Introduction of eHR Application

Ellen TONG, Dep SHI(eHR & SCP)
Hospital Authority of Hong Kong
Background

- Public consultation done on health-care system reform in 2008 & proposed to develop eHR sharing system (eHRSS)
- Finance Committee (FC) approved funding for HK$702M to the Food and Health Bureau (FHB) in Jul 2009 for the development of the first stage of eHR program
- eHR Office setup under FHB to steer the development and oversee policy matters and legal issues related to eHR
- Hospital Authority (HA) as a technical agent to develop eHR standard and build the eHR infrastructure and other related applications
- Three major components:
  - Core Infrastructure for eHR Sharing
  - Standardization and Interfacing
  - CMS Extension
Healthcare Structure in Hong Kong

**Primary Care (distribution of consultations)**
- Private Doctors: 55.8%
- Public Doctors: 28.8%
- Chinese Medicine Practitioners: 15.4%

**Secondary and Tertiary Care**
- Hospital Authority: 90%
- Private Hospitals/Doctors: 10%

Source:
2. Public/private share by in-patient bed day, updated in Sept 2008 (HA & Dept of Health)
Initiative of CMS Extension

- Aim at facilitating private hospitals & clinics to adopt electronic clinical documentation (mainly for those data within eHR sharable scope)
- CMS Extension as one of the eHR components in Phase I
- CMS Adaptation (Hospital version)
- CMS On-ramp (Clinic version)
Challenge of eMR adoption

**Hospital Authority**
- 8.9M patient records
- 3M transactions per day
- 800M Lab results
- 340M prescribed drugs
- 34M X-ray images

**Department of Health**
- Essential data (immunization)
- Clinical and administration systems being developed

**CMS Adaptation**
- Private Hospitals
  - Various eMR adoption
  - Mostly focus on financial & administrative systems
  - A few with eMR support clinical data capturing

**CMS On-ramp**
- Private Clinics
  - Mostly paper-based record
  - Estimated only ~ 20% of 5,000 PP use eMR

**Private Lab/Radiology**
- Not connected
Initiative of CMS Extension

- Aim at facilitating private hospitals & clinics to adopt electronic clinical documentation (mainly for those data within eHR sharable scope)
- CMS Extension as one of the eHR components in Phase I
  - CMS Adaptation (Hospital version)
  - CMS On-ramp (Clinic version)
Development approach

- Building blocks approach
- Leverage HA experiences on building CMS
- Engage clinician to cater private needs
- Align with eHR sharable scope & standard
Design Principles

- Simple user interface to facilitate efficient and standardized documentation
- Cater clinical workflow & operational need
- Support local customization
- Enable quality data capturing & safe patient care delivery
CMS Adaptation (Private Hospital)
Enhance Functionalities and Facilitate Data Sharing

Hospital IT Vendor

- Adaptation Module 1
- Adaptation Module 2

Existing Systems

- Modules Adapters

Hospital IT Department

- Adaptation Module 2
- Adaptation Module 3
- Adaptation Module 4

Interfaces with eHR Core

Hospital A

- Secured Network

Hospital B

- Secured Network

Compliant Service Provider

Adaptation Module 1

Adaptation Module 2

Adaptation Module 2

Adaptation Module 3

Adaptation Module 4

eHR Core
Communication with Private Sectors during Entire Development

- CMS Adaptation Task Force
- Focus Group on eHealth App
  - Medication Order Entry & Drug Allergy Checking System FG
  - Hospital ePR FG
- eHR Technical Task Force
## CMS Adaptation Modules (Hospital)

<table>
<thead>
<tr>
<th>Adaptation Modules</th>
<th>Development status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Structured Alert</td>
<td>Ready for deployment</td>
</tr>
<tr>
<td>2. Discharge Summary</td>
<td></td>
</tr>
<tr>
<td>3. Diagnosis &amp; Procedure Reporting</td>
<td>In progress (target in 1Q2013)</td>
</tr>
<tr>
<td>4. Outpatient Consultation Summary</td>
<td></td>
</tr>
<tr>
<td>5. Medication Order Entry (MOE)</td>
<td></td>
</tr>
<tr>
<td>6. Letter Engine</td>
<td></td>
</tr>
<tr>
<td>7. Drug Allergy Checking System</td>
<td></td>
</tr>
<tr>
<td>8. Hospital electronic Patient Record (ePR)</td>
<td></td>
</tr>
<tr>
<td>9. Person Master Index Service</td>
<td></td>
</tr>
</tbody>
</table>

As in Jan 2013
Adaptation modules walkthrough
Add an Allergy record

Click [Add] to record allergy information
Add diagnosis by keyword search

Auto keyword search starts when 4 letters are entered
Keyword search by abbreviation

When less than 4 letters, press [Enter] to start exact match searching
# Search by symbol

**Diagnosis & Procedure Reporting**

<table>
<thead>
<tr>
<th>Discharge Summary</th>
<th>Adm Date: 01-Jul-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Allergy</strong></td>
<td></td>
</tr>
<tr>
<td>No record</td>
<td></td>
</tr>
<tr>
<td><strong>Adverse Drug Reaction</strong></td>
<td></td>
</tr>
<tr>
<td>Cataflam (diclofenac pot...</td>
<td></td>
</tr>
<tr>
<td><strong>Alert</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Discharge Diagnosis</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Fracture neck of femur</td>
</tr>
<tr>
<td>Pathological fracture of neck of femur</td>
</tr>
<tr>
<td>Fracture neck of femur, open</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Procedure</strong></th>
<th><strong>History</strong></th>
<th><strong>Category</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>P Description</td>
<td>Date</td>
<td>Spect...</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Investigation</strong></th>
<th><strong>Template</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Status</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Discharge Note</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No record</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Medication Order Entry</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication</td>
</tr>
</tbody>
</table>

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**Patient Information**

- **CHAN, SIU LING (陳小玲)**
- **HKIC: A123456(7)**
- **DOB: 01-Jan-1990**
- **Age: 23 years**
- **Ward: 5A-X12**
- **Adm: 01-Jul-2012**
- **Hospital No.: wy10000**
- **Episode No.: 10003**
Add from History

Click [History]
Discharge Summary

Search by History

Period: All

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>02-Jun-2012</td>
<td>Gastritis</td>
</tr>
<tr>
<td>02-Jun-2012</td>
<td>Helicobacter pylori infection</td>
</tr>
</tbody>
</table>

Discharge Diagnosis

Investigation

Medication Order Entry

No record
Add from “My Favorite list”

Click on the dropdown arrow to retrieve the “My Favorite list”, user can set own favorite list in maintenance or add directly from current episode.
Right click on existing diagnosis record
Click [Add to Favorite list]
"Influenza A" is added to the "My Favorite list".
Age validation
This Diagnosis (Hyperplasia of prostate) can only be entered for patients of a particular Gender. The Gender specified for this patient is not valid. You may verify the patient’s data or select a more appropriate Diagnosis.
Add Procedure

Diagnosis & Procedure Reporting

Basically same logic with diagnosis. Add procedure date by inputting ddmmyyyyy or select from calendar.
3 free text components

**Features**

1. **Template**
   - Set in maintenance function
   - Facilitate faster input

2. **History**
   - Allow copy from History
   - Facilitate faster input

3. **Click to enlarge input area**
For example, copy from template in Discharge Note

Click [Template]

Select an appropriate template
Click [Replace All] or [Add to Cursor]
Click [New] to retrieve the MOE module.
Prescribe by keyword search

Medication Order Entry

Display

ADR: Cetirizine (cetirizine dihydrochloride)
Alert: G6PD Deficiency

Drug Name / Set

Ciprofloxacin (ciprofloxacin hydrochloride tablet)
Ciprofloxacin (Free Text)

Total Number: 0

Save & Print   Delete Order
Discharge Summary

Name: Chan Siu Ling 謝小玲
HKIC: A123456(7)
DOB: 01-Jan-1990
Age: 23 years
Ward: 5A-X12
Adm: 01-Jul-2012

Testing Hospital
惠華醫院 - SHP - SHP
Address: HKIC: A123456(7)
DOB: 01-Jan-1990
Age: 23 years
Ward: 5A

Discharge Prescription

Alert Allergy Information

Drug Allergy: Nil
Adverse Drug Reaction: Cateflam (diclofenac potassium)
Alert: G6PD Deficiency

Prescription

Dispense in pharmacy
1. Amoxicillin (as trihydrate) (Bright Future) capsule
   1,000 mg - twice daily - oral - for 1 week
2. AFO-Omeprazole (omeprazole) gastro-resistant capsule
   20 mg - twice daily - oral - for 1 week

Generic substitution is allowed unless otherwise specified.
Drug prescribed in MOE module will be integrated with discharge summary with no need for doctor to input on the summary again.
Select the letter type then click [Ok]
Corresponding data would be retrieved to complete the letter.
Example: Referral letter

Patient Referral Form to the Hospital Authority Specialist Clinic / A&E

To: MED Hospital

Patient: Chan, Siu Ling
Sex/Age: F / 40 years

Dear Professor / Doctor 謝醫生 / 醫生,

Thank you for seeing the above-named patient. 感謝見診

Diagnosis / Problems 病診 / 病情:
Upper Respiratory Tract Infection

Other significant history and physical findings 其它重要病史及發現:

Relevant Investigation Reports (Attached copies of reports) 相關診斷報告（附複印件）:

Page 1/2
Discharge Summary Module

Click [Sign off and Print] to complete the Discharge Summary
Virtual Hospital

Discharge Summary

Name: Chan, Siu Ling (陈少玲)
DOB: 01-Jan-1990  Age: 23 years
Sex: F  Ward: 5A  
Hospital No.: 000000

Discharge Date: 02-Aug-2012  Admission Date: 01-Jul-2012

Diagnosis:  
Principal: Gastritis

Procedure:

Description  Procedure Date  Specialty
Principal: Oesophagogastroduodenoscopy with biopsy  01-Jul-2012

Investigation:
Nil

Medication order entry:
1. amoxicillin (as trihydrate) (Bright Future) (amoxycillin (as trihydrate)) capsule - 1,000 mg - twice daily - oral - for 1 week
2. APO-Omeprazole (omeprazole) gastro-resistant capsule - 20 mg - twice daily - oral - for 1 week

Plan of Management:
Medication as charted
Soft diet
Increase fluid intake as tolerate
Sick leave x 4/7
FU as required

Discharge Note:
Admit for epigastric pain for 1 week
OGD with biopsy done
H-pylori positive for triple therapy

Remarks:
Nil

Consulting Doctor:
1. Dr. Chan, Senior Medical Officer

Doctor-In-Charge:

_________________________  _______________________
Signature                    Date
Dr. Sek
Medical Officer
History panel to view both **in-patient** record (if integrate with Discharge summary module) & **out-patient** record.
Consultation Summary Module

Click to start searching
The search results would be highlighted in RED.
The search results would be highlighted in RED.
Virtual Hospital

Consultation Summary

Name: Chan, Siu Ling (F, 16)
DOB: 01-Jan-1990  Age: 23 years
Sex: F
Hospital No.: wy10000

Consultation Date: 16-Jan-2013

Assessment:
Nil

Consultation Note:
Fever x 2 days. Sore throat and productive cough x 2 days.
RN and stuffy nose and headache.
No travel history
No family outbreak

Diagnosis:

Description:
Upper respiratory tract infection

Procedure:
Nil

Medication order entry:
1. Panadol (paracetamol) tablet - 500 mg - four times daily - oral - for 3 days

Doctor-In-Charge:

Signature
Dr Happy Sek
Medical Officer

Date
Drug Allergy Checking System

HIS
- Structured allergy record

Electronic medication prescription (MOE)

eHR Drug Allergy Checking System (Drug Allergy)

Alert

✔

✔
This patient has CERTAIN drug allergy to amoxicillin (as trihydrate). The clinical manifestation was angioedema and rash.

APO-Clox (cloxacillin (as sodium)) may result in ALLERGIC REACTION.

If you wish to prescribe anyway, you must provide the reason(s) for overriding this alert:

- No alternative treatment available.
- Patient is already taking this drug without allergic response.
- Desensitizing the patient with this drug.
- Doubts about the reported history of drug allergy.
- Others (Please specify reason below)

Remarks
Person Master Index

- Support compliance of eHR enrollment standard for PMI data
- No front-end development
- Validation rules for adoption in local Patient Registration System
  - eHR Number Validator
  - Date Exactness Validator
  - Document Type Validator
  - HKID CheckDigit Validator
  - BabyName Builder
  - Standard Name Display
  - Age Calculator
  - Different Glyph of Chinese Name in same ISO code
Demo – HKID Check Digit Validator

Please input a valid HKIC.
Demo – Name Validator

This is local eMR System

eHR No: [Placeholder]
Medical Record Number: [New Patient]
*Surname: CHAN
Given Name: TAI MAN
Other Name: PETER
Chinese Name:
*Date of Birth: 05-Jun-1987
Age: 25 years

*Sex: Female
Nationality: HONG KONG

HKID Card
Document Type: C668668
C668668

Warning: Special character(s) is found in Given name, do you want to continue?

Print Message
Yes
No

Contact Info.
Contact Person
*At least one phone number is required.
Tel.(Home): 22225555
Tel.(Office): [Placeholder]
Email Address: [Placeholder]

Residential Address
Room: 1
Floor: 21
District: ADMIRALTY
Block: [Placeholder]
Building/Street: TAI NAM STREET
Area: HONG KONG

Correspondence Address
Same as Residential Address
Room: [Placeholder]
Floor: [Placeholder]
Block: [Placeholder]
Building/Street: [Placeholder]
Area: [Placeholder]
Remarks: [Placeholder]
Hospital ePR

1. Front-end Local Hospital Viewer
   - Integrated view to facilitate reading different patient’s clinical data in local hospital at a glance
   - Simple UI
   - Indexing of available records by domains

2. Local Adaptor
   - Ensure connection compatibility of local system with eHR platform
   - Ensure compliance of sharable data with eHR standard
**Clinical Laboratory Report**

**DOCTOR**
Ordered By: 
On: 21/7/2012 @15:03

**PATIENT**
Hospitals: 
ID:

**Clinical Chemistry**

<table>
<thead>
<tr>
<th>Test</th>
<th>項目</th>
<th>Result</th>
<th>Unit</th>
<th>Ref Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea</td>
<td>尿素</td>
<td>5.1</td>
<td>mmol/L</td>
<td>3.2 – 6.2</td>
</tr>
<tr>
<td>Creatinine</td>
<td>血清肌酸酐</td>
<td>66.3</td>
<td>μmol/L</td>
<td>44.2 – 107.0</td>
</tr>
<tr>
<td>Sodium</td>
<td>鈉</td>
<td>135</td>
<td>mmol/L</td>
<td>133 – 145</td>
</tr>
<tr>
<td>Potassium</td>
<td>鈾</td>
<td>3.6</td>
<td>mmol/L</td>
<td>3.5 – 5.1</td>
</tr>
<tr>
<td>Chloride</td>
<td>氯</td>
<td>0.7</td>
<td>L</td>
<td>98 – 107</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>碳酸氫根</td>
<td>24.5</td>
<td>mmol/L</td>
<td>23.0 – 23.6</td>
</tr>
<tr>
<td>Protein, total</td>
<td>總蛋白質</td>
<td>69.3</td>
<td>g/L</td>
<td>64.0 – 82.0</td>
</tr>
<tr>
<td>Albumin</td>
<td>白蛋白</td>
<td>39.0</td>
<td>g/L</td>
<td>34.0 – 50.0</td>
</tr>
<tr>
<td>Globulin</td>
<td>球蛋白</td>
<td>29.1</td>
<td>g/L</td>
<td>22.0 – 35.0</td>
</tr>
<tr>
<td>A/G ratio</td>
<td>白蛋白/球蛋白比</td>
<td>1.47</td>
<td></td>
<td>1.40 – 1.56</td>
</tr>
<tr>
<td>Bilirubin, total</td>
<td>胆紅素</td>
<td>4.8</td>
<td>μmol/L</td>
<td>3.9 – 17.1</td>
</tr>
<tr>
<td>GGT</td>
<td>丙氨酸轉氨酸轉氨酶</td>
<td>35</td>
<td>IU/L</td>
<td>&lt; 54</td>
</tr>
<tr>
<td>Alkaline Phosphatase (ALP)</td>
<td>酸性磷酸酶</td>
<td>75</td>
<td>IU/L</td>
<td>45 – 143</td>
</tr>
<tr>
<td>ALT (SGPT)</td>
<td>轉氨酶</td>
<td>31</td>
<td>IU/L</td>
<td>10 – 53</td>
</tr>
<tr>
<td>AST (SGOT)</td>
<td>轉氨酶</td>
<td>16</td>
<td>IU/L</td>
<td>14 – 64</td>
</tr>
</tbody>
</table>

Released by: CHAN on 21-Jul-2012 @ 17:00
LOCAL ADAPTOR DESIGN
Sharable Clinical Data Transaction Records Storage

Adaptor

- Digital Certificate
- Signed HL 7 Message
- Data files
- Zipped files

Upload

- sFTP eHR login key
- SFTP Client

Local EMR

- PMI
- HCP info

Clinical Data

Adaptation Module

- DxPx
- CS
- SAAM
- MOE

Retrieval/Transform

TXN Data

Mapped Data

Data upload web service

Data retrieval web service

Encrypt/insert

Hotel IT

Prepare

Upload Job

Locate EMR DB

Shared dataset

DxPx

CS

SAAM

MOE

Hospital ePR

Users
Important Notes

1. All patient information is strictly confidential
2. Staff may only use the CMS On-ramp for authorised purposes
3. All access to CMS On-ramp is logged
4. Please logoff immediately after use
5. Please ensure you have verified the content before you sign the computer printouts
6. Please change your password on a regular basis

Terms and Conditions  Confidentiality Guidelines
Basic development principles

- **Portable**
  - Able to deploy to different platforms

- **Technology neutral**
  - No specific vendor product requirement

- **Open source**
  - Allow system enhancement, integration and adoption by private sectors
Structured Allergy and Alert codes
Structured Diagnosis codes using Hong Kong Clinical Terminology Table (HKCTT)
Drug Profile using Hong Kong Medication Terminology Table (HKMTT)

System Functions & Workflow

Patient feel Sick

Nurse
- Registration
  - Appointment Booking
    - Patient Queue
      - Assessment

Clinician
- Structured Allergy and Alert
  - Consultation, Diagnosis and Prescription
    - Medical Certification

Pharmacist
- Drug Procurement
  - Drug Inventory Management
    - Dispensary

Management
- Basic Billing
  - Reports

Healthy Patient
Patient registration comply with the eHR PMI standard
Appointment schedule at a glance
Appointment Booking
Consultation operation & documentation

Support consultation operation:
1. Consultation documentation
2. Medication order
3. Simple billing
4. Letter writing
5. Attachment (e.g. clinical photo)

Patient base data, e.g. allergy

Viewing of history record
Drug dispensing

Provide label printing function to facilitate drug dispensing process.
Final product features highlight

- Drug Allergy Checking Function
- Immunization Record
- Drawing & Charting
- Interfacing for other Government e-Health projects
  - CENO and EHS
  - PPP (Public Private Partnership) Program
- eHR Interoperability
  - eHR PMI Standard
  - eHR Viewer / Inbox
  - eHR Connectivity / Data upload and download
  - E-referral
### Development / Deployment progress

<table>
<thead>
<tr>
<th>CMS Adaptation (Hospital)</th>
<th>CMS On-ramp (Clinic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 3 private hospitals – Live run the Structured Alert module</td>
<td>• 9 private clinics – live run the system pilot version</td>
</tr>
<tr>
<td>• 6 private hospitals - Preparation in progress</td>
<td>• 2 private clinics / group practice – preparation in progress</td>
</tr>
<tr>
<td>• 3rd batch modules to be ready for deployment in 1Q2013</td>
<td>• Final version to be ready for deployment in 4Q2013</td>
</tr>
</tbody>
</table>

*As in Jan 2013*
Thank you