



Laboratory Information System L.I.S.

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Simulation Background

- Michener introduced a specific focus on the use of simulation in education in the Medical Laboratory Sciences in 2006.
- Some simulation activities are incorporated into most laboratory courses; however, the major impact is seen in the “Simulated Clinical” semester immediately prior to students attending their clinical placements.

Simulation Background

- During the Simulated Clinical semester, students rotate through each of the 5 disciplines for 2-week blocks.
- We convert our laboratories into as realistic models of hospital laboratories as possible.
- Synthesis and application: there are no lectures, new material or graded evaluations.
- Students are assessed on competencies and must be “signed-off” on all by the end of the semester to progress to clinical placements.

Educational purpose of an L.I.S.

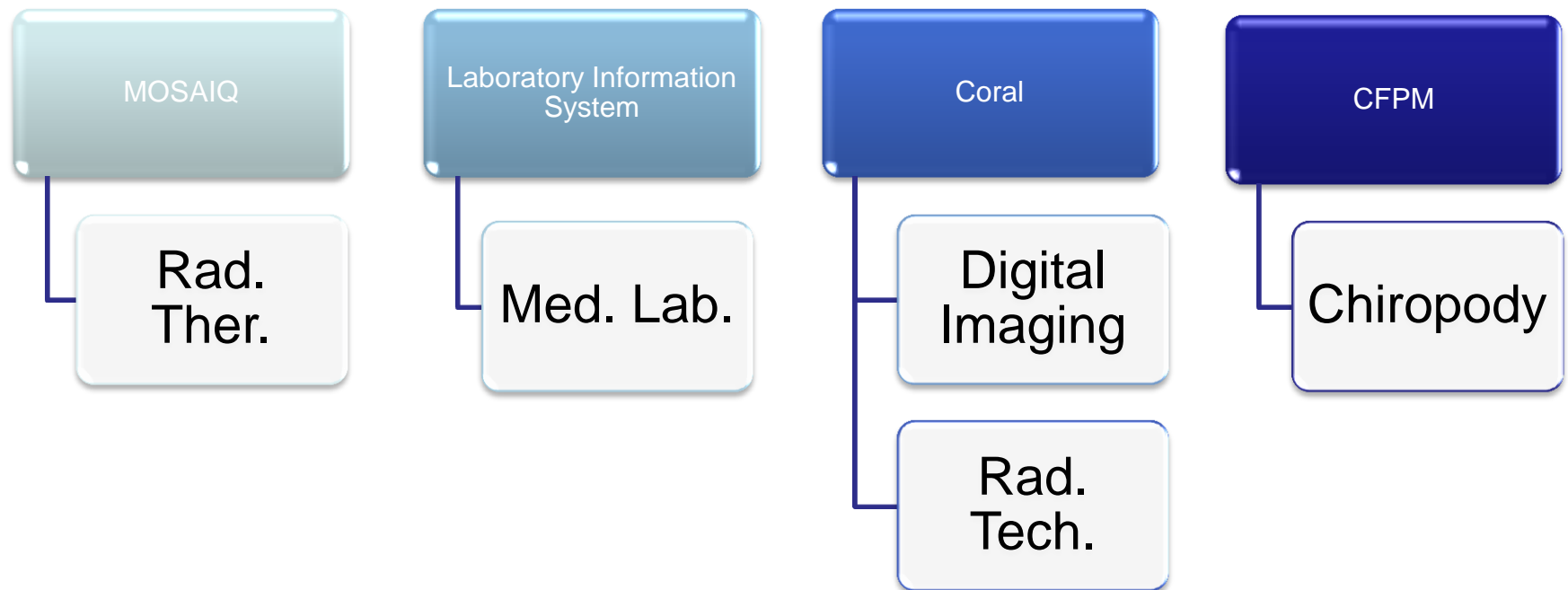
Enable the simulation of best practices and the development of digital clinical judgement through the use of integrated electronic systems within a simulated environment.

Goals

- To support the education of future Laboratory Professionals by creating an integrated digital environment that would simulate a true working clinical laboratory with an emphasis on work flow, patient care and privacy.
- To better prepare students for entry into the Clinical environment.

Michener – Current State

The L.I.S. is one example within Michener of electronic systems utilized to enhance the simulation of true clinical environments.



Michener and RVH

- A legal partnership agreement is in place between the Royal Victoria Hospital (Barrie, ON) and Michener to allow access to RVH Meditech Test Environment
- Provides a true mirror image of a fully-functional Hospital Lab Information System for use at Michener
- Access is provided through VPN tunnels to the RVH L.I.S. Servers (in Barrie)

Michener and RVH

Michener
LIS Module

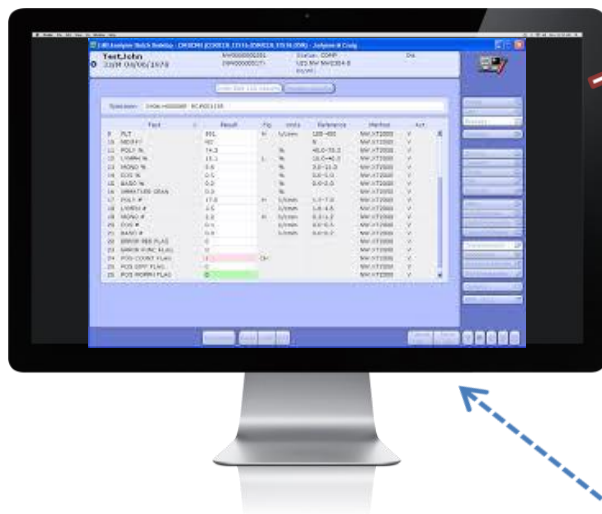
Logical VPN
Tunnel



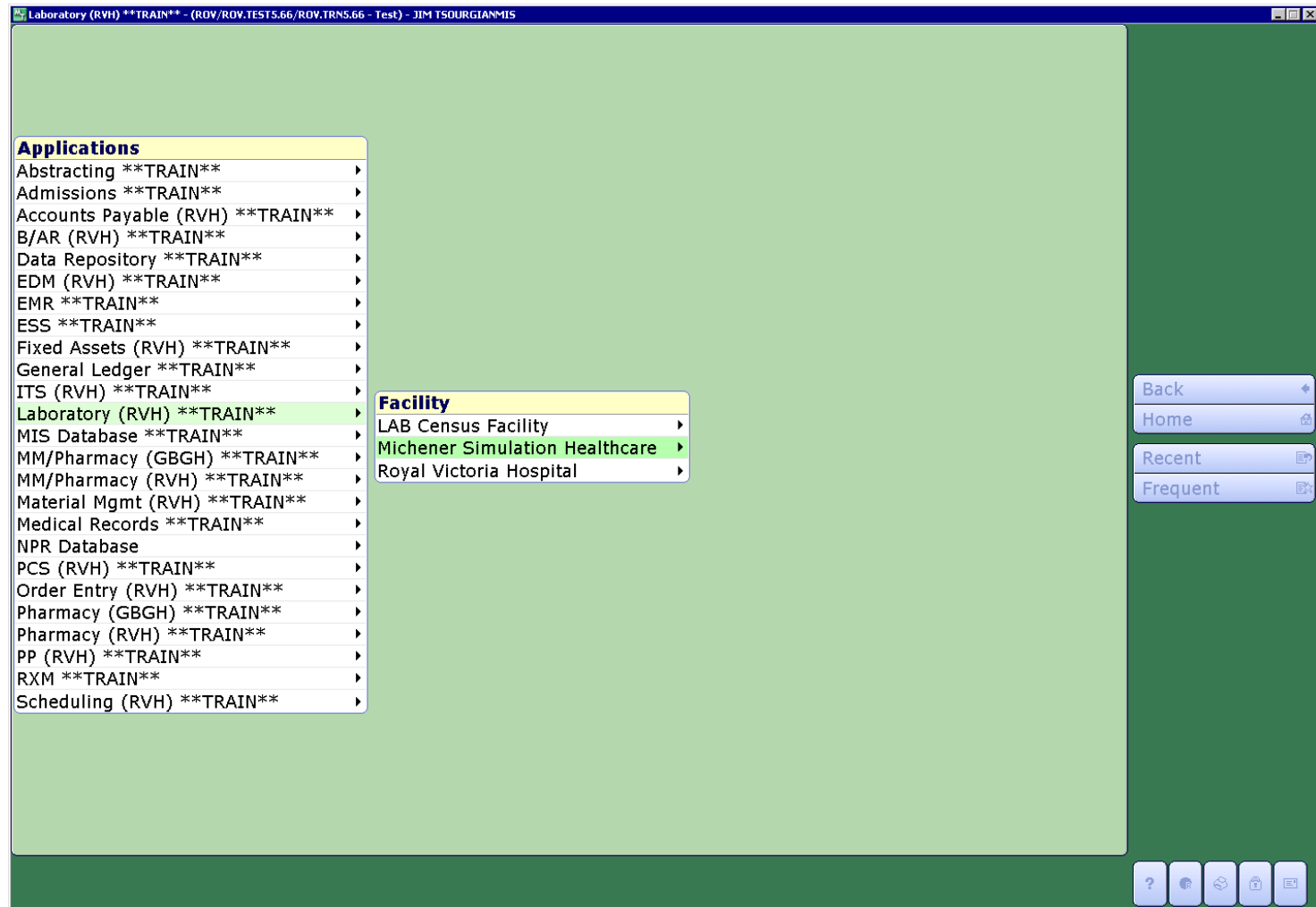
Lantronix Box

Analyzers

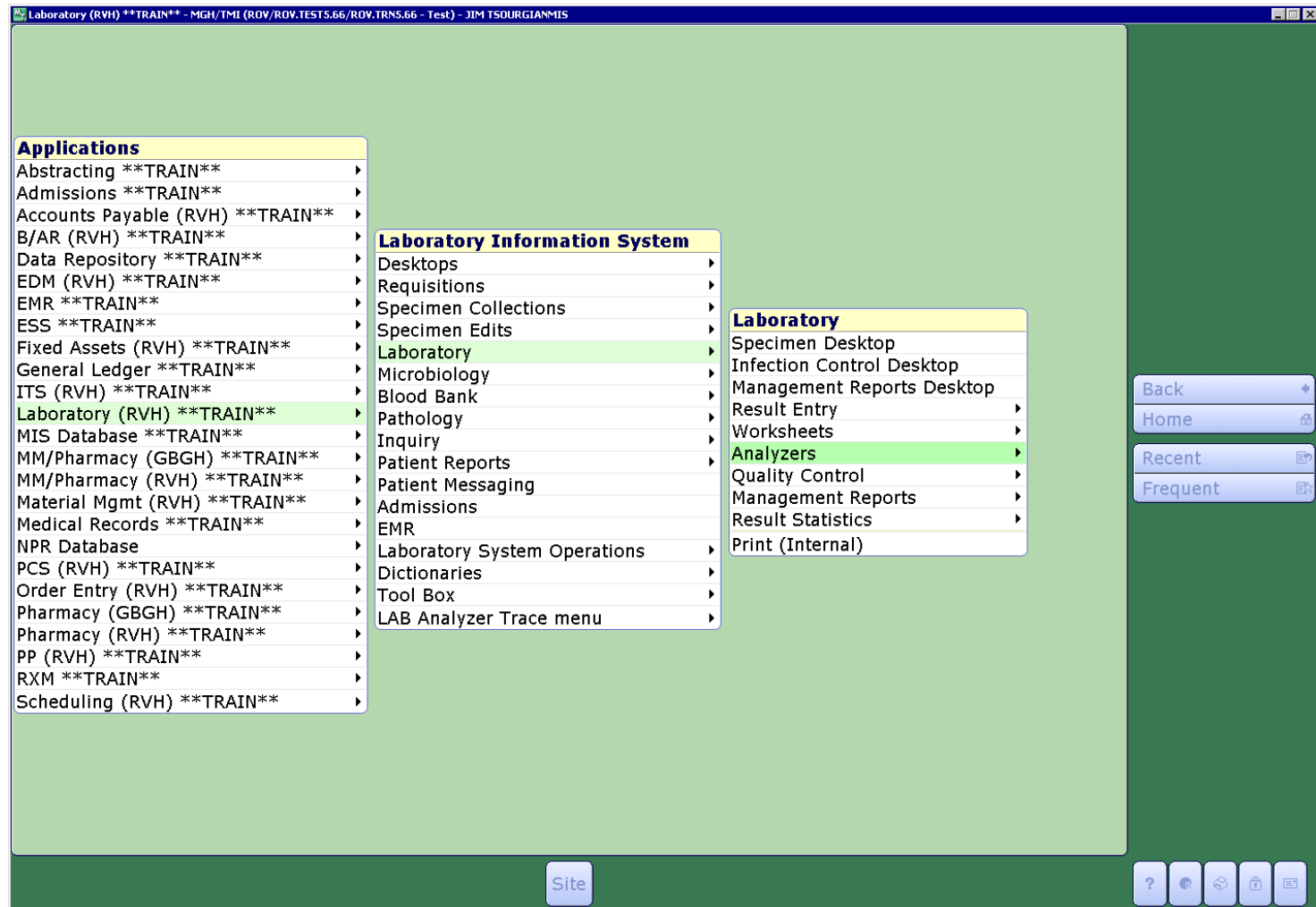
Ethernet Cable



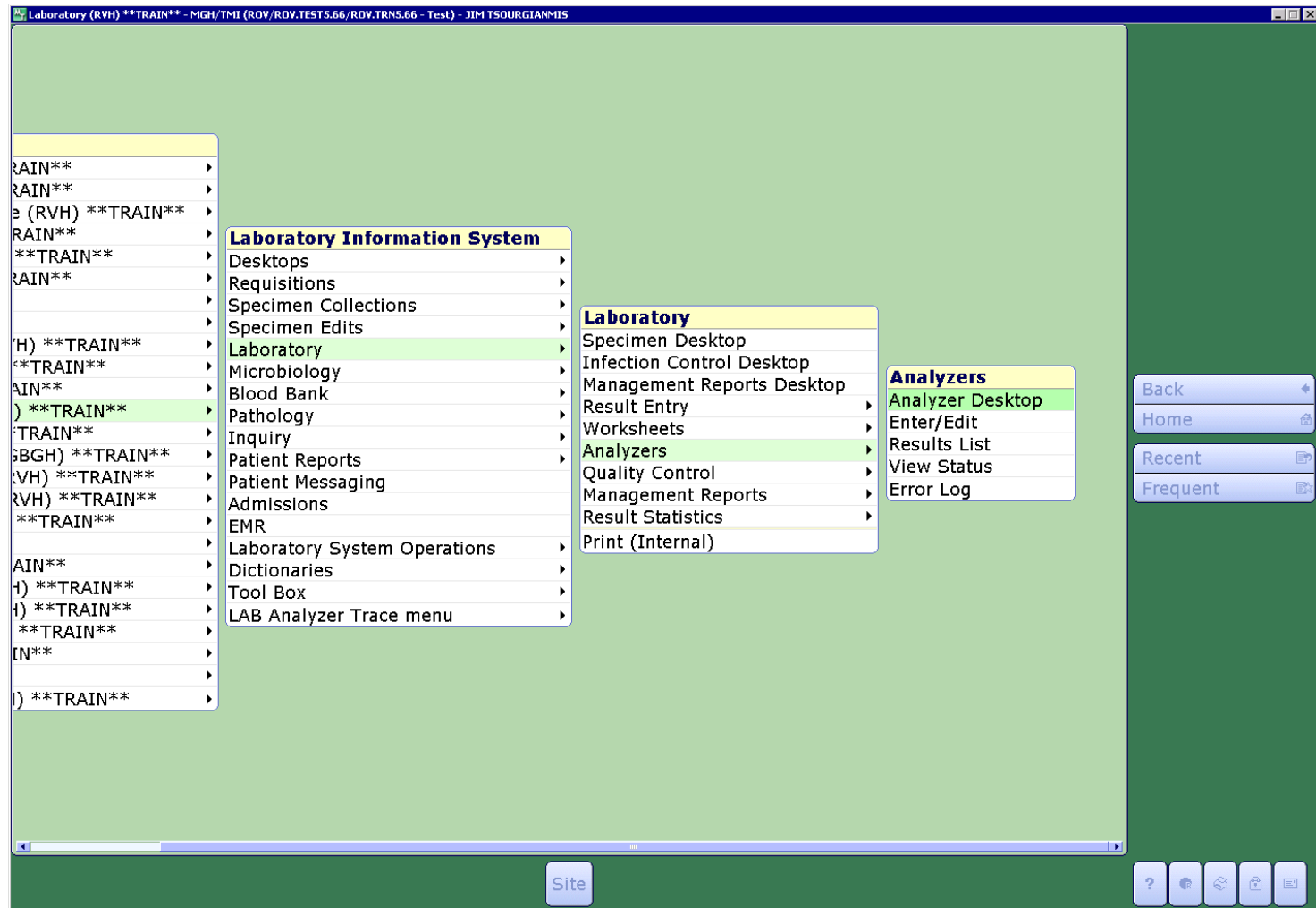
Lab Information System



Lab Information System



Lab Information System



L.I.S. Instrument Interfaces

LAB Analyzer Lookup

Search

Analyzer	Name
MCACCESS	MC ACCESS 2
MCACT	MC ACT DIFF
MCAU480	MC AU480
MCAU480B	MC AU480 B
MCRAPIDPOINT	MC RAPID POINT 1
MCVITROS250	MC VITROS 250

Active
Inactive
Both

Prior Next

Cancel

L.I.S. Instrument Interfaces

Microbiology Vitek Interface located on separate portal

[illegible]

Current State

- L.I.S. incorporated within Simulation Semesters for Clinical Chemistry, Microbiology, Hematology
- Eleven Lab Analyzers are currently interfaced with Meditech allowing electronic result verification:
 - 2x Beckman Coulter AU480 (Chemistry)
 - 2x Beckman Coulter Access (Immunochemistry)
 - 2x Biomerieux Vitek (Microbiology)
 - 2x Beckman Coulter AcT 5 (Hematology)
 - 3x Siemens Rapid Point (Blood Gas Instruments)

Simulation Process

- Over 500 fictitious patients are registered within Meditech for use with Lab Orders
- Registrations include:
 - Patient Demographic
 - Account Number
 - Location
 - Medical Record Number
 - Ordering Physician/ Clinician

Simulation Process – Patient Registry

Account Lookup

Name	Account Num	Status	Date	Location	Med Rec Num
ABBCOTT, JANE	OM000484/16	REG RCR	19/04/16	M.SIMLAB	M000000485
ABBCOTT, LACEY	OP000264/15	DIS RCR	27/04/15	R.DTLAB	V000000267
ACKART, MATTHEW	OM000470/16	REG RCR	19/04/16	M.SIMLAB	M000000471
ACKART, PERRY	OP000300/15	DIS RCR	28/04/15	R.DTLAB	V000000303
ACKERMAN, BLAKE	OM000025/16	REG RCR	14/04/16	M.SIMLAB	M000000026
ACKERMAN, SHAUN	OM000473/16	REG RCR	19/04/16	M.SIMLAB	M000000474
ACKERMAN, VICTOR	OP000303/15	DIS RCR	28/04/15	R.DTLAB	V000000306
ADAMS, FANTASIA	OM000486/16	REG RCR	19/04/16	M.SIMLAB	M000000487
ADAMS, JOHN	OM000021/16	REG RCR	14/04/16	M.SIMLAB	M000000022
ADAMS, LEAH	OP000270/15	DIS RCR	27/04/15	R.DTLAB	V000000273
ADAMSON, EVAN	OM000329/16	REG RCR	18/04/16	M.SIMLAB	M000000330
ADAMSON, MARK	OP000215/15	DIS RCR	17/04/15	R.DTLAB	V000000218
ADDISON, CASSANDRA	OM000058/16	REG RCR	14/04/16	M.SIMLAB	M000000059
ADDISON, LORRAINE	OP000383/15	DIS RCR	05/05/15	R.DTLAB	V000000386
ADELMA, HAYLEY	OP000384/15	DIS RCR	05/05/15	R.DTLAB	V000000387
ADELMAN, VIOLET	OM000059/16	REG RCR	14/04/16	M.SIMLAB	M000000060
AGOSTA, MARSHALL	OM000162/16	REG RCR	15/04/16	M.SIMLAB	M000000163
AHMED, SHARAF	OP000352/15	DIS RCR	01/05/15	R.DTLAB	V000000355
ALBRIGHT, JOHN	OM000368/16	REG RCR	18/04/16	M.SIMLAB	M000000369

Address	12	Birthdate Age	28/01/2004	12
City	TORONTO	Sex	F	
Province	ON	Conf Comment		
Postal Code	M1L 4S4	Client		
Phone	(416)555-1111	Temp Location		
Final Bill	N	Other Location		

Prior Next Filter Cancel

Simulation Process – Order Entry

- Lab order created corresponding to Faculty teaching objectives per specific lab
- L.I.S. Labels printed and affixed to Patient sample accordingly
- Several thousand true patient samples are obtained from clinical partner labs over the course of the simulation semester
 - Patient samples obtained in accordance with clinical lab retention and privacy policy

Simulation Process – Order Entry

Enter/Edit LIS Requisition - MGH/TMI (RDV/ROV.TEST5.66/ROV.TRN5.66 - Test) - JIM TSOURGIANNIS

La, Mary-Ann 15/04/16 15:04 - OM000180/16 M000000181
69 F 15/10/1946 Req: NEW
REG RCR M.SIMLAB DUNDAS,PARKER

Orders Doctors Specimens **Additional**

Patient LA, MARY-ANN
Req Number NEW

*Coll Date 17/02/17 T
*Coll Time 1111
*Priority R
Ord Src Written

*Received N
Coll By
Recv Date
Recv Time
Recv By

*Coll Cat 1100
Wkld Func
Label Device TMI_625NEW
Aliquot Dev

Order	Name	Px	Source	Spec Desc	Ct	Pr
UC	Urine culture	M	UR	MSU	1	R
CBC	COMPLETE BLOOD COUNT	H			1	R
LYTES	ELECTROLYTES	C			1	R
INR	INR	CG			1	R
CO2	TOTAL CO2	C			1	R
PTT	PARTIAL THROMBOPLASTIN TIME	CG			1	R

BBK History Product View Group Test/Proc Notes

EMR Cancel Save ? [Icons]

Simulation Process – L.I.S. Labels

L.I.S. Labels are affixed to true patient samples ready for student testing

Students electronically “Receive” samples and commence testing accordingly



Sample testing and L.I.S. verification

- Samples for Analyzer use are loaded for testing
- Upon test completion, students examine results for accuracy prior to Verifying and Broadcasting to the L.I.S. patient account

Sample Testing and L.I.S. verification



MIC Analyzer Batch Desktop - MICH/TMI (ROV/TESTS.66/ROV/TRANS.66 - Test) - LISA GIBBS

Interface: MC-VITEK2 - RUNNING
Convert: IDLE

VITEK MICHENER Site: TMI

Results from Analyzer Orders to Analyzer Conversions Pending

Trans	Seq	Identifier	Flags	Status	Specimen	Patient Name/C
21	44	010891		Matched	16:M0000027R	OP000392/15 STEVENS,IS
26	49	014584		Matched	16:M0000884R	OM000167/16 JACOBS,ABI
28	51	014585		Matched	16:M0000885R	OM000180/16 LA,MARY-AN

Specimen 16:M0000885R **Patient** LA,MARY-ANN

Edited Results

Procedure	Name	Method	Result
120.0112	Urine culture	MAN	
Organism ID	NP Isolate	Prompt	Result
PSEAE	1		

Susceptibilities

Procedure	Organism ID	Isolate	Method	Interpretation	Antibiotics
AST-N213	PSEAE	1	VIT		

Merged Transmissions

Upload Number	Created	
27		
28	05/05/16	
UQ Identifier	Queued for Conversion	Error
51		

Edit Transmission View Transmission Result File

Sample Testing and L.I.S. verification

MIC Analyzer Batch Desktop - MGH/TMI (ROV/ROV.TEST5.66/ROV.TRN5.66 - Test) - LISA GIBBS

La, Mary-Ann 15/04/16 15:04 - OM000180/16 M000000181
69 F 15/10/1946 Dx/Rfx: RECD
REG RCR M.SIMLAB DUNDAS, PARKER

What's that bug Susceptibility Antibiotics

Urine culture

Specimen 16:M0000885R BC#014585
Source URINE
Sp Desc Mid-stream urine

	Organism	NP	Name	Exc	Spec
1	PSEAER		Pseudomonas aeruginosa		
2	MIXCC		Mix: colonizing / contam flora		
3					
4					
5					

	Prompt	Result	Result Text
1	Colony count:	10	
2	See previous report for:		

Interp View Edit Flags Result Cancel Save ? [Icons]

Sample Testing and L.I.S. verification

MIC Analyzer Batch Desktop - MGH/TMI (ROV/ROV.TESTS.66/ROV.TRNS.66 - Test) - LISA GIBBS

La, Mary-Ann 15/04/16 15:04 - OM000180/16 M000000181
69 F 15/10/1946 Dx/Rfx: RECD
REG RCR M.SIMLAB DUNDAS, PARKER

What's that bug Susceptibility Antibiotics

Urine culture

Specimen 16:M0000885R BC#014585
Source URINE
Sp Desc Mid-stream urine

Organism ID Susceptibility Procedure

1	Pseudomonas aeruginosa	AST-N213
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	Antibiotic	Rx or MIC	MIC VL	*Rx	Abn	NP	Text
1	TRIMETH/SULFA						
2	AMOX/CLAVULANIC						
3	AMPICILLIN	>=32\NP	>=32	R		NP	
4	CEFAZOLIN	>=64	>=64	R		NP	
5	CEFOTAXIME						
6	CEFOXITIN	>=64	>=64	R		NP	
7	CEFTAZIDIME	2	2	S			
8	CEFTRIAXONE	32	32	R		NP	
9	CIPROFLOXACIN	<=0.25	<=0.25	S		NP	
10	GENTAMICIN	<=1	<=1	S			
11	ERTAPENEM						
12	MEROPENEM	0.5	0.5	S		NP	
13	NITROFURANTOIN	>=512	>=512	R		NP	

Interp View Edit Flags Result Cancel Save ? [Icons]

Single List Process Refresh Status Convert Edit Reports Mark Add/Remove Match/Unmatch Transmissions Specimens Previous Results Options Patient Message EMR <F11>

Sample Testing and L.I.S. verification

16:M0000885R BC#014585

URINE

Mid-st

File Status

- ☐ Preliminary/Unverified
- ☐ Final/Unverified
- ☐ Preliminary/Verified
- ☒ Final/Verified
- ☐ Corrected Prelim/Unver
- ☐ Corrected Final/Unver

Cancel Save

CEFOXITIN	>=64	>=64	R	NP
CEFTAZIDIME	2	2	S	

Students are responsible for confirming accuracy of results prior to electronic Verification and Broadcast

Student usernames will be tagged to verified results for audit purposes

16:M0000885R BC#014585

File MIC Results

- ☒ Broadcast Results
- ☐ Edit Requisition
- ☐ Print Workcard
- ☐ Print Internal Inquiry
- ☐ Print External Inquiry
- ☐ Call Result
- ☐ Suppress Activity
- ☐ Save Only

Cancel Save

/Time/User 04/05/16 0918 PINGI

L.I.S. Patient Reports

[PID=20412] Mic Specimen Internal Inquiry - MEDITECH Document Preview

File Help



DATE: 17/02/17 @ 1217		Royal Victoria Laboratory **TRAINS.66**		PAGE 1
USER: TSOJ		MIC SPECIMEN INTERNAL INQUIRY		
PATIENT: LA,MARY-ANN		ACCT : OM000180/16	LOC: M.SIMLAB	U : M000000181
REG DR: DUNDAS,PARKER		AGE/SX: 69/F	ROOM:	REG: 15/04/16
		DOB: 15/10/1946	BED:	DIS:
		STATUS: REG RCR	TLOC:	
SPEC : 16:M0000885R	ORD FOR: 04/05/16-0918	STATUS: COMP	REQ : 00010369	
	COLL: 04/05/16-0918	SUBM DR: DUNDAS,PARKER		
	RECV: 04/05/16-0918	PT AGE AT COLL: 69		
SOURCE: URINE	SP DESC: Mid-stream	OTHER DR:		
ENTERED: 04/05/16-0920	ENT BY: PINGI			
COLL BY: CBN	RCV BY: PINGI			
LAST RPTD: 05/05/16-1442	WKLD FN:			
LAST ACT: 05/05/16-1442	BAR CD: 014585			
ORDERED: Urine culture				
SETUP: Urine culture: 04/05/16 0918 PINGI				
COL CATEG:				
ORD SITE: TMI	TRANSIT SITE:			
RECV SITE: TMI				
PERFORM SITE: TMI 04/05/16-0918 GP	AT SITE: TMI 04/05/16-0918 GP			

Procedure	Result						
> Urine culture] Final Method: MAN Perf Site: TMI Ent: 05/05-1442 GIRLI, Ver: 05/05-1442 GIRLI							
Organism 1	Pseudomonas aeruginosa						
Colony count:	>=100 X E6 cfu/L						
Organism 2	Mix: colonizing / contain flora						
Colony count:	10-100 X E6 cfu/L						
1. Pseudomonas aeruginosa AST-N213 Ent: 05/05-1442 GIRLI Method: VIT Perf Site: TMI							
Target	Route Dose	RX	AB	Cost	M.I.C.	IQ	NP
AMPICILLIN		R			>=32		NP
CEFAZOLIN		R			>=64		NP
CEFOXITIN		R			>=64		NP
CEFTAZIDIME		S			2		NP
CEFTRIAZONE		R			32		NP
CIPROFLOXACIN		S			<=0.25		NP
GENTAMICIN		S			<=1		NP
MEROPENEM		S			0.5		NP
NITROFURANTOIN		R			>=512		NP
TOBRAMYCIN		S			<=1		NP
AMIKACIN		S			<=2		NP
PIPERA/TAZOBACT		S			<=4		NP
CEFPODOXIME		R			>=8		NP

*** End of Report ***

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L.I.S. Patient Reports

[PID=20412]Mic Specimen Internal Inquiry - MEDITECH Document Preview

File Help



DATE: 17/02/17 @ 1217 Royal Victoria Laboratory **TRAIN5.66** PAGE 1
USER: TSOJ MIC SPECIMEN INTERNAL INQUIRY

PATIENT: LA,MARY-ANN	ACCT : OM000180/16	LOC: M.SIMLAB	U : M000000181
REG DR: DUNDAS,PARKER	AGE/SX: 69/F	ROOM:	REG: 15/04/16
	DOB: 15/10/1946	BED:	DIS:
	STATUS: REG RCR	TLOC:	

SPEC : 16:M0000885R	ORD FOR: 04/05/16-0918	STATUS: COMP	REQ : 00010369
	COLL: 04/05/16-0918	SUBM DR: DUNDAS,PARKER	
	RCV: 04/05/16-0918	PT AGE AT COLL: 69	

SOURCE: URINE	SP DESC: Mid-stream	
ENTERED: 04/05/16-0920	ENT BY: PINGI	OTHR DR:
COLL BY: CBN	RCV BY: PINGI	
LAST RPTD: 05/05/16-1442	WKLD FN:	
LAST ACT: 05/05/16-1442	BAR CD: 014585	

ORDERED: Urine culture	
SETUP: Urine culture: 04/05/16 0918 PINGI	
COL CATEG:	
ORD SITE: TMI	TRANSIT SITE:
RCV SITE: TMI	
PERFORM SITE: TMI 04/05/16-0918 GP	AT SITE: TMI 04/05/16-0918 GP

Procedure	Result
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> Urine culture	Final
Method: MAN	Perf Site: TMI
Ent: 05/05-1442 GIBLI	Ver: 05/05-1442 GIBLI

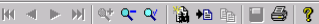
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L.I.S. Patient Reports

[PID=20412] Mic Specimen Internal Inquiry - MEDITECH Document Preview

File Help



Procedure	Result							
> Urine culture Final Method: <i>MAN</i> Perf Site: <i>TMI</i> Ent: <i>05/05-1442 GIBLI</i> , Ver: <i>05/05-1442 GIBLI</i>								
Organism 1	Pseudomonas aeruginosa							
Colony count:	>=100 X E6 cfu/L							
Organism 2	Mix: colonizing / contam flora							
Colony count:	10-100 X E6 cfu/L							
1. Pseudomonas aeruginosa AST-N213 Ent: <i>05/05-1442 GIBLI</i> Method: <i>VIT</i> Perf Site: <i>TMI</i>								
Target	Route	Dose	RX	AB	Cost	M.I.C.	IQ	NP
AMPICILLIN			R			>=32		
CEFAZOLIN			R			>=64		NP
CEFOXITIN			R			>=64		NP
CEFTAZIDIME			S			2		
CEFTRIAXONE			R			32		NP
CIPROFLOXACIN			S			<=0.25		NP
GENTAMICIN			S			<=1		
MEROPENEM			S			0.5		NP
NITROFURANTOIN			R			>=512		NP
TOBRAMYCIN			S			<=1		
AMIKACIN			S			<=2		NP
PIPERA/TAZOBACT			S			<=4		
CEFPODOXIME			R			>=8		NP

*** End of Report ***

Simulation and L.I.S.

- All simulated semester samples are registered within L.I.S. (Patient account and orders created)
 - Results from Interfaced Analyzers file directly to the L.I.S. for student electronic verification
 - Results from non-interfaced instruments (Special Hematology: PT/PTT) are manually entered by students into associated patient accounts within the Meditech L.I.S.
 - In addition, students are taught L.I.S. Downtime Procedures

Student Benefits

Education

- Supports a patient-driven model of care
- Provides an environment that promotes continuous and adaptive learning
- Creates a comprehensive learning environment to practice the use of electronic health systems risk-free
- Supports development of clinical reasoning, judgement, and digital literacy



Student Benefits

Clinical Preparedness

- Replicates the patient's journey via system-wide integration of information systems (Registration, Order Entry, Result Verification, and Broadcast)
- Facilitates greater awareness of clinical privacy, ethical standards, and cyber security
- Enhances appreciation for the work, roles, responsibilities, and accountabilities of other health care professionals



Future Enhancements of L.I.S.

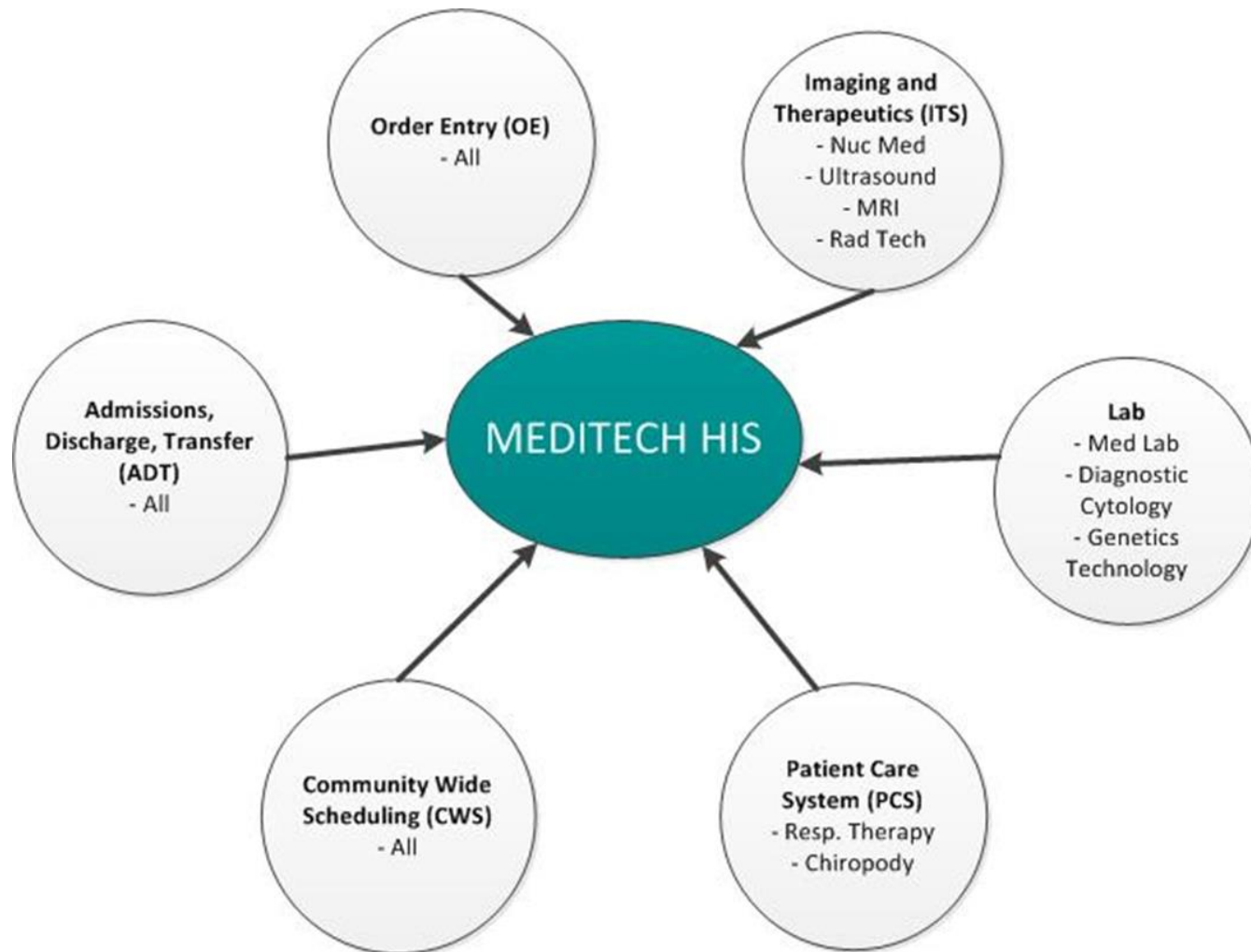
Integration of L.I.S. with an organization-wide Hospital Information System (H.I.S.) for use across multiple Academic Programs: Chiropody, Respiratory Therapy, Genetics Technology, Diagnostic Imaging, etc.

Michener General Hospital



THE MICHENER INSTITUTE

The Future at Michener



The Future at Michener

A common digital space benefiting all learners across all
Michener Academic programs



First in
Canada



Fully Simulated Environment

Inter-Professional Real Life Case
Studies

Builds on Current L.I.S. Investments

Digitally Integrated Training
Curriculum

Leading Clinical Education Nationally
and Internationally

Michener L.I.S.

Questions ?

Thank you