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Graduate School of Global Information and
Telecommunication Studies (GITS)
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openEHR based Maternity Record System for Use in Cambodia

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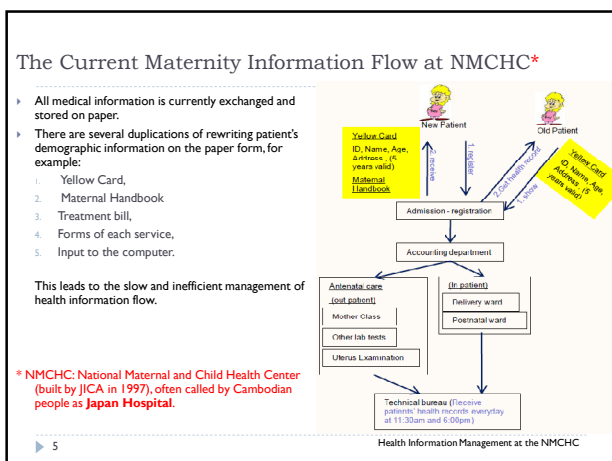
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Objectives of the Research Study

▸ To identify the flow of medical information regarding maternity care. A case study is done at the National Maternal and Child Health Center (NMCHC) in Phnom Penh;

▸ To identify the issues and challenges in developing EHRs;

▸ To design and provide an openEHR based Maternity care EHR System;

▸ To identify problems if EHRs have to be adopted in the hospital;

▸ and finally, to set a clue if maternity EHRs will replace maternal handbook.

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The Maternity Care Status in Cambodia

▸ Population: 15 million, roughly 20% of total population living in capital city, Phnom Penh
▸ Annual population growth: 1.8%
▸ Total fertility rate: 3.3
▸ Every year more than 2,000 women die of maternity-related complications
▸ Over half of mothers do not receive any health care during their pregnancy
▸ There are significant regional differences in antenatal care:
  ▸ 84% of expectant mothers in Phnom Penh come to health care facilities
  ▸ Out of Phnom Penh, the proportion of births delivered in health facilities is low in all regions (14% or less). 66% of childbirths are assisted by traditional birth attendants (TBAs).

▸ The current maternity medical record system is paper based.

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The Current Maternity Information Flow at NMCHC*

▸ All medical information is currently exchanged and stored on paper.
▸ There are several duplications of rewriting patient's demographic information on the paper form, for example:
  1. Yellow Card,
  2. Maternal Handbook
  3. Treatment bill,
  4. Forms of each service,
  5. Input to the computer.

This leads to the slow and inefficient management of health information flow.

* NMCHC: National Maternal and Child Health Center (built by JICA in 1997), often called by Cambodian people as **Japan Hospital**.

Health Information Management at the NMCHC

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Maternity Steps

1st Step: First Visit	2nd Step: Uterus Examination	3rd Step: Delivery	4th Step: Postnatal Record
Date of LMP	Week of Gestation	Number of fetuses	Check-up Date
The month of the first fetus movement	Weight	Labour Type	Mother condition
Expected date of birth	Blood Pressure	Off spring	Affecting diseases?
Mother's height less than 1,45m	Fundus Height	Date of delivery	breast-feed her baby?
Number of delivery=0 or >5	Heart Rate	Gender	Mother's breast
Age<17 or >35	Protein in urine	Birth Weight	Baby condition
First pregnancy age>29	Glucose in urine	Length	Baby's Bowel is ok?
Under TB treatment	Complications	Chest Circumference	Baby drink well?
Syphilis test	Treatment	Head Circumference	Baby seems painful?
Problems found during last pregnancy	Date of next visit	Intervention	Apgar score
Date of last delivery			Other problems..
Caesarean			
Instrument Intervention			
Edema			
Offspring status			
Abortion>=3			
Tetanus Vaccination			

All these concepts could not be found in the current archetypes repository

❖ **Based on these 4 steps , 4 Templates will be created accordingly.**

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Review of existing archetypes regarding "Maternity Care"

- List of current archetypes specifically concerning "Maternity Care"

Template	List of Available Archetypes in openEHR Repository	Evaluation
First Visit	1. openEHR-EHR-EVALUATION.pregnancy.v1 (specialized)	Not good for our purpose. Need new archetypes
Uterus Examination	1. openEHR-EHR-OBSERVATION.exam.v1 2. openEHR-EHR-CLUSTER.exam-uterus.v1 3. openEHR-EHR-CLUSTER.exam-fetus.v1 4. openEHR-EHR-OBSERVATION.urinalysis.v1 5. openEHR-EHR-INSTRUCTION.follow_up.v1 6. openEHR-HER-BSERVATION.blood_pressure.v1 7. openEHR-EHR-OBSERVATION.body_weight.v1 8. openEHR-EHR-OBSERVATION.heart_rate.v1	Good enough for our purpose
Delivery	1. openEHR-EHR-EVALUATION.pregnancy.v1 (specialized)	Not good for our purpose. Need modifications
Postnatal	1. openEHR-EHR-OBSERVATION.body_temperature.v1 2. openEHR-EHR-OBSERVATION.apgar.v1 3. openEHR-EHR-OBSERVATION.heart_rate.v1	Not good for our purpose. Need new archetypes

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❖ 3 Archetypes used for "Pregnancy: First Visit" Template

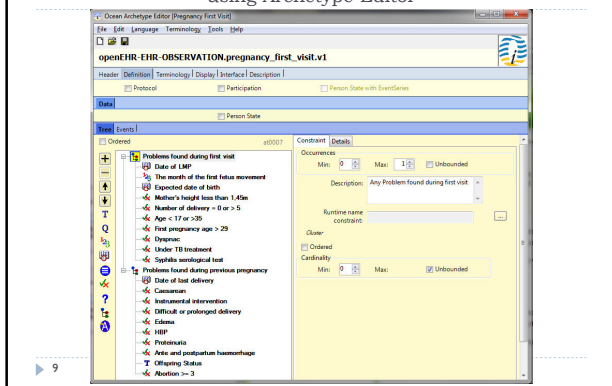openEHR-EHR-COMPOSITION.encounter.v1   (Exists in the current openEHR Repository)

openEHR-EHR-OBSERVATION.pregnancy_first_visit.v1 (Newly created)

Date of LMP
The month of the first fetus movement
Expected date of birth
Mother's height less than 1,45m
Number of delivery=0 or >5
Age<17 or >35
First pregnancy age>29
Under TB treatment
Syphilis test
Problems found during last pregnancy
Date of last delivery
Caesarean
Instrument Intervention
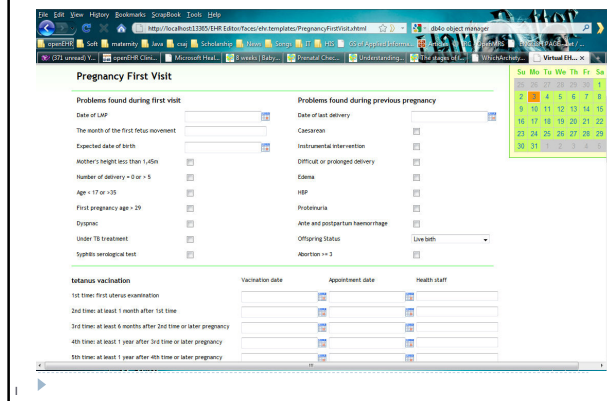**Edema**
Offspring status
Abortion>=3

openEHR-EHR-INSTRUCTION.tetanus_vaccination.v1 (Newly created)

Tetanus Vaccination
Vaccination date
Next appointment date
Health staff

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An Example of Creating "openEHR-EHR-OBSERVATION.pregnancy_first_visit.v1" using Archetype Editor

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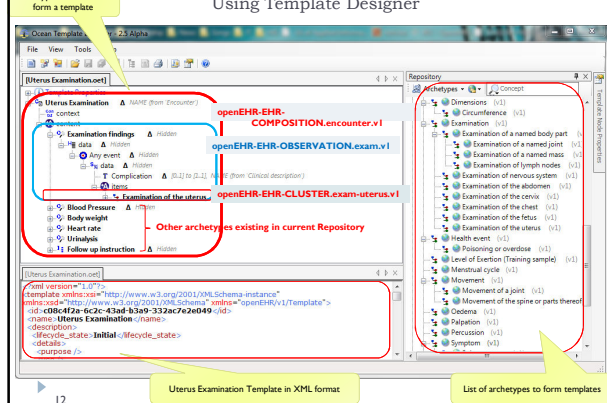## Screenshot of Newly Created Template: Pregnancy: First Visit

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List of 9 Archetypes used for "Uterus Examination" Template

Archetypes	Existing in Repository	under Reviewed	approved by ARB
1. openEHR-EHR-COMPOSITION.encounter.v1	√		
2. openEHR-EHR-OBSERVATION.exam.v1			
3. openEHR-EHR-CLUSTER.exam-uterus.v1			
4. openEHR-EHR-CLUSTER.exam-fetus.v1			
5. openEHR-EHR-OBSERVATION.urinalysis.v1			
6. openEHR-EHR-INSTRUCTION.follow_up.v1			
1. openEHR-HER-BSERVATION.blood_pressure.v1	√		√
2. openEHR-EHR-OBSERVATION.body_weight.v1			
1. openEHR-EHR-OBSERVATION.heart_rate.v1	√	√	

❖ No new Archetypes were created for this Template

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An Example of Designing "Uterus Examination" Template Using Template Designer

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Screenshot of Newly Created Template: Uterus Examination

Additions to "Pregnancy" Archetype to be used in "Delivery" Template, to be proposed to ARB

Proposed Additions

Screenshot of Newly Created Template: Delivery

Archetypes	Existing in Repository	under Reviewed	approved by ARB	Modified	Newly Created
1. openEHR-EHR-COMPOSITION.encounter.v1	√				
1. openEHR-EHR-EVALUATION.pregnancy.v1 (specialized)				√	

List of 5 Archetypes used in "Postnatal Record" Template

Archetypes	Existing in Repository	under Reviewed	approved by ARB	Newly Created
1. openEHR-EHR-COMPOSITION.encounter.v1	√			
1. openEHR-EHR-OBSERVATION.body_temperature.v1	√		√	
2. openEHR-EHR-OBSERVATION.apgar.v1				
1. openEHR-EHR-OBSERVATION.heart_rate.v1	√	√		
1. openEHR-EHR-OBSERVATION.postnatal_maternity.v1				√

16   ARB = Archetype Review Board

Screenshot of Newly Created Template: Postnatal Record

Maternity EHR System

Step 1. First Visit

Step 2. Uterus Examination

Step 3. Delivery

Step 4. Postnatal Record

"That Archetypes are Reusable" is Proved

Template	List of Archetype
First Visit	1. openEHR-EHR-COMPOSITION.encounter.v1
	2. openEHR-EHR-OBSERVATION.pregnancy_first_visit.v1
	3. openEHR-EHR-INSTRUCTION.tetanus_vaccination.v1
Uterus Examination	1. openEHR-EHR-COMPOSITION.encounter.v1
	2. openEHR-EHR-OBSERVATION.exam.v1
	3. openEHR-EHR-CLUSTER.exam-uterus.v1
	4. openEHR-EHR-CLUSTER.exam-fetus.v1
	5. openEHR-EHR-OBSERVATION.urinalysis.v1
	6. openEHR-EHR-INSTRUCTION.follow_up.v1
	7. openEHR-HER-BSERVATION.blood_pressure.v1
	8. openEHR-EHR-OBSERVATION.body_weight.v1
	9. openEHR-EHR-OBSERVATION.heart_rate.v1
Delivery	1. openEHR-EHR-COMPOSITION.encounter.v1
	2. openEHR-EHR-EVALUATION.pregnancy.v1 (specialized)
Postnatal	1. openEHR-EHR-COMPOSITION.encounter.v1
	2. openEHR-EHR-OBSERVATION.body_temperature.v1
	3. openEHR-EHR-OBSERVATION.apgar.v1
	4. openEHR-EHR-OBSERVATION.heart_rate.v1
	5. openEHR-EHR-OBSERVATION.postnatal_maternity.v1

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Summary: List of 15 Archetypes used for the current Maternity Record (As of May 2010)

Archetypes	Existing in Repository	under Reviewed	approved by ARB	Modified	Newly Created
1. openEHR-EHR-COMPOSITION.encounter.v1	√				
2. openEHR-EHR-OBSERVATION.exam.v1					
3. openEHR-EHR-CLUSTER.exam-uterus.v1					
4. openEHR-EHR-CLUSTER.exam-fetus.v1					
5. openEHR-EHR-OBSERVATION.urinalysis.v1					
6. openEHR-EHR-INSTRUCTION.follow_up.v1					
1. openEHR-EHR-OBSERVATION.body_temperature.v1	√		√		
2. openEHR-EHR-OBSERVATION.apgar.v1					
3. openEHR-HER-BSERVATION.blood_pressure.v1					
4. openEHR-EHR-OBSERVATION.body_weight.v1					
1. openEHR-EHR-OBSERVATION.heart_rate.v1	√	√			
1. openEHR-EHR-OBSERVATION.postnatal_maternity.v1					√
2. openEHR-EHR-OBSERVATION.pregnancy_first_visit.v1					
3. openEHR-EHR-INSTRUCTION.tetanus_vaccination.v1					
1. openEHR-EHR-EVALUATION.pregnancy.v1	√			√	

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Further Activities

- **To Develop Maternity EHR System in Cambodia:**
  - Do experiment of openEHR based Maternity Record System at Japan Hospital, as the first step

- **To Contribute to openEHR Community:**
  - Join Archetype discussion on openEHR Clinical Knowledge Manager: http://www.openehr.org/knowledge/
  - Submit newly created archetypes to CKM for review by ARB
  - Create new templates and submit to CKM for reference
  - Help review the current draft archetypes and templates

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Conclusion

- **Merits**
  - Archetypes and templates illustrated above show a strong basis for developing EHR.
  - As the archetypes and templates can be easily created, those new needed templates can be added to the existing EHR System in the future.
  - The feedback from the experiment at Japan Hospital, will help improve the quality of existing templates, or create new templates, if needed.
  - As the Japan Hospital is a National hospital specializing in obstetrics-gynecology, the positive feedback from this hospital will also have influence on other public and private hospitals to introduce the openEHR based maternity EHR System to their hospitals
- **Issues for further study**
  - The level of lab tests in maternity care may be different based on the available resources of each hospital or health center.
  - Therefore, the four above created templates may not be sufficient to serve other maternity hospitals or health centers

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Thank you