THIRRA

User Manual

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

1 User manual

1.1 User Manual

1.2 Introduction

The full name of the project is Portable System for **T**elehealth and **H**ealth **I**nformatics in **R**ural & **R**emote **A**reas.

THIRRA is an Open Source project under the PAN Asian Collaboration for Evidence-based eHealth Adoption and Application (PANACeA), funded by the IDRC. The source codes are hosted by Sourceforge.

THIRRA is a web based application primarily for use over the narrowband Internet. As such, the user only needs to have internet connectivity and a web browser that supports XHTML, such as Mozilla Firefox, Opera, Google Chrome, etc.

THIRRA utilises the database models from PCDOM PrimaCare Electronic Medical Records and Clinic Management System developed by the Primary Care Doctors Organisation Malaysia, licensed under the PCDOM Public License.

THIRRA EHR is also interfaced with the Generic Engine for Modules to extend its clinical modules.

The license for the software is the Mozilla Public License v1.1.

The latest version of this documentation is available at http://202.9.99.47/wiki-thirra/.

1.3 Modes

The THIRRA research project will be testing the intervention slightly differently in the 3 partner countries.

1. **Biosurveillance** - Sri Lanka
2. **Electronic Health Records System (EHR)** - Malaysia, Nepal and Philippines
3. **Offline EHR** - Malaysia and Philippines

Although there are 3 different modes to use THIRRA, at its core is the patient records. They use the same database model, albeit for different purposes.

1.4 Manual Metadata

Manual_Metadata page.

2 Electronic health records system

2.1 THIRRA ELECTRONIC HEALTH RECORDS SYSTEM

THIRRA consists of a central web server that holds the medical records of all the clinics' patients participating in the network. The users need to connect to the web server over the internet to access the application.

The various sections are accessible using the links in the banner section.

2.1.1 EHR Dashboard

The EHR Dashboard is the first page the user sees after successfully logged in. To return to this page anytime, click on the 'Home' link in the banner section. The user can access the patient records if the patient is inside the queue. Searching for patient will bring the user to the Patients Section.

2.1.2 Patients Section

The Patients Section is the main section of the EHR. It houses all the patient records. The doctor can also initiate clinical consultations from the patients listing.

2.1.3 Pharmacy Section

The Pharmacy Section is for managing prescriptions and dispense labels.

2.1.4 Orders Section

The Orders Section is where the user manages the results of orders for labs, imaging and procedures. The management of the suppliers and the suppliers' catalogues reside in this section.

2.1.5 Queue Section

The Queue Section is for adding patients to the clinic's queue and setting appointments. This section also contains the rooms management.

2.1.6 Reports Section

The Reports Section provides a handful of report templates. Outputs can be in HTML, Adobe's Portable Document Format (PDF) or Comma Separated Value (CSV) files. The CSV files can be opened for further analysis in spreadsheet programs.

2.1.7 Utilities Section

The Utilities Section hosts some utilities for the THIRRA system. The management of geographical locations are done here. The section also provides listing of the codes and classifications used by THIRRA such as ICD-10, ICPC-2, LOINC, etc.

2.1.8 Admin Section

The Admin Section is for managing users, clinics, departments, referral centres and data synchronisation.

2.1.9 FAQ

Frequently Asked Questions

3 EHR Dashboard

3.1 EHR DASHBOARD

The EHR Dashboard is the first page the user sees after successfully logged in. It consists of a few sections.

3.2 Today's Patient Queue

Patients in the current day's queue who has yet to see the doctor will be listed here. The doctor can easily access the patient's medical file by clicking on the patient's name.

3.3 Post Consultation Queue

Patients who have completed clinical consultations will be transferred from the 'Today's Patient Queue' to this list. The clinic staff can continue to process the patient for post-consultation tasks such as dispensing medicine, billings, etc.

3.4 Pending Lab Orders

The list of lab orders awaiting results are displayed.

3.5 Incoming Referrals

If the patient being referred inwards come from another clinic in the same THIRRA network, the patient's name will appear here.

3.6 Search for Patient

Enter full name or partial name to search for matching set.

4 EHR Banner

4.1 BANNER

The banner is the top most section of the browser window.

It consist of the word "**THIRRA**" or "**THIRRA - OFFLINE MODE**" (if the system is in the mobile offline mode).

The current clinic logged in, and the user name is displayed on the right side.

Underneath that, are the links to the various sections of the system. Clicking 'Home' will take you to the Dashboard.

5 EHR patients section

5.1 PATIENTS SECTION

5.2 Patients List

List patients by alphabet or click ALL to view full list (would be long for large clinics network). The alphabet links ABOVE the list of patients will list the patients by alphabet only for the current clinic logged on. To see list of patients in other clinics, click on the alphabet links BELOW the list of patients.

Click on the table headers such as birth date, sex, etc. to view list sorted accordingly.

Click on the patient's name to view the **Patient Overview Sheet**, in a separate window. You can open multiple patient's records concurrently.

To start a **consultation**, click on the 'Start New Consultation' link in the Patient Overview Sheet.

Click the **queue** link to add the patient to the day's queue or to set an appointment.

5.3 Add New Patient

It is required that the user search for the patient first before attempting to add a new record. This will open a new window.

5.4 Search for Patient

Enter full name or partial name to search for matching set.

6 EHR Adding New Patient

6.1 ADDING NEW PATIENT

After being satisfied that there is no existing record for the patient in question, the user can add a new record to the database. Clicking the [Add New Patient] link will open a new window.

The form is divided into

1. Bio data
2. Contact info
3. Demise info

Only fields with a red asterisk (*) are mandatory. The same form will appear again if any of the mandatory fields is incomplete.

The birth date of the patient can either exact or an estimate. For estimates, fill in the estimated age, e.g. 23.5 years. THIRRA will save the birth date assuming that the date of creation is the birth day if the estimated age is a round figure.

A list of patients with the same name will also be listed if applicable, to ensure that duplicate records creation is avoided.

The village field in the contact form is mandatory. Selecting one, will fill in the other address details such as state, country, etc. accordingly.

Closing the window without saving, will discard the attempt and no record will be added.

You may continue to add/edit information for the same patient in the Demographic Information form of the Individual Patient Overview Sheet.

7 EHR Patient Overview Sheet

7.1 PATIENT OVERVIEW SHEET

The Patient Overview Sheet is the equivalent of the paper based patient medical card. It contains the patient's demographic information and medical history, including details of previous consultations.

7.1.1 Side bar

7.2 OVERVIEW

Click the **OVERVIEW** link to return to the main page of the Patient Overview Sheet.

7.3 Patient Portrait

Upload a portrait picture of the patient to reduce errors in opening the wrong patient's record. In the broadband version, click on the thumbnail to view a larger picture.

7.4 Demographic

Edit patient's demographic info. This includes biodata, contact information and demise information.

7.5 Family Cluster

THIRRA is able to build family cluster with one patient as the Head of the Family.

7.6 Immunisation

Add immunisations that the patient has taken previously.

7.7 History

7.8 Upload

Files such as patient portraits, scans, snapshots, etc. can be uploaded and tagged, for future retrievals. All portrait files are resized to optimise storage space.

7.9 External Modules

Links to external modules such as Generic Engine for Modules (GEM), etc. Past information recorded in GEM is inside this section.

7.9.1 Main Body

7.10 Clinical Consultation

Click on the link to either start a new clinical consultation or continue with the previous consultation.

7.11 Drug Allergies

List of drug allergies, that will be used to check when prescribe medicine during clinical consultation.

7.12 Other Allergies

List of other allergies, non-drugs related, e.g. pollen, etc.

7.13 Vital Signs

The most recent vital signs recorded is displayed. Go to Vitals History to see list of past readings.

7.14 Appointments

Appointments for future visits.

7.15 Current Medication

Current medication are medicine prescribed in previous sessions, and the course is yet to be completed, provided the patient adhered to dosages prescribed.

7.16 Medication History

List of the most recent medication prescribed for the patient, excluding the Current Medication list.

7.17 Medical History

List of the most recent clinical diagnosis. Diagnoses recorded during consultations are transferred here.

7.18 Family History

List of the most recent clinical diagnosis of patient's family members.

7.19 Lab Orders

List of the most recent lab orders. All lab results require the doctor to review them. A warning will show if the results is awaiting a review.

7.20 Imaging Orders

List of the most recent imaging orders.

7.21 Procedure Orders

List of the most recent procedure orders.

7.22 Social History

The most recent social history recorded is displayed.

7.23 Immunisation History

List of immunisation taken by the patient.

7.24 Antenatal History

List of all pregnancies of the patient.

7.25 Past Consultations

List of previous consultation visits. Click on the date to view the details of the consultation, in printer friendly form.

7.26 Patient Booklet

This generates PDF output for printing on small labels to be pasted on patient booklets.

8 EHR Demographic Info

8.1 DEMOGRAPHIC INFORMATION

Demographic information are non-clinical information about the patient.

It is divided into:

1. Bio data
2. Contact info
3. Demise info

Only fields with red asterisk (*) are mandatory.

The Home Clinic is the current clinic that the patient is visiting.

The addresses section require the user to choose from the available geographical locations. This will provide good structure for future analysis.

9 EHR Family Cluster

9.1 FAMILY CLUSTER

Medical records of patients can be grouped together as a family with on Head of Family.

All patients can be categorised as either

1. Head of Family
2. Independent
3. Under Head of Family

Click on the link to convert the patient's category.

If the patient is categorised as Under Head of Family, she can be linked to a Head of Family by adding new relationship. This will bring up the form to select from a list of all Head of Family in the clinic. Next, select to type of relationship.

To view other family member's medical records, just click on their respective names as listed.

10 EHR Drug Allergies

10.1 DRUG ALLERGIES

Record the drugs that the patient is allergic to.

It does not matter what the dosage of the drug formulary recorded, THIRRA EHR will match the drug formula against the drugs when prescribing. Thus, trying to prescribe Simvastatin 10mg when the drug allergy was recorded as Simvastatin 20mg, will still trigger a warning.

11 EHR Immunisation History

11.1 IMMUNISATION HISTORY

Use this to record the vaccinations that the patient has taken in his/her lifetime.

Select the vaccine (in yellow cells), append any notes, and the estimated date of the vaccination.

You may optionally record the batch number of the doses in the notes to the vaccination.

The immunisation history is also updated in the Prescribe Immunisation form in the Consultation window.

12 EHR Lab Orders History

12.1 LAB ORDERS HISTORY

This is the list of lab tests order in previous consultations.

Click on the lab order to view or edit the lab results. The lab results form is identical to the form used by the Orders Section except for an additional flag - review and close the order.

13 EHR Antenatal History

13.1 ANTENATAL HISTORY

Pregnancies are specific events over the lifetime of a patient. Each pregnancy can consist of multiple clinical consultations.

THIRRA tracks each pregnancy i.e. gravida, regardless of the outcome of the event, whether it ends with a delivery or a miscarriage. Thus, the gravida value must be unique.

If the status of the pregnancy is flagged as Open, the information can be viewed and edited in the Consultation window as well. Please ensure that only the current pregnancy's status is set as Open.

Antenatal checkups and postpartum care can be added in the Consultation window.

13.2 ANTENATAL DELIVERY

THIRRA has the capability to record multiple births per pregnancy, e.g. twins, triplets, etc. Just add new delivery for every baby.

14 EHR upload files

14.1 UPLOAD FILES

One can store multiple files of multiple formats into the THIRRA system.

For portrait photos, THIRRA will reduce the size of the picture to optimise for storage and display.

CAUTION: Uploading new photos will overwrite the previous photo.

15 EHR Past Consultations

15.1 PAST CONSULTATIONS

This is the full details of previous consultations.

For ethical reasons, the details cannot be changed or deleted.

16 EHR Clinical Consultation

16.1 CLINICAL CONSULTATION

The user do not need to follow any specific order in the consultation. None of the items is mandatory except Consultation Session Information.

Only one clinical consultation session is allowed to be opened at any one time. To start a new consultation session, the previous one, if any, must be ended before a new one can be started.

If this window was closed either intentionally or unintentionally such as when the workstation crashes, the user can still resume the previous open consultation session.

16.2 Progress

Click on the Progress link to view the progress of the current consultation.

16.3 Complaints

Form to record the reasons for this encounter.

16.4 Vital Signs

Form to record patient's vital signs and anthropometric data for charting.

16.5 Physical Examination

Form to record physical examination of patient, by anatomical system.

16.6 Lab Orders

Form to record lab orders for in-house and external labs.

16.7 Imaging Orders

Form to record imaging orders for in-house and external imaging facilities.

16.8 Diagnosis (categorised)

Form to add diagnosis, based on category of classification, e.g. ICD-10.

16.9 Diagnosis (searchable)

Form to add diagnosis using search terms.

16.10 Prescription (categorised)

Form to add prescription, based on drug system of ATC.

16.11 Prescription (searchable)

Form to add prescription, based on search terms of generic drug names or indication.

16.12 Immunisation

Form to record immunisations for the current clinical session.

16.13 Referral

Form to add referral. THIRRA will automatically generate a pre-polutated referral letter.

16.14 External Modules

Links to external modules such as Generic Engine for Modules (GEM), etc.

16.15 Antenatal

The Antenatal Module is activated if the patient is a female and is passed menarche. The age of menarche can be configured in config.php

16.16 Consultation Session Information

The user can change the date and time to back date the session if necessary.

16.17 Closing Consultation Session

Click the [Close Consultation] button to end the current consultation session. Clinical details of closed sessions, cannot be modified once the session is ended.

17 EHR Reasons For Encounter

17.1 REASONS FOR ENCOUNTER

Use this form to add reasons for the encounter, i.e. complaints. THIRRA uses the ICPC-2 classification.

Multiple complaints can be added, per clinical consultation session.

18 EHR Vital Signs

18.1 VITAL SIGNS

Use this form to record vital signs taken from the patient for the current clinical consultation session.

All fields are optional. Input boxes that are disabled (greyed) are calculated figures to assist the user in converting different units of measure.

You can use the auto-conversion box to determine the nearest metric value. For example, if you are familiar with or measured in inches, you can try to record the nearest centimetre to obtain the desired value.

19 EHR Physical Examination

19.1 PHYSICAL EXAMINATION

This is the form to record physical examination by anatomical system.

The systems available are:

1. Cardiovascular System
2. Respiratory System
3. Abdomen
4. Central Nervous System

Most of the answers require elaboration if the finding is abnormal. The extra box is made available if abnormal.

Not answering a question does not mean that the answer is favourable. The notes field is mandatory.

20 EHR Lab Orders

20.1 LAB ORDERS

User can only add lab orders for lab packages already inside the labs catalogue.

The user may also record the results of the lab test if the findings is obtainable before ending the consultation session, i.e. immediate results. When the lab is outside the clinic or if the results require time to conclude, the results can still be recorded after the consultation has ended, in the Orders Section.

To enable immediate results, enable the checkbox "Add Test Results Values. You may not change the Package for this lab order after that.".

There is also the option to record the individual test readings of the particular test panel. One may just record the abnormal results and leave the rest blank, if they are within normal ranges. This can be filled in immediately in the Orders Section or later in the Patient Overview Sheet after the consultation is ended.

21 EHR Imaging Orders

21.1 IMAGING ORDERS

User can only add imaging orders for imaging packages already inside the imaging facilities catalogue.

The user may also record the results of the imaging procedure if the findings is obtainable before ending the consultation session. The results can still be recorded after the consultation has ended.

22 EHR Diagnosis Categorised

22.1 DIAGNOSIS (CATEGORISED)

This form categorises the diagnosis codes, to enable the user to drill down to the specific code.

THIRRA uses the ICD-10 from the WHO. The codes are categorised by chapters.

If ones finds difficulty in ascertaining the correct chapter, one can choose 'ALL' which will bring up the full list of diagnosis codes. Alternatively, one change search for the diagnosis terms in the DIAGNOSIS (SEARCHABLE) form.

For diagnosis that is difficult to classify, one can also select the 'Free text' as an option and elaborate further in the other field.

23 EHR Diagnosis Searchable

23.1 DIAGNOSIS (SEARCHABLE)

Search for diagnosis codes by using search term filters.

The most commonly used diagnosis codes are also available in the pull-down selection.

THIRRA uses the ICD-10 from the WHO.

24 EHR Prescription Categorised

24.1 PRESCRIPTION (CATEGORISED)

This form categorises the generic drugs by anatomical system, to enable the user to drill down to the specific drug.

THIRRA uses the ATC from the WHO.

The user will be warned if the drug prescribed is among the Drug Allergies list.

Information about the drug chosen will be displayed in the Drug Knowledgebase box, if available.

25 EHR Prescription Searchable

25.1 PRESCRIPTION (SEARCHABLE)

This form enables the user to search for terms in the generic drug names or indications for a list of drugs.

THIRRA uses the ATC from the WHO.

The user will be warned if the drug prescribed is among the Drug Allergies list.

Information about the drug chosen will be displayed in the Drug Knowledgebase box, if available.

26 EHR Prescribe Immunisation

26.1 IMMUNISATION

Select the vaccine to prescribe for the current clinical session.

Vaccines previously administered or assumed administered are in blue cells. You can add to this in the Immunisation History section. Vaccines available are in yellow cells.

Select the correct immunisation, followed by the details of the drugs/vaccine. This part is similar to prescribing medicine. This will also create an entry for the prescription.

27 EHR Referral

27.1 REFERRAL

Select the referral centre followed by the referral person.

Multiple referrals to different centres can be made if needed.

Click the **print** link to generate the preformatted referral letter.

28 EHR External Modules

28.1 EXTERNAL MODULES

THIRRA EHR can be expanded to external modules, such as the modules powered by the Generic Engine for Modules (GEM), etc.

29 EHR Antenatal Info

29.1 ANTENATAL INFORMATION

If there is no existing pregnancy or all previous pregnancies have their statuses set as Closed, a new pregnancy will be created when saving the form.

If there are more than one pregnancy whose statuses remains as Open, there is a possibility that the wrong pregnancy would be shown. Please ensure that only the current present has the status set as Open.

The Estimated Date of Delivery (EDD) based on the LMP will be computed if the Last Menstrual Period (LMP) date is entered. User can use this as a guide to fill in the value.

Once an antenatal event is created, the user can add new Antenatal Checkups or new Deliveries.

30 EHR Pharmacy

30.1 PHARMACY SECTION

30.2 Prescriptions

Listing of prescriptions to be printed and handed to patients.

30.3 Dispensings

Listing of dispensing prescribed. The clinic must have available stocks of the drug prescribed, in order to dispense. User can print the labels for the individual medicine.

30.4 Closed Orders

After the prescriptions or labels are printed, the status of the prescription orders will be changed to closed.

31 EHR Orders

31.1 ORDERS SECTION

31.2 Pending Lab Orders

Record Lab results received in this section. Normally, the pending lab orders will only appear here after a clinical consultation is concluded. However, the doctor can make the order available for immediate recording of results, if needed.

31.3 Pending Imaging Orders

Record Imaging Orders results received in this section. The pending orders will appear after a clinical consultation is concluded.

31.4 Pending Procedures Orders

Record Procedure Orders results received in this section.

31.5 Closed Results

The results recorded as received will transfer them from the pending queue to the closed results section.

31.6 Suppliers and Catalogues

All orders are made only from products added to the catalogues. Each product is tied to one supplier, and a supplier can have multiple products in its products catalogues.

Click on the type of supplier to manage the supplier.

1. Lab Suppliers
2. Imaging Suppliers
3. Procedure Suppliers

32 EHR Lab Results

32.1 LAB RESULTS

Use this form to record results from Laboratory Reports.

One can record as much information as deemed necessary. The minimum is just the results summary. The individual test readings can be recorded, or just filling in the ones that are out of normal range if the list is too long. Alternatively, everything on the lab report can be transcribed into THIRRA.

The order of the individual test readings is based on the sort order saved in the lab package catalogue in the Lab Suppliers section.

Once the results are filled up and saved, the lab order is classified as closed. The lab result will be highlighted in the patient's Overview Sheet to prompt the doctor to review the results. After review, the doctor can change the flag to reviewed.

33 EHR Lab Suppliers

33.1 LAB SUPPLIERS

Each supplier will have its own list of lab packages in a catalogue. The lab packages are what the user can order during consultations. Each clinic will have its own catalogue of packages although they may all share the same supplier.

The clinic can record the lab results in detail if needed, by adding the lab package tests.

34 EHR Lab Package

34.1 LAB PACKAGE

The lab packages are what the user can order during consultations. Each clinic will have its own catalogue of packages although they may all share the same supplier.

THIRRA uses the LOINC classification of lab tests. Lab tests are grouped by LOINC class names. Hence each package will have only one class name.

At the most basic level, the clinic may record just the results summary. The clinic can also record the lab results in detail if needed, by adding the lab package tests. For instance, a Hematology package may consists of readings for Haemoglobin, Platelets Count, Mean corpuscular volume, etc. Try to follow the exact order using the sorting order field, as it appeared in the actual physical lab report, so that the user can capture the data in the exact order.

When the results are returned, the clinic may choose to record all of the readings, or just the abnormal readings.

Lab packages cannot be modified by deleting or adding new readings, once a single lab order has been made. Only editing is allowed.

35 EHR Imaging Suppliers

35.1 IMAGING SUPPLIERS

Each supplier will have its own list of imaging products in a catalogue. The imaging products are what the user can order during consultations. Each clinic will have its own catalogue of packages although they may all share the same supplier.

THIRRA uses the LOINC classification of lab tests. Lab tests are grouped by LOINC class names. Hence each package will have only one class name.

36 EHR Queue

36.1 QUEUE SECTION

36.2 Patients Queue

Patients queue for the current clinic logged in. The patients are grouped by departments and sorted by time.

One can add patients to the queue by clicking the Add to Queue link or click the letter 'Q' of the patient listing in the Patients Section.

Click on the date and time to change the date and time of the queue. To remove from the queue, edit the queue and provide a reason for the cancellation.

36.3 Appointments

List of all appointments.

36.4 Rooms

There must be at least one room defined, in order to perform a clinical consultation. A clinic can contain multiple rooms per department.

37 EHR Reports

37.1 REPORTS SECTION

THIRRA contains standard report templates as well as custom report templates. The custom report templates allows the user to customise the reports generated.

37.2 Custom Report Templates

All reports retrieve data from preset database views. There are a few standard database views available:

1. Patient Demographic Info
2. Vital Signs
3. Clinical Consultations
4. Diagnoses
5. Complaints
6. Lab Orders
7. Imaging Orders
8. Closed Biosurveillance Investigations
9. Pregnancies

User can customise the report template to a certain extent. Click Edit to modify the template. Each template consist of a header that defines the top portions of reports. The report body consists of columns that the user wants displayed. Use the sort order to determine the placement of the columns. The table headers of each column can be renamed to be more meaningful.

Reports can be printed as HTML or PDF documents. The raw data can be exported as Comma Separated Values (CSV), for further analysis using spreadsheets or statistical software. The periods scope for each report can also be set on ad hoc basis.

38 EHR Utilities

38.1 UTILITIES SECTION

38.2 Geographical Locations

The addresses of patients are linked to these geographical locations. The hierarchy is as follows:

1. Villages
2. Towns
3. Areas
4. Districts
5. States

The villages may be within a town or outside a town, but within an area. A village with an underscore ('_') as a name should be created for towns that do not contain villages.

38.3 Codes and Classifications

These are the codes and classifications used by THIRRA.

1. Complaints Codes
2. Diagnosis Codes
3. LOINC
4. ATC Drug Codes
5. Drug Formulary Codes
6. Drug Codes
7. Immunisation Codes

38.4 Useful Links

Some links that may assist the user to obtain more information.

39 EHR Complaints Codes

39.1 COMPLAINTS CODES

THIRRA uses the ICPC-2 (International Classification for Primary Care) published by WONCA, for Reasons for Encounter.

The clinic can add new reasons for encounter, if needed.

40 EHR Diagnosis Codes

40.1 DIAGNOSIS CODES

THIRRA uses the ICPC-2 (International Classification for Primary Care) published by WONCA, or the ICD-10 published by WHO, for Clinical Diagnosis.

The clinic can add new diagnosis, if needed.

The diagnosis codes consists of 2 segments, where the first segment is a general terminology for the diagnosis. The second segment provides a more precise classification. The segments denoted by X and Y respectively are represented in ICPC-2, as XXXYYY, while ICD-10 is broken down as XXX.YY.

41 EHR Drug ATC

41.1 ATC DRUG CODES

The drug formularies are built upon the Anatomical Therapeutic Chemical (ATC) Classification System. ATC drug codes are drug classifications issued by the World Health Organisation.

The ATC codifies the drug compounds. The length of the ATC code is 7 characters.

The clinic can add new ATC drug code, if needed.

42 EHR Drug Formulary Codes

42.1 DRUG FORMULARY CODES

Drug formulary, a.k.a. generic drug name, forms the basis for drug prescription in THIRRA.

Every drug tradename must have a parent drug formulary/generic name. Every drug formulary is built upon the ATC drug code which specifies the chemical compound. The clinic can add new drug formulary, if needed.

The sample database uses the drug formulary codes of Malaysia's Ministry of Health [1]. The format of the codes is as follows:

Character Description

```
7          ATC code
3          Salt substance
3          Dosage form
2          Strength


15          Total
```

For example:

```
C10AA01000T1001   Simvastatin 10 mg Tablet
C10AA01000T1002   Simvastatin 20 mg Tablet
C10AA01000T1003   Simvastatin 40 mg Tablet

N03AX12000C1002   Gabapentin 400 mg Capsule
N03AX12000T1001   Gabapentin 600mg tablet
```

43 EHR Drug Codes

43.1 DRUG CODES

Drug codes uses the trade names of the drugs. Each drug code must link to a drug formulary.

The clinic can add new drug code, if needed.

The sample database uses the drug codes of Malaysia's Ministry of Health [1]. The format of the codes is as follows:

Characters Description

```
15      Formulary code
2       Tradename registered


17      Total
```

For example:

```
Generic Name : Acyclovir 200 mg Tablet
Drug Code          Trade Name
J05AB01000T400101  ZORAXIN TABLET 200MG
J05AB01000T400111  HEPIRAX 200 TABLET
```

44 Generic Engine for Modules

44.1 GENERIC ENGINE for MODULES

Generic Engine for Modules (GEM) is an external toolkit that enables an EHR to extend its functionalities with simple modules.

It takes a lot of resources to extend a complex EHR. If the modules required are simple, such as to record information, display the recorded information and to print simple reports, then GEM can perform this role.

The modules can be created without any programming knowledge. This means that the domain experts can develop the modules hands-on. One just need to assign different data types depending on the nature of the question. The available data types are:

1. Characters
2. Numbers
3. Dates
4. Boolean
5. Multiple choice
6. Table look up
7. Data from EHR
8. Header (no answer required)
9. Explanatory text (no answer required)

The forms created are tied to the clinical consultation. To view the forms used by previous consultations, go the the External Modules in the Patient Overview Sheet.

GEM is an Open Source application using the Mozilla Public License v1.1, developed by PCDOM under the UNDP-APDIP programme, funded by the IDRC. The website for GEM is at http://gem.primacare.org.my.

45 Manual Metadata

45.1 MANUAL METADATA

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