cp desired

CI:  L/day

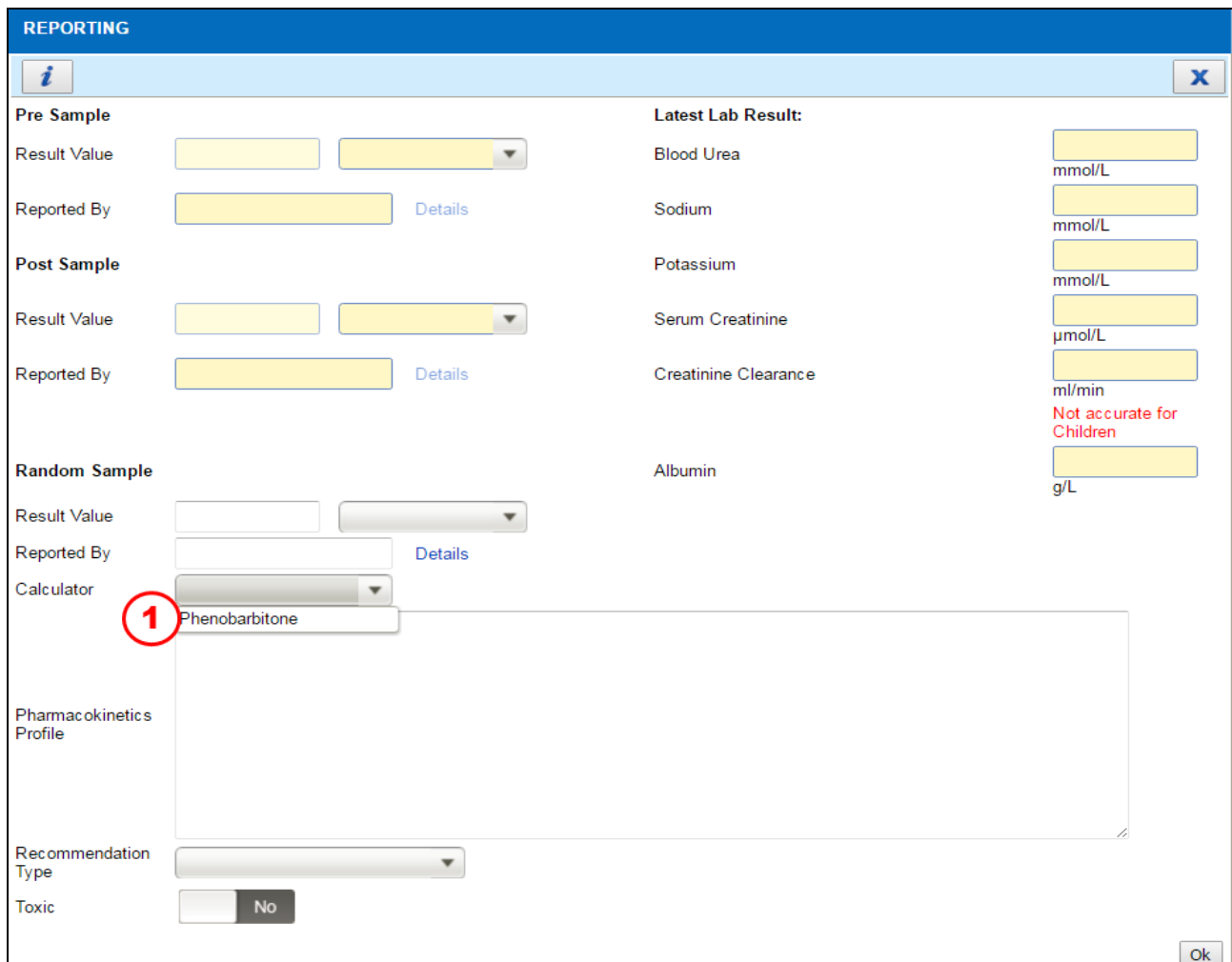
Cp Desired:  ng/ml

New Dose:  mg/day

**Figure 8.0-2 Calculator for Digoxin for Drug Digoxin**

## 9.0 Calculator for Phenobarbitone

To view the calculator in the system, perform the steps below:



**REPORTING**

**Pre Sample**

Result Value

Reported By  Details

**Post Sample**

Result Value

Reported By  Details

**Random Sample**

Result Value

Reported By  Details

Calculator  **1** Phenobarbitone

**Latest Lab Result:**

Blood Urea  mmol/L

Sodium  mmol/L

Potassium  mmol/L

Serum Creatinine  µmol/L

Creatinine Clearance  ml/min  
Not accurate for Children

Albumin  g/L

**Pharmacokinetics Profile**

Recommendation Type

Toxic  No

Ok

Figure 9.0-1 Calculator for Phenobarbitone

### STEP 1

Select calculator from dropdown box example:

- Phenobarbitone

### Note

- Choose the calculator and fill the result in the box as per Figure 9.0-1. Sample Details consists of:
  - **Phenobarbitone calculator**
    - Dose medication in mg
    - Interval Time in Hours
    - Total Dose in mg/day
    - Cp Measured in mcg/ml
    - Constant CI in ml/kg/hr
    - Vd, Ke and t1/2 based on CI
    - New Maintenance Dose (NMD) based on CI, Cp measured and Cp desired
    - Cpss level based on current dose and CI
    - Expected Cp based on CI and New Suggested Dose (NSD)

- After save the calculator, the result will appear at the Pharmacokinetics Profile box.
- Calculator is optional only user can direct type at the Pharmacokinetics Profile box without using the calculator as per Figure 9.0-1

**CALCULATOR FOR PHENOBARBITONE**

Body Weight: Actual ▼  
 Body Weight:  kg  
 Dose:  mg

Interval(T):  hour  
 S:   
 Note: Oral / IV = 1  
 Total Dose:  mg/day

Cp measured:  mcg/ml  
 Note: mcg/ml = mg/L  
 Clearance CP measured:  L/day  
 ≈  L/hr

Constant Cl:  ml/kg/hr  
 Note: Adult = 4 ml/kg/hr Children (≤ 12years 11month) = 8 ml/kg/hr Neonate = 4 ml/kg/hr  
 Clearance (Population):  L/day  
 ≈  L/hr

☐ To calculate Vd, Ke and t1/2 based on Cl

Cl:  L/hr  
 Constant Vd:  L/kg  
 Note: Adult = 0.5 L/kg, Neonate = 0.8 - 1 L/kg  
 Vd:  L  
 Ke:  hr<sup>-1</sup>    t 1/2:  hour

☐ To calculate Cpss level based on current dose and Cl

Cl:  L/hr  
 Cpss:  mcg/ml  
 Note: mcg/ml = mg/L

☐ To calculate New Maintenance Dose (NMD) based on Cl, Cp measured and Cp desired

Cp desired:  mcg/ml  
 Note: mcg/ml = mg/L  
 Cl:  L/day  
 New Dose:  mg/day

☐ To calculate Expected Cp based on Cl and New Suggested Dose(NSD)

Cl:  L/day  
 NSD:  mg/day  
 Expected Cp:  mcg/ml  
 Note: mcg/ml = mg/L

Figure 9.0-2 Calculator for Phenobarbitone for Drug Phenobarbitone

## 10.0 Calculator for Phenytoin

To view the calculator in the system, perform the steps below:

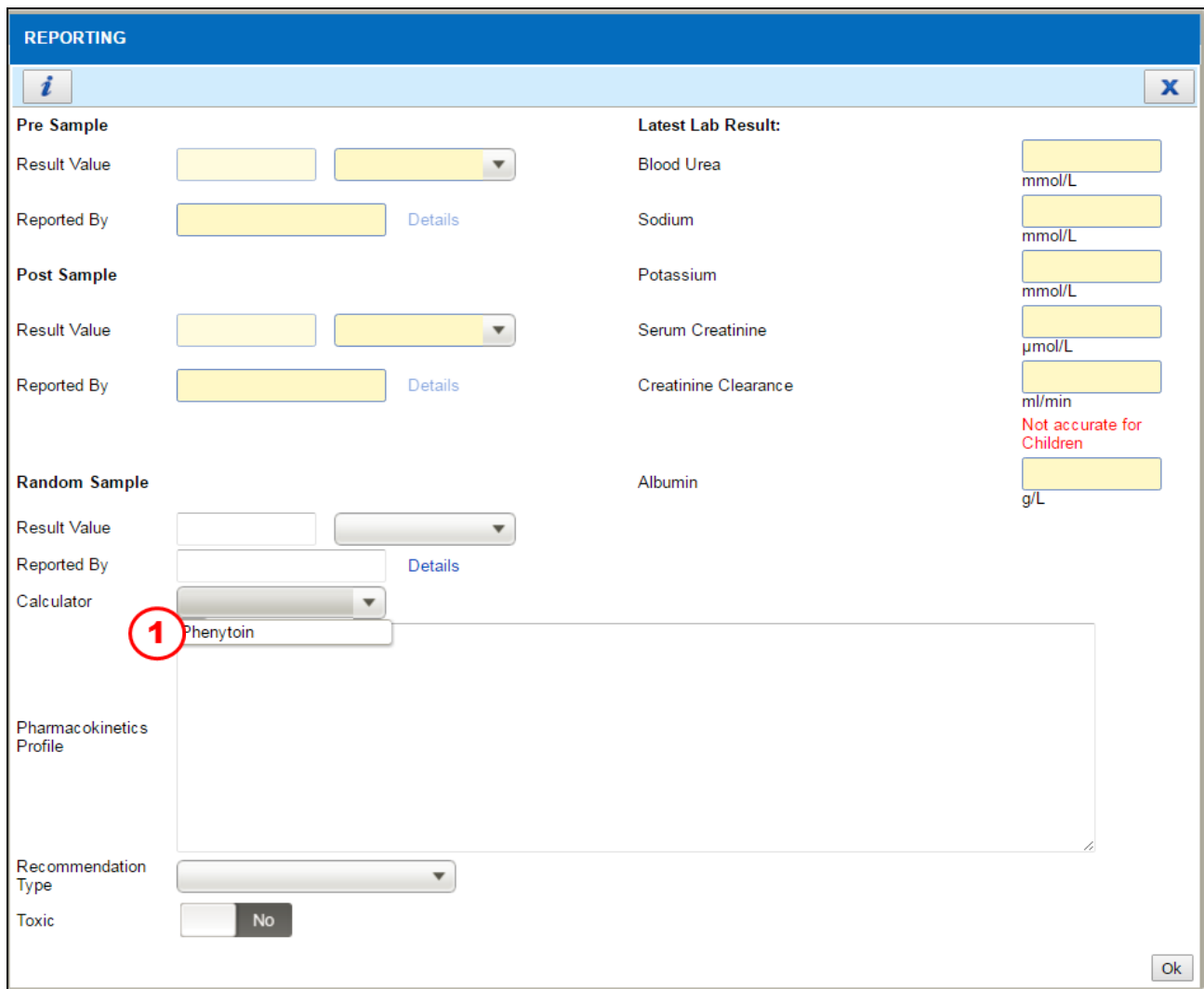


Figure 10.0-1 Calculator for Phenytoin

### STEP 1

Select calculator from dropdown box example:

- Phenytoin

### Note

- Choose the calculator and fill the result in the box as per Figure 10.0-1. Sample Details consists of:
  - **Phenytoin calculator**
    - Total Dose in mg/day
    - Albumin g/dl
    - Choose patient condition between **Without Hypoalbuminemia, Hypoalbuminemia or Hypoalbuminemia with ESRF**
      - Without Hypoalbuminemia**
        - Cp Measured in mcg/ml
        - Vmax (population)
        - Vd, Ke, t1/2 and Cl based on Vmax
        - Cpss level based on Vmax
        - Incremental Loading Dose (ILD) based on Cp desired and Cp measured

- f. Loading Dose (LD) based on  $C_p$  desired
- g. therapy withhold period (T) when level is toxic
- h. New Maintenance Dose (NMD) based on  $V_{max}$  and  $C_p$  desired

### Hypoalbuminemia/Hypoalbuminemia with ESRF

- a.  $C_p$  Measured in mcg/ml
- b. Corrected  $C_p$  Measured in mcg/ml
- c.  $V_{max}$  (population)
- d.  $V_d$ ,  $K_e$ ,  $t_{1/2}$  and  $Cl$  based on  $V_{max}$
- e.  $C_{pss}$  level based on  $V_{max}$
- f. Incremental Loading Dose (ILD) based on  $C_p$  desired and  $C_p$  measured
- g. Loading Dose (LD) based on  $C_p$  desired
- h. therapy withhold period (T) when level is toxic
- i. New Maintenance Dose (NMD) based on  $V_{max}$  and  $C_p$  desired

- After save the calculator, the result will appear at the Pharmacokinetics Profile box.
- Calculator is optional only user can direct type at the Pharmacokinetics Profile box without using the calculator as per Figure 10.0-1

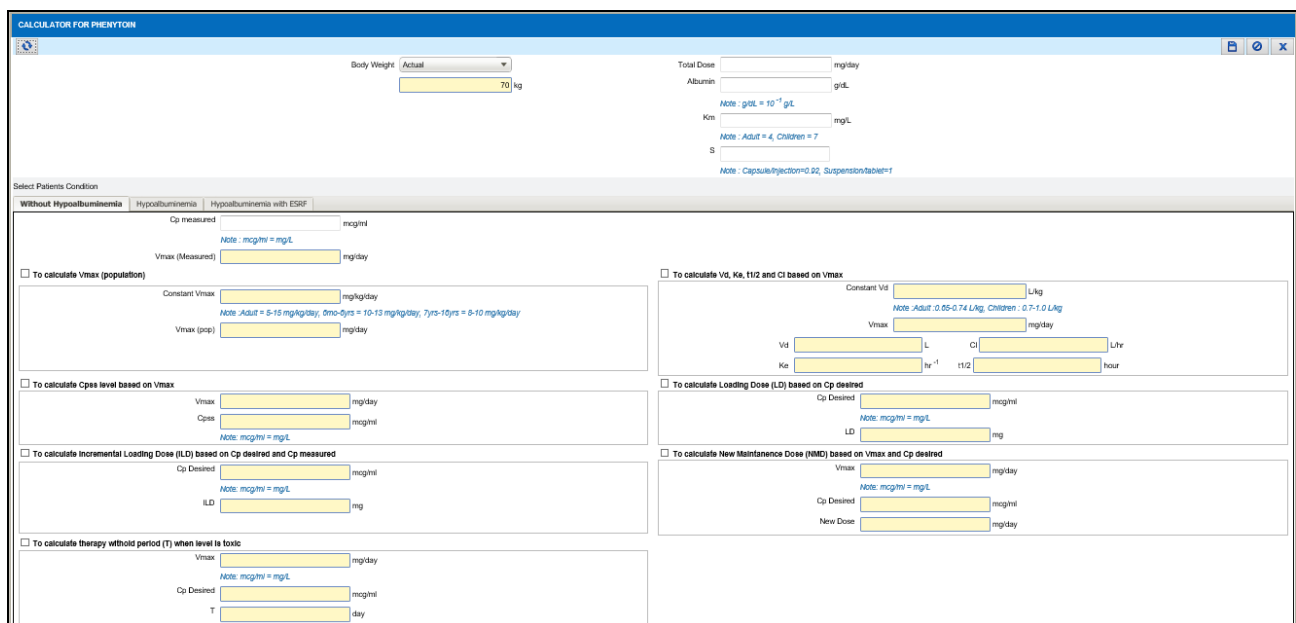


Figure 10.0-2 Calculator for Phenytoin for Drug Phenytoin

## 11.0 Acronyms

| Abbreviation | Definition                                 |
|--------------|--------------------------------------------|
| PhIS         | Pharmacy Information System                |
| CPS          | Clinical Pharmacy System                   |
| PM           | Patient Management                         |
| eGL          | Electronic Guarantee Letter                |
| HRMIS        | Human Resource Management Informasi System |
| MRN          | Medical Record Number                      |
| MOH          | Ministry Of Health                         |

## 12.0 Links To Clinical Modules

| No | Module                 | PDF Links                  | No | Module               | PDF Links                  |
|----|------------------------|----------------------------|----|----------------------|----------------------------|
| 1  | Inpatient              | <a href="#">Click Here</a> | 12 | CDR Dispensing       | <a href="#">Click Here</a> |
| 2  | CDR Order              | <a href="#">Click Here</a> | 13 | Methadone Dispensing | <a href="#">Click Here</a> |
| 3  | TDM Order              | <a href="#">Click Here</a> | 14 | PN Dispensing        | <a href="#">Click Here</a> |
| 4  | PN Order               | <a href="#">Click Here</a> | 15 | Order Management     | <a href="#">Click Here</a> |
| 5  | IV Order               | <a href="#">Click Here</a> | 16 | Patient Management   | <a href="#">Click Here</a> |
| 6  | Prepacking             | <a href="#">Click Here</a> | 17 | Radiopharmaceuticals | <a href="#">Click Here</a> |
| 7  | Galenical              | <a href="#">Click Here</a> | 18 | Outpatient           | <a href="#">Click Here</a> |
| 8  | MTAC                   | <a href="#">Click Here</a> | 19 | Special Drug Request | <a href="#">Click Here</a> |
| 9  | ADR & DAC              | <a href="#">Click Here</a> | 20 | MAR                  | <a href="#">Click Here</a> |
| 10 | Medication Counselling | <a href="#">Click Here</a> | 21 | DICE                 | <a href="#">Click Here</a> |
| 11 | Ward Pharmacy          | <a href="#">Click Here</a> | 22 |                      |                            |