

# An Introduction to Laboratory Management Solution (LMS)



**MOBIGATOR**  
**TECHNOLOGY GROUP**





# Presentation Overview

1. Project Background
2. Solution Design
3. Current Status and future plan





# PROJECT OVERVIEW



# Background

- Estimated 40+ are active legal medical laboratories, servicing private clinics, hospitals and other medical institutions.
- Most medical laboratories employ some level of technology (e.g. LIS) for test management, but no common data standards for laboratory results or protocols for information sharing.
- Technology knowhow and support by IT vendors are limited.
- Laboratories are cautious about eHR, due to uncertainty on cost, support and risk in business interruption.







# Objectives

1. Raise the **awareness and support** of the coming changes brought forward by healthcare reform and **eHR sharing**
2. Create a **common and open source platform** for the industry to support **electronic info exchange**
3. Provide standardized **laboratory data to medical clinics** to support **standardized and integrated eHR**
4. Provide a **foundation** which paves way for the territory-wide **eHR sharing** and healthcare service delivery **infrastructure**





# Participating Parties

- HKAML – Industry Body and Project Manager
- Mobigator – Technology Developer
- eHR Office – Sponsor
- Private Labs/Hospital Labs – Users
- Clinics – Users





# HKAML & Mobigator

- **HKAML** ([www.hkaml.org](http://www.hkaml.org)) is the **industry body** for private laboratories:
  - A non-profit organization representing the entire industry;
  - Members include 34 private laboratories, 12 hospital laboratories and all major suppliers of laboratory products.
- **Mobigator** ([www.mobigator.com](http://www.mobigator.com)) is one of **the strongest healthcare technology providers** with domain knowledge, technical expertise and project experience in working with the healthcare service providers, the Hospital Authority and Department of Health.





# Deliverables

- Technology Development:
  - Create a common gateway and hub (LIH) for the industry to facilitate future integration with eHR
  - Create an open-source module (LMS) for interfacing between the LIH and local LIS. It will convert various proprietary results to eHR's common data standards
- Professional Training & Technical Support
  - Provide Professional Training to 400 laboratory professionals (MLT, etc.)
  - Provide hands-on technical training and support to facilitate 18 private laboratories and 6 hospital laboratories to integrate with LIH
- End-to-end Clinic-Laboratory Integration
  - Integrate with clinics, via CMS, for electronic test ordering and result delivery for 10 private laboratories, 4 hospital laboratories, and 60 clinics using CMS.

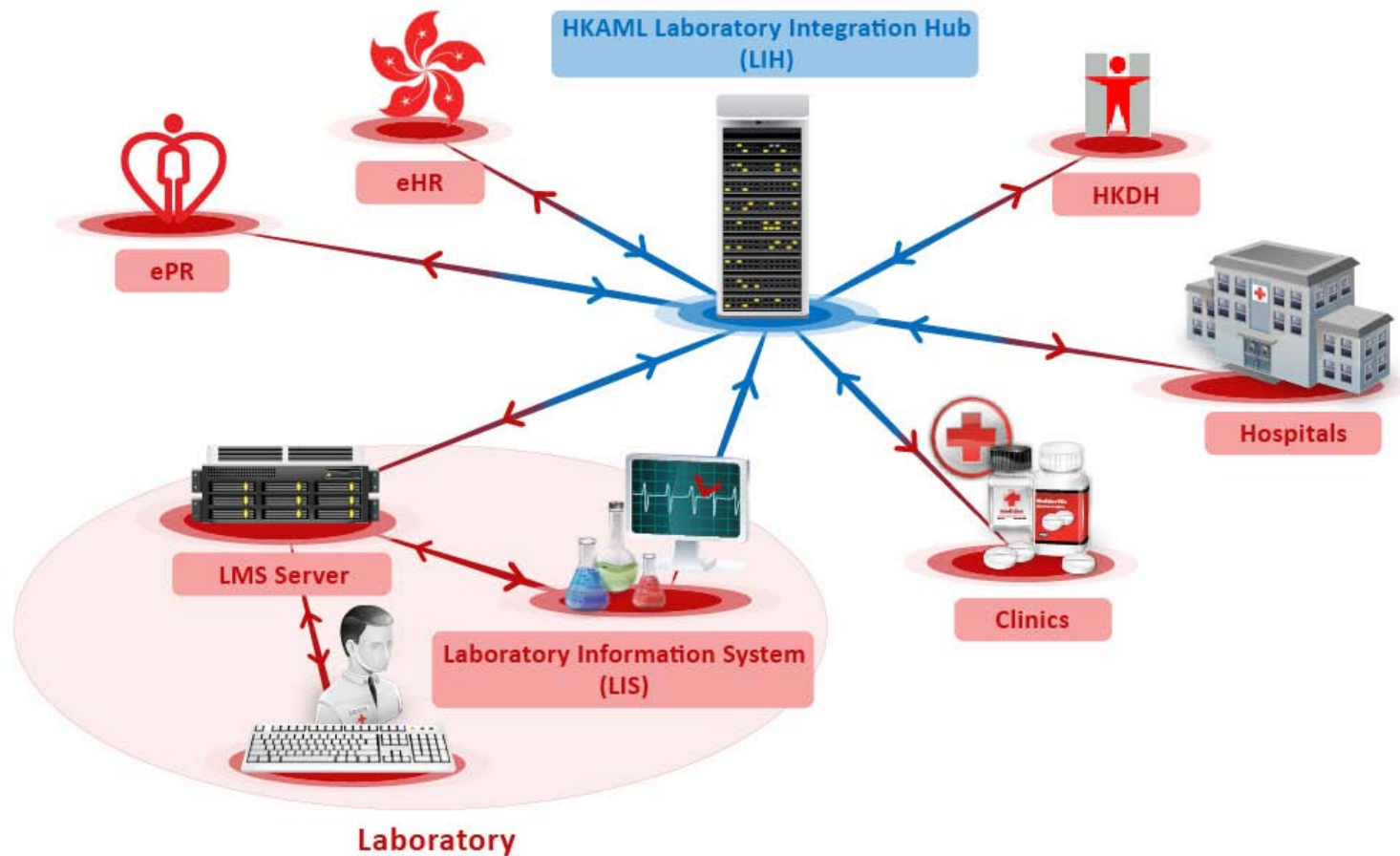




# TECHNICAL ARCHITECTURE



# Architecture





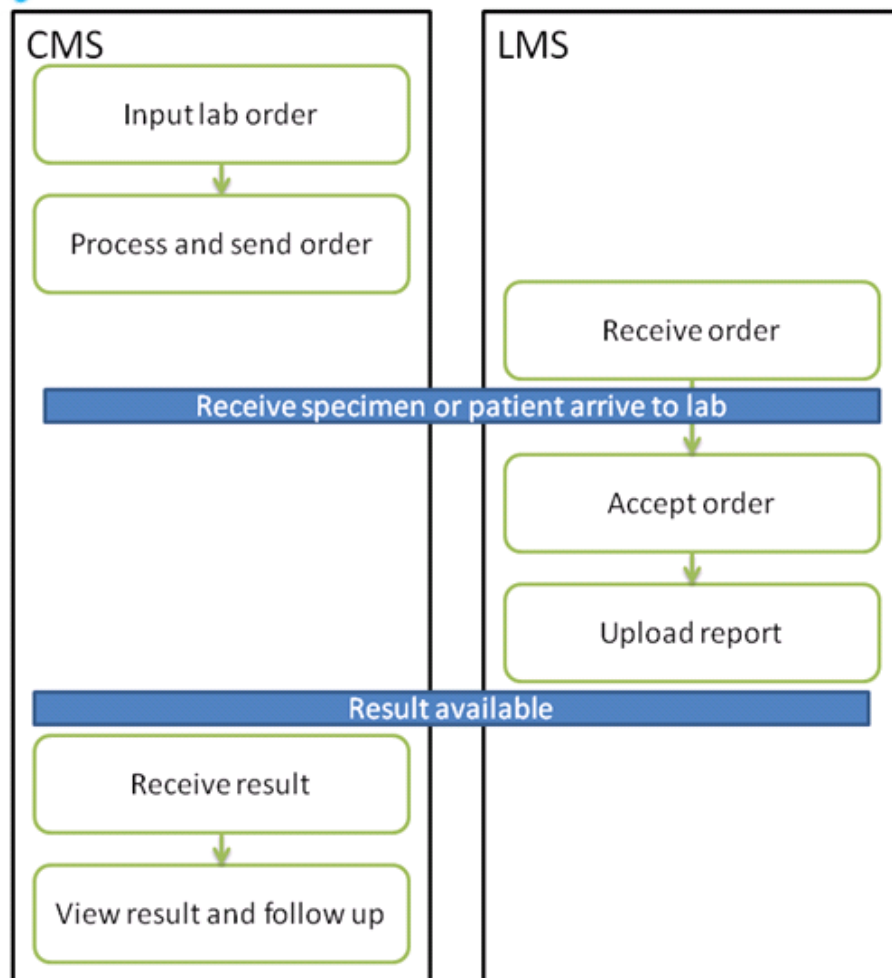


# Laboratory Integration Hub (LIH)

- An **integration hub** for the medical laboratory industry to interfacing with other healthcare service stakeholders, including the HA, DH and eHR.
- A **secured** and **central** platform for information **exchange** and **sharing**.



# Lab Order Workflow





# Lab Ordering within CMS

Lab Order Form

Test Items

Save as Template Select a lab order template

Remarks: Urgent: ☐ Total: \$0.00

Test Code	Require Item	Lab	Price	Instruction	Remarks	Label ...
			\$0.00			

Cholesterol  
Lab(s): L1005-Mob2

Hepatitis Profile 1 Hep A & B Vaccine  
Lab(s): L1003 Cost: 250 Price: 500

Hepatitis Profile 1 Hep A & B Vaccine  
Lab(s): ADVENTIST Cost: 270 Price: 300

Hepatitis Profile 1 Hep A & B Vaccine  
Lab(s): ASIAN Cost: 360 Price: 400

Hepatitis Profile Hep B Vaccine  
Lab(s): L1003 Cost: 200 Price: 500

Hepatitis Profile Hep B Vaccine  
Lab(s): ADVENTIST Cost: 200 Price: 400

Hepatitis Profile Hep B Vaccine  
Lab(s): ASIAN Cost: 200 Price: 350

Liver Function Tests  
Lab(s): L1003 Cost: 320 Price: 500

Liver Function Tests  
Lab(s): ADVENTIST Cost: 320 Price: 500

Liver Function Tests  
Lab(s): ASIAN Cost: 320 Price: 501

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Save Save and Close Print All Labels Print Lab Order Form

Lab Order Form

Test Items

Save as Template Select a lab order template

Order No: LN000442 Remarks: type remarks Urgent: ☐ Total: \$500.00

Test Code	Require Item	Lab	Price	Instruction	Remarks	Label ...
Liver Function Tests	3mL Plain	ADVENTIST	\$500.00			1
			\$0.00			

Save Save and Close Print All Labels Print Lab Order Form Close Send/Update Test to Lab



DATE, TIME RECEIVED		PHYSICIAN NAME (Print)	ID #	PAGER/EXT.	CLINIC NAME
LAB USE ONLY		COLLECTED BY	DATE	TIME (24 hour time)	CLINIC
BLOOD/SERUM CLINICAL LABORATORY REQUISITION San Francisco General Hospital Clinical Laboratory (TUBE STATION 1)		WARD or CLINIC LOCATION		PATIENT HISTORY - (REQUIRED FOR IMMUNOLOGY REQUIRED FOR SEROLOGY SENDOUT TESTS. INCLUDE DATE OF ONSET, SYMPTOMS, LABS, TREATMENT.)	
BLOOD DRAWING STATION 1033 WINDOW 5		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
STAT TEST - INDICATE BY: 1) Checking Red Box after test. OR 2) Writing "STAT" after test. PATIENT ADDRESS: (If not known)		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT SPECIMEN INFORMATION OR CRITICAL VALUES TO:		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT NAME: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT ROOM: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT DOB: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT SEX: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT RACE: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT ETHNICITY: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT ALLERGIES: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT MEDICATIONS: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT HISTORY: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT PHYSICIAN: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT NPI: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT PHONE: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT FAX: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT EMAIL: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT ADDRESS: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT CITY: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT STATE: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
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PATIENT SIGNATURE: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
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PATIENT ALLERGIES: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
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PATIENT PHYSICIAN: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT NPI: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT PHONE: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
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PATIENT ADDRESS: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
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PATIENT COMMENTS: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT SIGNATURE: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
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PATIENT ETHNICITY: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT ALLERGIES: _____		CHECK BLOOD TUBE TYPE (COLOR)		RED - S CODE: MEDICATION: (Indicate time of last dose)	
PATIENT MEDICATIONS: _____					

Clinic1

Tel: undefined

DrTsang

Date: 17/10/2011

010015

CHOW001

Sex: M

Birthdate: 11/06/1993



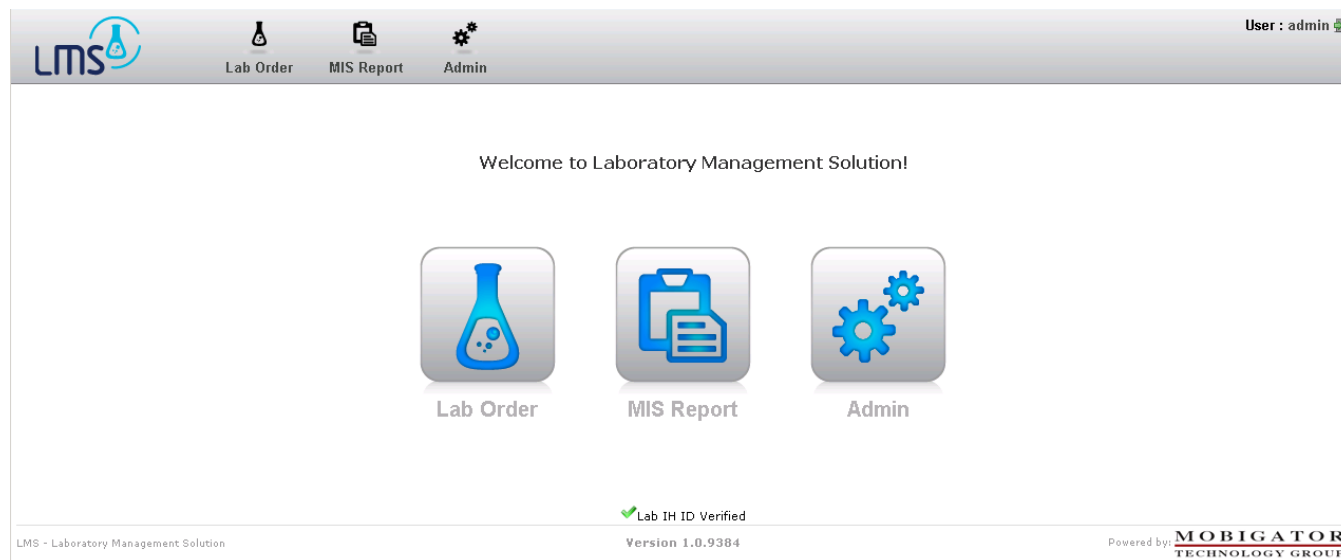
Lab. Test Name

### Liver Function Tests



# Lab Management Module

- Receive lab orders and upload result
- MIS reporting
- Lab test management (manage lab tests, and templates)







Lab Order



MIS Report



Admin

User : admin

## Lab Order

Pending (w/ specimen) **Pending (w/o specimen)** Processing Partial/Complete Report Voided Global Search

Search Show All Show Latest Only Clinic: Choose a Clinic Order Date From: to: << Today >>

Action: Void

	Order At	Order No.	Patient	Sex	DOB	Patient ID	Test Code	Clinic	
★	17/10/2011 18:55	C1004-Mob4-LN000442	CHOW001	M			LFT	Mob Clinic (cyberport)	+
★	14/10/2011 15:46	C1004-Mob4-LN000432	CHAN002	F			Check Up 5 -Basic 2	Mob Clinic (cyberport)	+
★	14/10/2011 15:40	C1004-Mob4-LN000431	CHAN001	F			HABPV	Mob Clinic (cyberport)	+
★	14/10/2011 14:47	C1004-Mob4-LN000429	CHAN004	M			HBPV	Mob Clinic (cyberport)	+
★	14/10/2011 14:46	C1004-Mob4-LN000428	CHAN003	F			RFT	Mob Clinic (cyberport)	+
★	14/10/2011 14:45	C1004-Mob4-LN000427	CHAN002	F			Check Up 5 -Basic 2	Mob Clinic (cyberport)	+
★	10/10/2011 18:15	C1004-Mob4-LN000414	PATIENT 9999	M			Check Up 5 -Basic 2	Mob Clinic (cyberport)	+
★	30/09/2011 17:54	C1004-Mob4-LN000380	PATIENT 9999	M			LFT	Mob Clinic (cyberport)	+
★	30/09/2011 16:56	C1004-Mob4-LN000369	LEUNG003	F			HABPV,LFT,RFT	Mob Clinic (cyberport)	+
★	30/09/2011 16:41	C1004-Mob4-LN000364	LEUNG004	M			Check Up 5 -Basic 2,RFT	Mob Clinic (cyberport)	+
★	30/09/2011 16:39	C1004-Mob4-LN000362	CHOW005	M			Check Up 5 -Basic 2,RFT	Mob Clinic (cyberport)	+
★	30/09/2011 16:13	C1004-Mob4-LN000361	CHOW004	M			HBPV	Mob Clinic (cyberport)	+
★	30/09/2011 16:09	C1004-Mob4-LN000360	CHOW003	M			Check Up 5 -Basic 2	Mob Clinic (cyberport)	+
★	28/09/2011 15:13	C1004-Mob4-LN000353	PATIENT 9988	M			HABPV,LFT,RFT	Mob Clinic (cyberport)	+
★	28/09/2011 15:01	C1004-Mob4-LN000350	CHOW004	M			Check Up 5 -Basic 2,RFT	Mob Clinic (cyberport)	+
★	28/09/2011 14:58	C1004-Mob4-LN000349	CHOW003	M			HBPV	Mob Clinic (cyberport)	+
★	28/09/2011 14:50	C1004-Mob4-LN000348	CHOW002	M			HABPV,LFT,RFT	Mob Clinic (cyberport)	+
★	26/09/2011 19:27	C1004-Mob4-LN000332	PATIENT 9988	M			HABPV	Mob Clinic (cyberport)	+

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★ Latest Record ★ Urgent Specimen From Clinic Specimen From Walk-in Patient Partial Report

+ Add Lab No View Lab Result



LabOrderRequestFromClinic Edit

**Basic Information** Patient Information Details

**Patient Information**

Patient: CHOW001 DOB: 17/10/2011

Patient Chinese Name: Sex: M

Identity Document: Passport

Patient ID: 124egrfyher

**Lab Order**

Order No.: C1004-Mob4-LN000442 Lab No.:

Urgent: ☐ Order Status: Waiting Specimen

Routine: ☐ Clinic: Mob Clinic (cyberport)

Specimen From Clinic: ☐

**Lab Order Details**

Test Code: LFT

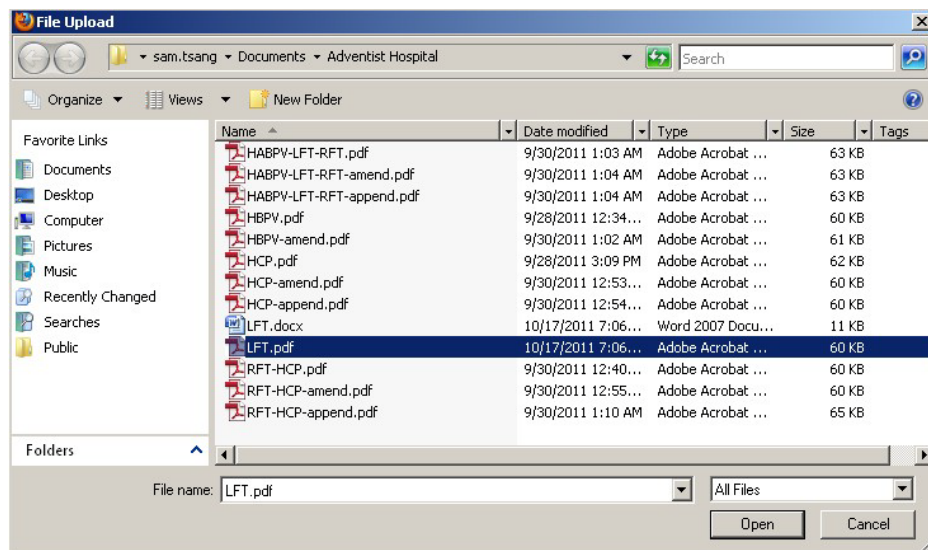
Test Name: Liver Function Tests

Remarks: type remarks

Update Cancel



# LMS



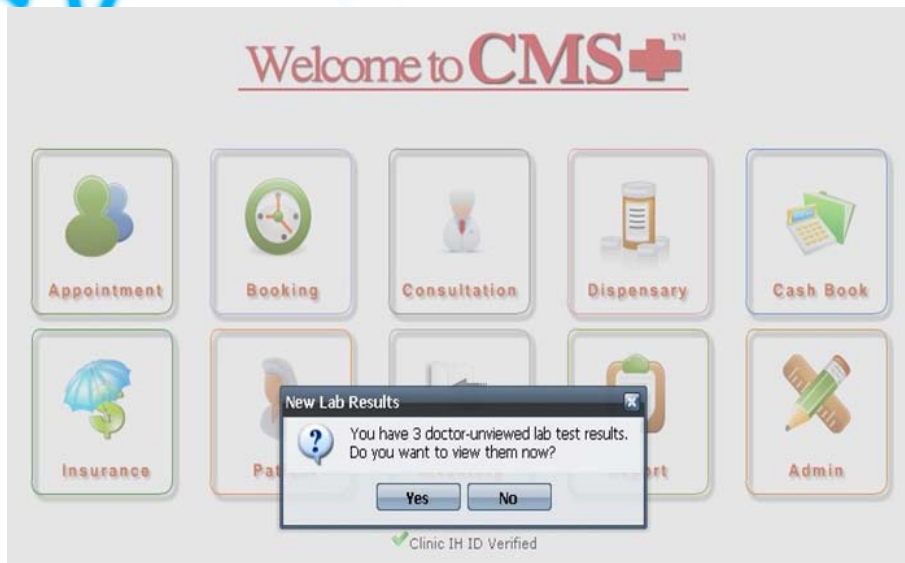
Lab No.	Lab No. Issued At	Change Remarks	Active	Uploaded At	Version	Sent At
★ labno-000442	17/10/2011 18:58:39		✓	17/10/2011 19:07:43	1	

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# CMS Lab Result Review



CMS+

APPOINTMENT

BOOKING

DISPENSARY

LAB

INVENTORY

REPORT

ACCOUNTING

ADMIN

Patient Search

User : C - DrTsang

Lab Order

Lab Result

Lab Result Follow-up

Search

Show All

Doctor Viewed: Not Viewed

Nurse Viewed: Nurse

Follow-up: All Follow-up Action

Follow-up Completed/not Completed

View All Doctor's Reports:

Date From:

to:

<<

Today

>>

	Patient	Received At	Lab No.	Order No.	Remarks	Follow-up Action	Doctor Viewed	Nurse Viewed	
	✖ CHOW005	30/09/2011 13:50:23	ASIAN-labno-000342	LN000342		None			
	✖ CHOW001	17/10/2011 19:09:42	ADVENTIST-labno-00...	LN000442		None			

<

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Alert

Completed Follow-up

Not Completed Follow-up

Open Patient Record

Open Report Panel









# Benefits for the Laboratories and Clinics

- More Accurate – No/Less Human Error due to Copying/Interpreting.
- More Timely – Instant Results Update.
- Higher Accessibility – Multi Copies/Destinations Possible.
- More Secured – Authentication and Password Control.
- Higher Productivity – Computerization/Automation, Alert, Template...
- Save Space & Money – Less Space to Keep Record.





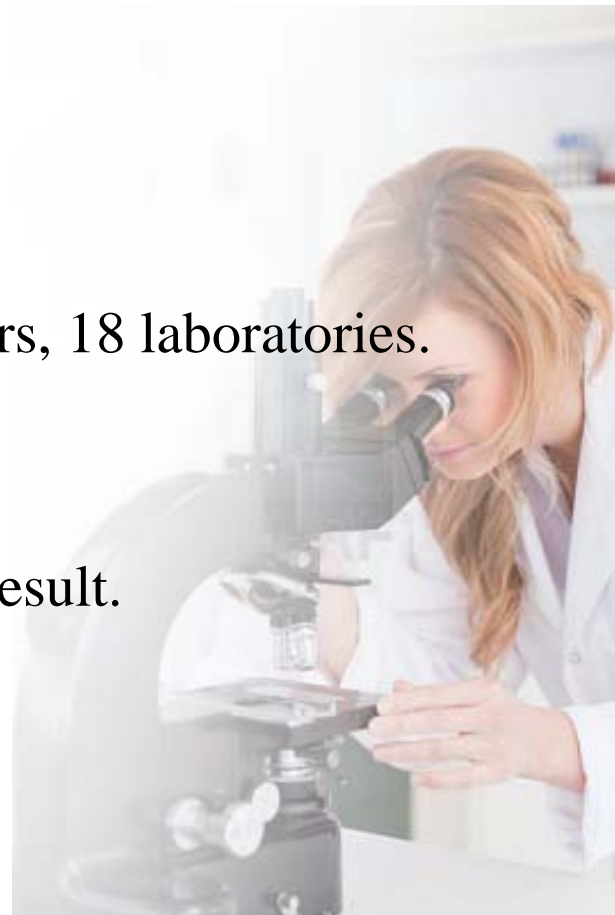
# Benefits with eHR

- Improve the **support** and **readiness** of the private medical laboratory industry **for integration with eHR**.
- Establish a **data standard** and **open technology platform** for exchanging and sharing laboratory results.
- Facilitate **eHR integration** of private medical laboratory data.
- Enable **better patient care** via seamless healthcare information delivery.



# Current Progress

- Started in Feb/2011
- Completed pilot testing in Sept/2011.
- Starting the first phase rollout to 60 doctors, 18 laboratories.
- Target to complete in Jun/2012.
- Results are transmitted as PDF.
- Next phase will standardize the data and result.







# Contact Information

## **The Hong Kong Association of Medical Laboratories**

<http://lms.hkaml.org>

### **LMS Project Steering Committee:**

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Thank You