



Integration vs. Interoperability: Best of Breed vs. Enterprise Solutions

Pathology Informatics Summit 2016

David McClintock, MD

May 23, 2016

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David McClintock, MD
John Blau, MD

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Who are we?



David McClintock, MD
Assistant Professor, Pathology
Medical Director, Pathology Informatics
Medical Director, Point of Care Testing
Associate Director, UChicago MedLabs
Faculty Director, MSc in Biomedical Informatics



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Clinical Assistant Professor, Pathology
Medical Director, Pathology Informatics



THE UNIVERSITY OF
CHICAGO
MEDICINE &
BIOLOGICAL
SCIENCES

The logo for the University of Iowa Carver College of Medicine, featuring a stylized building icon and the text "UNIVERSITY of IOWA CARVER COLLEGE OF MEDICINE".

University of Iowa Health Care

Setting the stage...

- You are a new Medical Director of Pathology Informatics, fresh out of a clinical informatics fellowship and ready to put your stamp on the world
 - You have a job in an academic health system that has a single EHR system
 - Your labs are currently using a “classic” LIS that was initially installed in the 1980s
- After being at work for a whole week, the CIO of your health system meets with you and would like your expert opinion on the following topic...

Is it time to change our LIS?

- The CIO reveals to you that one of the enterprise's strategic goals is to "integrate" systems as much as possible
 - Decrease redundant systems, consolidate maintenance, etc.
- Your enterprise EHR has recently started to heavily market its LIS product – the general consensus is that it's ready for prime time
- So...what do you want to do?
 - Switch to the EHR vendor's LIS module and "Integrate" or
 - Stay with your current LIS and optimize your "Interoperability"

You remember this talk you went to...

Led by two young(ish), dashing, energetic midwestern Pathology Informaticists

...and you want to ask some questions:

1. Besides hospital strategy – are there other reasons for switching LISs?
 - Has anyone from the labs asked for this? Do they know this is being discussed?
 - Has a needs analysis been done?
2. What is the scope of your labs and their systems?
 - AP/CP only? Transfusion Medicine? Molecular? HLA? Cytogenetics? Point of Care?
3. Do you have special middleware or other needs that will be affected?

System Selection

- The “Process” of selecting a system is just as important as the system ultimately selected itself!
- Process should be independent of the system type being chosen

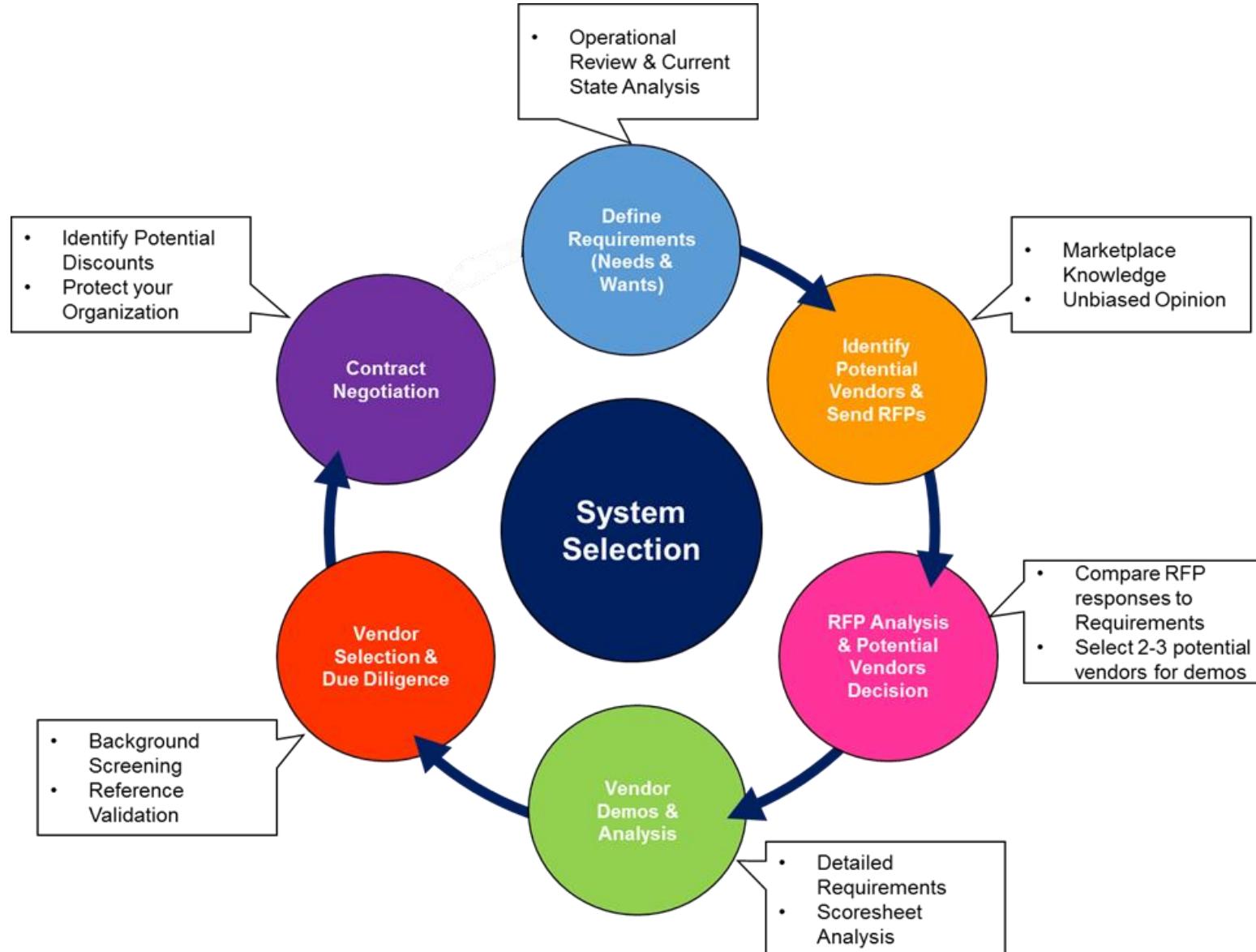
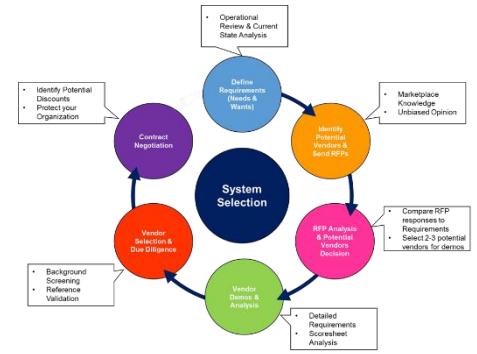


Image from: http://www.bnncpa.com/assets/uploads/general/selecting_a_new_software_system.png

System Selection in Healthcare



- Workflow in healthcare is integrally tied to its information systems
- Healthcare information system selection and management relies on three primary philosophies:
 1. Enterprise vs. Specialty/Best of breed solutions
 2. Off-the-shelf vs. Custom-built solutions
 3. Institutional vs. Departmental/Section management

Enterprise Solutions



- Enterprise level = Institutional level
 - Decisions on systems and IS solutions done at high level
 - Decision made in mutual agreement or separately and imposed
 - Typical “integrated” and “cost-efficient”
 - One size fits all approach...

Epic image from: <http://hcis.healthcare.uiowa.edu/images/epic.jpg>; Cerner image from: <http://www.cerner.com>; Meditech image from: <https://ehr.meditech.com/>

Evolution of Enterprise Solutions

- Had their start as billing systems, inpatient EMRs
- Added additional modules over time
 - Patient registration systems
 - Patient management systems
 - Ambulatory solutions
 - Department specific solutions
 - Procedure services (e.g. Surgery, Anesthesiology)
 - Ancillary services (e.g. Radiology, Laboratories)
 - Specialty specific services (e.g. Emergency Medicine, Heme/Onc)



Specialty / Best of Breed Solutions

- Specialty solutions = “Best-of-breed” = Silos
 - Individual departments decide
 - Can lead to better efficiency and productivity, designed with departmental workflow in mind
 - Deployment and maintenance historically on department, may or may not be supported by central IT



Off-the-shelf Solutions

- Off-the-shelf = ready-made vendor solution
 - Faster deployment
 - Costs may be better anticipated (usually)
 - Should have “typical” configurations to help facilitate implementation process
 - Usually have more standard features, tested amongst multiple sites
 - Development typically takes longer for new features / upgrades
 - This is changing as more companies move to agile development
 - Long-term service/maintenance contracts are the norm



Custom-built Solutions

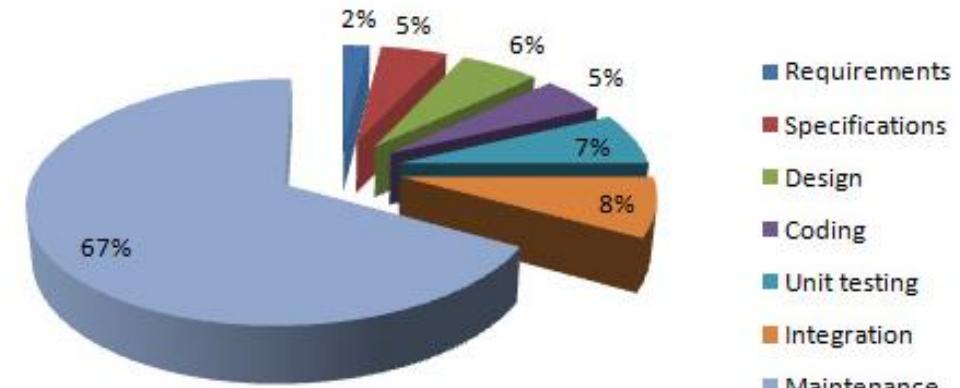
- Used to primarily denote home-grown systems
 - Some vendor solutions can allow for significant customizations (for the right fee)
- Designed to more readily meet the needs of the specific department
- Requires more of your own resources (money, people, subject matter experts)
 - Typically higher up front costs, more bugs since your site is now an alpha/beta/production site
 - At the mercy of those who built it – if they leave, who supports / maintains the system?
- Can fill gaps left by vendor solutions (e.g. mol path, information exchange)



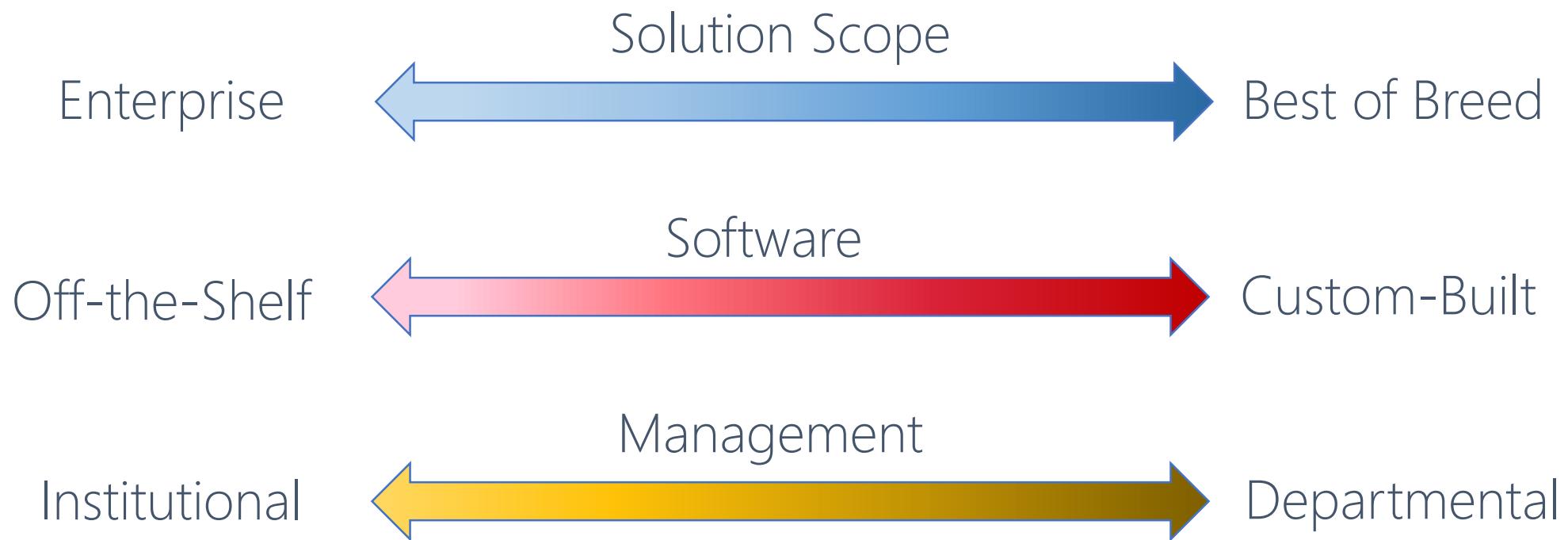
Who is Managing Your System?

- Institutional support (a.k.a. central IT)
 - Allows consolidation and sharing of equipment, human resources, cost
 - Relies on institutional priority – is your request really that important?
- Departmental/Sectional support
 - Usually more efficient, timely, effective
 - Aligned with departmental priorities
 - More costly to maintain
 - Can lead to conflicts between scope of support with institution

Software Life-Cycle Costs



Reality is a Spectrum



What is Interoperability?



- The ability of two or more systems or components to exchange information and to use the information that has been exchanged
 - From: IEEE Standard Computer Dictionary: A Compilation of IEEE Standard Computer Glossaries (New York, NY: 1990)
- In healthcare, refers to the architecture or standards that make it possible for diverse EHR systems to work compatibly in a true information network
 - From: HealthIT.gov, <https://www.healthit.gov/providers-professionals/faqs/what-does-interoperability-mean-and-why-it-important>

Image from: <https://www.healthit.gov>

Fundamental building blocks of interoperability



- Interoperability works where there is standardization of:
 - **meaning** through the use of standardized healthcare vocabularies,
 - **structure** by using messaging standards (e.g. HL7, CDA, DICOM)
 - **transport** using secure email protocols,
 - **security** through National Institute of Standards and Technology (NIST)-adopted encryption standards, and
 - **services** through open, and accessible application programming interfaces (APIs)

From: <https://www.healthit.gov/providers-professionals/standards-interoperability>, image from: http://www.babylonhobbies.com/ebay/pictures/LEG_5795_5.jpg

Interoperability

For the purposes of this talk, interoperability = stand-alone systems

Interoperability Depends on Standards...

...and cooperation between competing healthcare IT vendors

- Interoperability means keeping best of breed information systems, but relying on vendors to talk to each other to exchange the information you want
 - You can do this yourself...but now you're back to custom-built

What is Integration?

- Integrate:
 - “Combine (one thing) with another so that they become a whole”
 - http://www.oxforddictionaries.com/us/definition/american_english/integrate
- Integration:
 - “The intermixing of people or groups previously segregated”
 - http://www.oxforddictionaries.com/us/definition/american_english/integration

What is Integration?

- For health information systems:
 - The combining or intermixing of previously separate health information systems such that they now form a single whole system
- For the LIS:
 - Implementing a laboratory information system as a “module” within the larger EHR system



“It just works”

IT JUST WORKS



UNTIL IT BREAKS

Advantages of an Integrated LIS

- Give physicians, pathologists, and other data users a consistent, unified, and simpler user experience
 - Single system used on a regular basis by all physicians, including pathologists
 - Same features used by both the ordering clinicians and pathologists/laboratorians
 - E.g. Epic In-basket messaging; clinic, inpatient and op notes; labs and pathology reports all in one location
 - Lab techs familiar with the same user interface as nurses and other allied health professionals
 - All data present within the same system
 - Examples: Critical value reporting, AP specimen tracking

Advantages of an Integrated LIS

- Single database for both EHR and LIS data
 - Information lives in one place → various components of an EHR can make use of data in a seamless way
 - When information is changed in one component of the EHR, it automatically updates throughout the entire system
 - Access to EHR data readily available for laboratory use
 - Integrated analytics with preset dashboards
 - Complete encounter information for orders

Epic Anatomic Pathology Outstanding List Schedule In Basket Patient Lists Specimen Inquiry Open Pt Station Telephone Call Orders/Notes Enc Send Letter My Reports Calculator Personalize My Cases Case Results Case Views Open Remove All Case Info Chart Review Case Builder Amendment Preview Case Report Advance Status Assign Final Verify Case Inquiry Case QA Prelim Verify Beaker ? Actions Resize Close

Cases S16-017419

Case Summary History Hot Seat Gyn History Billing

Responsible: Mitros, Frank A, MD Status: Gross Description Done Location: 2RCW2, 2057, 1

Specimens

ID	Protocol	Source	Description	Collected	Received
A	Liver, core (medical)	Liver	Liver Biopsy	05/20/16 1105	05/20/16 1113
Attributes: Fresh Collection ID: 1					

Tasks

ID	Task	Slides	Ordered	Setup	Flags
A1	H&E Slide	1	05/20/16 1501 by Crowell, Austin	Not created	
A1	Iron	2	05/20/16 1501 by Crowell, Austin	Not created	
A1	Klatskin Trichrome	3	05/20/16 1501 by Crowell, Austin	Not created	
A1	PASD	4	05/20/16 1501 by Crowell, Austin	Not created	

Authorizing Provider

Katz, Daniel A, MD	Phone	Fax	Pager
319-356-1616			2012

Case Summary

Discharged (MAIN OR 06)

Results Synoptic History Charges SNOMED Addendum Mnemonic Scan Expand

Surgical Pathology Exam

Amendment*

Final Diagnosis*

Comment*

Internal Consultation*

Clinical History*

Gross Description

A. Received fresh labeled Johnson, Jocelyn, hospital number and "liver biopsy" is a 2.0 cm in length x 0.1 cm in diameter cylindrical, tan, soft tissue core which is wrapped and submitted in toto in A1.
ATC/cja

Microscopic Description*

Intraoperative Consult*

Additional Procedures*

Synoptic

Immunopathology*

Preliminary Diagnosis**

Linked Orders

Order	Type
None	

Billing Summary

ID	Protocol or Task	Charge Code	Qty
A	Liver, core (medical)	88307 (CPT®) [LVL V-SURG PATH GROSS&MCRSCP XM]	1
A	Liver, core (medical)	88307 (CPT®) [HB SURG PATH - GROSS & MICRO EXAM - LEVEL 5]	1
A1	Iron	88313 (CPT®) [CHG SPECIAL]	1
A1	Klatskin Trichrome		1
A1	PASD		1

Order/Result Diagnoses

SNOMED

No SNOMED codes attached

Customize...

Epic Anatomic Pathology Outstanding List Schedule In Basket Patient Lists Specimen Inquiry Open Pt Station Telephone Call Orders/Notes Enc Send Letter My Reports Calculator Personalize My Cases Case Results

Beaker ? Actions Resize Close

Case Results

Views Open Remove All Case Info Chart Review Case Builder Amendment Preview Case Report Advance Status Assign Final Verify Case Inquiry Case QA Prelim Verify

Cases S16-017419

Case Summary History Hot Seat Gyn History Billing 2RCW2-2057-1

Surgical Pathology (Last 10 results in the past 99 years)	FNA (Last 10 results in the past 99 years)	Surgical Notes (Notes from through 05/21/16)
None	None	5/21/2016 4:30 PM Consults addendum by Stegman, Elisa L, RD LD
Eye Pathology (Last 10 results in the past 99 years)	Non-Gyn Cytology (Last 10 results in the past 99 years)	5/21/2016 4:00 PM Consults signed by Stegman, Elisa L, RD LD
None	None	5/21/2016 12:32 PM Progress Notes signed by Scott, Aaron T, MD
Flow Cytometry (Last 10 results in the past 14 days)	Gyn Cytology (Last 5 results in the past 99 years)	5/21/2016 11:23 AM Progress Notes signed by Mohr, Nicholas M, MD
None	None	5/21/2016 11:17 AM Progress Notes signed by Ruth, Denise L, RPH
Surgical History	Bone Marrow Final (Last 10 results in the past 99 years)	5/21/2016 11:06 AM Progress Notes signed by Edwards, Nicholas J, MD
None	None	5/20/2016 3:26 PM Procedures filed by Katz, Daniel A, MD
		5/20/2016 3:12 PM Anesthesia Postprocedure Evaluation signed by Becher, Timothy, CRNA
		5/20/2016 12:15 PM H&P signed by Kealey, Gerald P, MD
		5/20/2016 9:54 AM Progress Notes signed by Mohr, Nicholas M, MD
		5/20/2016 8:03 AM Progress Notes signed by Coonrod, Peter E, MD
		5/20/2016 7:49 AM Progress Notes signed by Khan, Aamir A, MD
		5/20/2016 7:44 AM Anesthesia Plan addendum by

Results Synoptic History Charges SNOMED Addendum Mnemonic Scan Expand

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A1	Iron	88313 (CPT®) [CHG SPECIAL]	1
A1	Klatskin Trichrome		1
A1	PASD		1

Order/Result Diagnoses

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Customize...

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Case Results Case Summary History Hot Seat Gyn History Billing

ESTIMATED BLOOD LOSS:
50 mL.

COMPLICATIONS:
None.

INDICATIONS:
The patient is a 34-year-old female who presented to an outside hospital with abdominal pain, and other abdominal symptoms. Diagnostic procedures were done, which led to the diagnosis of acute cholecystitis. The patient was taken to the operating room yesterday for a laparoscopic cholecystectomy, at which time a bile duct injury was made and identified intraoperatively. The patient was transferred urgently to the University of Iowa for further management.

DESCRIPTION OF PROCEDURE:
The patient was brought to the operating room, and placed in the supine position. Following the induction of general endotracheal tube anesthesia, the patient's chest, abdomen, and pelvis were prepped with Betadine solution and draped in the usual sterile fashion. A Foley catheter and nasogastric tube were inserted. Blood pressure monitoring devices and large infusion lines were placed by the Anesthesia Team. Following prep and drape a timeout was performed according to hospital procedure.

Bilateral subcostal incisions were made. The Jackson-Pratt drain was placed at the time of the laparoscopic cholecystectomy was removed. It had been draining bile.

The abdominal cavity was entered. There was bile mostly contained to the right upper quadrant. Overall, the other quadrants were also contaminated with bile. Therefore, the abdomen was irrigated with approximately 10 liters of saline and GU irrigation fluid. The right upper quadrant was exposed.

The Thompson retractor system was set up for right subhepatic exposure. The right upper quadrant was further inspected. Clips were identified in the distal common bile duct. They were left in place. Other clips in the peri-duodenal, hepatoduodenal ligament area were removed. No other vascular or ductular structures were identified. The portal plate was divided, and bile ducts were mobilized. The proximal divided end of the common hepatic duct was identified. It was visually inspected and probed. It was transected within 5 mm of the right and left hepatic duct confluence.

Results Synoptic History Charges SNOMED Addendum Mnemonic Scan Expand

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A1	Iron	88313 (CPT®) [CHG SPECIAL STAINS,GROUP II]	1
A1	Klatskin Trichrome	88313 (CPT®) [CHG SPECIAL STAINS,GROUP II]	1
A1	PASD	88313 (CPT®) [CHG SPECIAL STAINS,GROUP II]	1

Order/Result Diagnoses

SNOMED

No SNOMED codes attached

Epic Anatomic Pathology Outstanding List Schedule In Basket Patient Lists Specimen Inquiry Open Pt Station Telephone Call Orders/Notes Enc Send Letter My Reports Calculator Personalize My Cases Print Help Desk Log Out

Case Results Case Summary History Hot Seat Gyn History Billing

Pap Results (Last 10 results in the past 9 years)
None

Surgical Pathology (Last 10 results in the past 99 years)
None

OB History
No data available

HPV Results (Last 10 results in the past 9 years)
None

Gyn History
LMP 05/19/2016, Postmenarcheal
Age at Menarche
Age at First Pregnancy
Age at Menopause
Gyn History Comments
Sexual Activity No sexual activity data on record; No partner data on record
Contraception No contraception data on record
Medical History
Surgical History

Results Synoptic History Charges SNOMED Addendum Mnemonic Scan Expand

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Amendment*

Final Diagnosis*

Comment*

Internal Consultation*

Clinical History*

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Order None Type

ID	Protocol or Task	Charge Code	Qty
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A1	PASD	88313 (CPT®) [CHG SPECIAL STAINS,GROUP II]	1

Order/Result Diagnoses

SNOMED
No SNOMED codes attached

Epic Anatomic Pathology Outstanding List Schedule In Basket Patient Lists Specimen Inquiry Open Pt Station Telephone Call Orders/Notes Enc Send Letter My Reports Calculator Personalize My Cases Print Help Desk Log Out Epicare Search

Location: 2RCW2 2057 / 1 Res Org: None Weight (kg): 85 (5/20/16) Payor: AMERIHEALTH CARITAS IOWA...
 Allergies: No Known Allergies Iso: Standard BMI: 34.27 (5/19/16)
 Attending: None Code: Prior PCP: None
 Vital Signs: View

Chart Review (Last refresh: 19:10:56)

SnapShot Chart Review

Results Review

13 records match filters, all records loaded Default filter Blau Pathology

Filters: Default filter

S	Serv Date	Enc Date	Enc Type	Type	Service	Author	Autho...	Status	Original Author	Au
	5/21/2016	5/19/2016	Admission (C...	Consults	FOOD & NUTRI...	Stegman, Elisa L, Rd Ld	Dietitian	Addendum	STEGMAN, ELISA L	Di
	5/21/2016	5/19/2016	Admission (C...	Progress Notes	SRG TRANSPL...	Scott, Aaron T, Md	Physici...	Cosign Ne...	SCOTT, AARON T	Ph
	5/21/2016	5/19/2016	Admission (C...	Progress Notes	PHARMACY	Ruth, Denise L, Rph	Pharm...	Signed	RUTH, DENISE L	Ph
	5/21/2016	5/19/2016	Admission (C...	Progress Notes	CRITICAL CAR...	Mohr, Nicholas M, Md	Physici...	Signed	EDWARDS, NICHOLA...	Ph
	5/20/2016	5/20/2016	Anesthesia E...	Anesthesia Postproc...	ANESTHESIA	Becher, Timothy, Crna	Nurse ...	Signed	BECHER, TIMOTHY	Nu
	5/20/2016	5/19/2016	Admission (C...	Procedures		Katz, Daniel A, Md	Physici...	Unsigned T...	KATZ, DANIEL	Ph
	5/20/2016	5/19/2016	Admission (C...	Progress Notes	CRITICAL CAR...	Mohr, Nicholas M, Md	Physici...	Signed	COONROD, PETER E	Ph
	5/20/2016	5/19/2016	Admission (C...	Progress Notes	SRG TRANSPL...	Khan, Aamir A, Md	Physici...	Cosign Ne...	KHAN, AAMIR A	Ph
	5/20/2016	5/20/2016	Anesthesia E...	Anesthesia Plan	ANESTHESIA	Becher, Timothy, Crna	Nurse ...	Addendum	BECHER, TIMOTHY	Nu
	5/20/2016	5/20/2016	Anesthesia E...	Anesthesia Preproc...	ANESTHESIA	Becher, Timothy, Crna	Nurse ...	Addendum	BECHER, TIMOTHY	Nu
	5/19/2016	5/19/2016	Admission (C...	H&P	SRG TRANSPL...	Khan, Aamir A, Md	Physici...	Cosign Ne...	KHAN, AAMIR A	Ph
	5/19/2016	5/19/2016	Admission (C...	H&P	CRITICAL CAR...	Kealey, Gerald P, Md	Physici...	Signed	COONROD, PETER E	Ph
	5/19/2016	5/19/2016	Admission (C...	Event	Super Triage	Simmons, Jonathan S...	Physici...	Signed	SIMMONS, JONATHA...	Ph

Back |

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 University of Iowa Health Care

[Open this encounter \(5/19/16 2RCW2\)](#)
[Jump to Notes Activity](#)

University of Iowa Hospitals and Clinics 200 HAWKINS DRIVE
 IOWA CITY, Iowa 52242-1084

Visit Summary 5/19/2016 Jocelyn J Johnson | MRN: : 10119561

Visit Information
 5/19/2016 7:40 PM Provider Daniel A Katz, MD Department 2rcw2 Encounter # 333070930

Event Info
 Author Simmons, Jonathan S, MD Note Status Signed Last Update User Simmons, Jonathan S, MD Last Update Date/Time 5/19/2016 4:02 PM

Event by Simmons, Jonathan S, MD at 5/19/2016 4:00 PM
 Author: Simmons, Jonathan S, MD Service: Super Triage Author Type: Physician-Staff
 Filed: 5/19/2016 4:02 PM Note Time: 5/19/2016 4:00 PM Status: Signed
 Editor: Simmons, Jonathan S, MD (Physician-Staff)

Super Triage Physician Note

Date: 5/19/2016

Patient Location: OR

Referring LIP: AHARI, ABDI
 Referring LIP Phone:
 Transferring Facility: MASON CITY-MERCY N IOWA
 Transferring Facility Contact:
 Transferring Facility Phone: 641-428-7267

Epic Anatomic Pathology Outstanding List Schedule In Basket Patient Lists Specimen Inquiry Open Pt Station Telephone Call Orders/Notes Enc Send Letter My Reports Calculator Personalize My Cases Print Help Desk Log Out EpicCare Search

Case Results Location: 2RCW2 205 / 1 Res Org: None Weight (kg): 85 (5/20/16) Payor: AMERIHEALTH CARITAS IOWA... Allergies: No Known Allergies Iso: Standard BMI: 34.27 (5/19/16) PCP: None Attending: None Code: Prior Vitals: View

Results Review (Last refresh: 5/21/2016 19:14:05) ? Resize

SnapShot Back Forward View Hide Tree Ref Range Load All Flowsheet Graph Time Mark Refresh Legend Options

Search: Hide data prior to: 5/19/2016 Use Date Range Wizard

ALL TOPICS

Results

LABORATORY RESULTS

- ELECTROLYTE/BUN/CRT
- CBC AND BLOOD SMEAR
- WBC DIFFERENTIAL
- RENAL/CALCIUM
- ENDOCRINE-GLUCOSE/INSULIN
- LIVER FUNCTION
- COAGULATION
- CRITICAL CARE/NICU LAB TESTS
- BLOOD BANK-TRANSFUSION
- EXTRA TUBE STORED IN LAB
- PREGNANCY/HCG TESTING

RADIOLOGY RESULTS

DIAGNOSTIC IMAGING ORDERABLES

ANATOMIC PATHOLOGY

SURGICAL PATHOLOGY

OTHERS

	6	5	4	3	2	1
	5/19/2016 2005	5/19/2016 2105	5/20/2016 0430	5/20/2016 0909	5/20/2016 1523	5/21/2016 0337
ELECTROLYTE/BUN/CRT						
Sodium			140		146	139
Potassium			4.0		3.5	4.0
Chloride			103		112	103
CO2			23		20	24
Anion Gap			14		14	12
BUN			3		3	4
Creatinine		0.8 *		0.7 *	0.7 *	
Calculated GFR			82		>90	>90
CBC AND BLOOD SMEAR						
WBC Count			12.7		10.6	12.8
RBC Count			4.19		4.21	4.08
Hemoglobin			12.9		13.0	12.5
Hematocrit			37		38	37
MCV (Mean Corpuscular Volume)			89		89	90
MCH (Mean Corpuscular Hemoglobin)			31		31	31
MCHC (Mean Corpuscular Hemoglobin Concentration)			35		35	34
Platelet Count			269		238	213
MPV (Mean Platelet Volume)			10.0		9.2	9.7
RBC Dist Width-STD			40.6		41.7	42.5
RBC Distrib Width			12.6		12.7	12.9
Nucleated RBC			0		0	0
WBC DIFFERENTIAL						
Neutrophils-Auto Diff						10740
Lymphocytes-Auto Diff						1240
Monocytes-Auto Diff						710
Eosinophils-Auto Diff						70
Basophils-Auto Diff						20
Immature Granulocytes						40
% Neutrophils-Auto Diff						83.8
% Lymphocytes-Auto Diff						9.7
% Monocytes-Auto Diff						5.5
% Eosinophils-Auto Diff						0.5
% Basophils-Auto Diff						0.2
% Immature Granulocytes						0.3

Expand Collapse

More Activities Extended View: Trend data within the date range (6 columns loaded; there are more)

Results Future/Standing Orders Verbal Order Cosign

JOHN L BLAU 7:14 PM

Case Results

Allergies: No Known Allergies
Attending: None

Res Org: None Weight (kg): 85 (5/20/16)
Iso: Standard BMI: 34.27 (5/19/16)
Code: Prior Vital: View
Payor: AMERIHEALTH CARITAS IOWA...

Specimen Inquiry: 16U-142H00072

Refresh Open Specimen Result Entry Specimen Update Labels & Docs Patient Inquiry

Specimen Inquiry

16U-142H00072 Instrument ID: 10139902

Blood

Coll. Dept: SIC1 Collected Today 0337 by Lipinski, Teresa M, RN
Location: 2RCW2, 2057, 1 Container: 1 LAV

Specimen Tracking

Event	Detail	User	Location
05/21/2016		Edi, Incoming Lab Instruments	HLAB
0348 Charge Triggered	Differential	Bkr, Background	HLAB
0348 Result Filed To Chart	CBC	Bkr, Background	HLAB
0348 Interfaced Result Processed	Results:H183161, H183162	Edi, Incoming Lab Instruments	HLAB
0348 Interfaced Result Filed	Differential	Edi, Incoming Lab Instruments	HLAB
0348 Result Final Verified	Differential	Edi, Incoming Lab Instruments	HLAB
0348 Interfaced Result Filed	CBC	Edi, Incoming Lab Instruments	HLAB
0348 Result Final Verified	CBC	Edi, Inc Results/Orders	HLAB
0348 Interfaced Result Received	Received into UIHC HOSPITAL LAB	Edi, Incoming Lab Instruments	HLAB
0342 Received	Tests CBC,Differential	Cyrus, Sarah M	HLAB
0342 Order Sent To Instrument	Date/Time: 5/21/2016 0337 CDT, Collector: Lipinski, Teresa M, RN	Cyrus, Sarah M	HLAB
0337 Collection Updated	From Order transmittal	Lipinski, Teresa M, RN	HLAB
0332 Specimen Created		Lipinski, Teresa M, RN	SIC1

Instrument ID: 10139902

CBC

Res	Component	Value	Units	!	Δ	L	IE	R	Ref. Range	Chart	Trend→	PV
1	WBC	12.8	K/MM3	!				3.7-10.5	3.7-10.5	10.6		
1	RBC	4.08	M/MM3					4.00-5.20	4.00-5.20	4.21		
1	Hb	12.5	g/dL					11.9-15.5	11.9-15.5	13.0		
1	Hct	37	%					35-47	35-47	38		
1	MCV	90	fL					82-99	82-99	89		
1	MCH	31	PG					25-35	25-35	31		
1	MCHC	34	%					32-36	32-36	35		
1	Plt #	213	K/MM3					150-400	150-400	238		
1	Plt comment									
1	MPV	9.7	fL					9.4-12.3	9.4-12.3	9.2		
1	RDWSD	42.5	fL					36.4-46.3	36.4-46.3	41.7		
1	RDW	12.9	%					9.0-14.5	9.0-14.5	12.7		
1	NRBC	0	/100 WBC							0		
1	SRV											

Method: UIHC XN-2 Last received: 5/21/2016 0342 Last verified: 5/21/2016 0348 by Edi, Inc Results/Orders

Differential

On the other hand...

...things may not be as integrated as one would expect



Image from : http://www.teradatamagazine.com/tdmo_assets/tdmo_images/one_size_headline.jpg



Image from:
<http://static1.squarespace.com/static/53a60116e4b0488fb14d69d8/t/5446cbe3e4b0dbeb387ec342/1413925867296/>

Epic Anatomic Pathology Outstanding List Schedule In Basket Patient Lists Specimen Inquiry Open Pt Station Telephone Call Orders/Notes Enc Send Letter My Reports Calculator Personalize My Cases Print Help Desk Log Out **SUP** **Case Results**

Views Open Remove All Case Info Chart Review Case Builder Amendment Preview Case Report Advance Status Assign Final Verify Case Inquiry Case QA Prelim Verify

Cases

Case Summary History Hot Seat Gyn History Billing

Specimens

ID	Protocol	Source	Description	Collected	Received
A	Omentum, biopsy	Omentum	omentum nodule is this invasive cancer or not	05/06/16 0854	05/06/16 0900

Results Synoptic History Charges SNOMED Addendum Save Next Cancel Mnemonic Scan Expand

Appendix - All Specimens

STAGE (pTNM) (Note !)

TNM Descriptors

- Not applicable
- m (multiple primary tumors)
- r (recurrent)
- y (post-treatment)

Primary Tumor (pT)

- pTX: Primary tumor cannot be assessed
- pT0: No evidence of primary tumor
- pTis: Carcinoma in situ: intraepithelial or invasion of lamina propria
- pT1: Tumor invades submucosa
- pT2: Tumor invades muscularis propria
- pT3: Tumor invades through the muscularis propria into the subserosa or mesoappendix**
- pT4: Tumor penetrates visceral peritoneum, including mucinous peritoneal tumor ...
- pT4a: Tumor penetrates visceral peritoneum, including mucinous peritoneal tumor ...
- pT4b: Tumor directly invades other organs or structures

Regional Lymph Nodes (pN)

pNX: Cannot be assessed

- pN0: No regional lymph node metastasis
- pN1: Metastasis in 1 to 3 regional lymph nodes
- pN2: Metastasis in 4 or more regional lymph nodes
- No nodes submitted or found
- Number of Lymph Nodes Examined

Clear Current Form Edit Forms

Current Case

Surgical Pathology Exam

Specimens

A	Omentum, omentum nodule is this invasive cancer or not
B	Omentum, omentum
C	Mesentery, small bowel mesenteric nodule
D	Colon, specify, right colon small bowel and colon margins
E	Tissue, specify, small bowel nodules
F	Spleen, spleen
G	Omentum, additional omentum
H	Tissue, specify, colon nodules
I	Tissue, specify, Right lower quadrant pelvic peritoneum
J	Tissue, specify, Left lower quadrant pelvic peritoneum
K	Tissue, specify, Pelvic nodules
L	Tissue, specify, Right upper quadrant peritoneum
M	Tissue, specify, Ligamentum teres

Diagnosis

- A. Omentum, biopsy:
Low grade appendiceal mucinous neoplasm (LAMN).
- B. Omentum, omentectomy:
Low grade appendiceal mucinous neoplasm (LAMN).
- C. Mesentery, excision:
Low grade appendiceal mucinous neoplasm (LAMN).
- D. Terminal ileum and right colon, resection:
Low grade appendiceal mucinous neoplasm (LAMN) diffusely involving the appendix with additional deposits on the serosal surface of cecum and terminal ileum.
Margins are uninvolved.
Six benign lymph nodes.
ELEVEN (11) ADD'L NODES IN D18-23.
- E. Small intestine nodules, excision:
Low grade appendiceal mucinous neoplasm (LAMN).
- F. Spleen, splenectomy:
Low grade appendiceal mucinous neoplasm (LAMN).
- G. Omentum, omentectomy:
Benign adipose tissue

Case Status: Gross Description Done
Test Status: Resulted

Location: None Res Org: None Weight (kg): 71.2 (5/10/16) Payor: BC/BS FEDERAL
 Allergies: Other Agent Iso: Standard BMI: 28.89 (12/28/15) PCP: Dale E Bieber, MD
 Attending: None Code: Prior Vitals: View

MyChart: Active

Case Builder

Accept Cancel Changes Clear Changes Intra-op Grossing Case Results AP History CC Results Case Info Link Orders Show Deleted Show Block Comm Log

Case type: SURGICAL PATHOLOGY carcinoma vs inflammatory papule vs other
 Order Question
 Reflex testing options

Case number: [REDACTED]

Users Assigned Role
 FISHBURN, AARON J Grossing Assistant

Specify current known or suspected infectious disease.
 Number of specimens:
 Specimen A source:
 Specimen A site:
 Use a specimen from this case sent for Immunopathology?

Answer
 I understand and agree that reflex testing may occur per established procedures (see link below).
 None
 1
 Skin shave
 left chest
 No

Add Specimen (Alt+D)

ID	Protocol (Alt+1)	Source	Code (CPT®)	Description	Coll Date	Coll Time	Collector	Coll Dept	Task Flags
A	Skin, biopsy, other	Skin, other, specify	88305, 88305	LT CHEST	5/20/2016	03:45 PM	KEOMANIVC DERMATOLO		<input checked="" type="checkbox"/> <input type="checkbox"/>

Add Task (Alt+R)

ID	Task (Alt+2)	Slides	Code (CPT®)	Qty	Task Note	Task Flags
A1	H&E Slide	1				

More Activities

Advantages of an Integrated LIS

- No need to interface between EMR and LIS
 - No HL7
 - Rich Text and images in EMR results without PDF

Case Results

Views Open Remove All Case Info Chart Review Case Builder Amendment Preview Case Report Advance Status Assign Final Verify Case Inquiry Case QA Prelim Verify

Cases S16-015116

Case Summary History Hot Seat Gyn History Billing

Responsible: Rastogi, Prerna, MD Status: Signed Out
RQ68965 submitted by Great River Medical Center

ID	Protocol	Source	Description	Collected	Received
A	UIDL KIDNEY BIOPSY	Kidney Biopsy, Native	LM, EM, IF	05/04/16 0900	05/04/16 1217

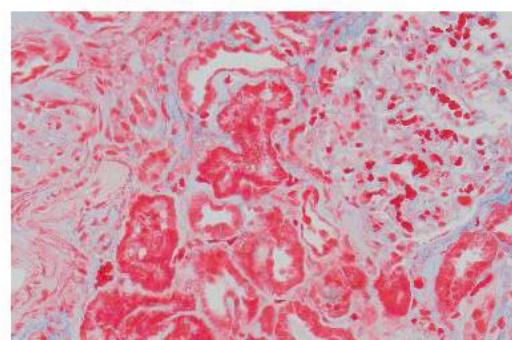
Results Synoptic History Charges SNO MED Addendum Mnemonic Scan Expand

Microscopic Description

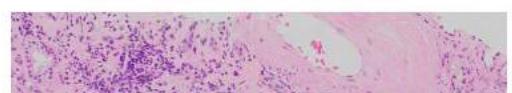
LIGHT MICROSCOPY: Sections stained with H+E, PAS, trichrome and Jones silver stains contain renal cortex with 15 glomeruli, 5 of which, globally sclerosed. The glomeruli are normocellular, or show mild mesangial expansion, capillary loop wrinkling and periglomerular fibrosis. There is severe interstitial fibrosis and tubular atrophy. Admixed in the predominantly fibrotic interstitium there is moderate amount of lymphoplasmacytic interstitial inflammation. There is moderate arteriosclerosis and arteriolar hyaline sclerosis. A Congo red stain for amyloid is negative.

IMMUNOFLUORESCENCE: Sections stained with IgG, IgA, IgM, C3, C1q, albumin, kappa and lambda light chains and fibrinogen contain renal cortex with 5 glomeruli, three (3) of which are globally sclerosed/ obsolete. Glomerular immunofluorescence staining is negative / nonspecific in the glomeruli for immunoglobulins, light chains, complements and fibrin. There is normal, mild linear albumin staining in the glomerular capillary loops, and tubular basement membranes. Tubular casts and tubular cell protein droplets present stain equally with kappa and lambda light chains. Negative control is negative.

ELECTRON MICROSCOPY: Toluidine blue stained sections contain renal cortex with 2 glomeruli, one (1) of which is globally sclerosed. Ultrastructural glomerular evaluation shows segmental glomerular basement membrane corrugation. There is moderate podocyte epithelial foot process effacement. There is no evidence of immune complex mediated type electron dense deposits. Tubulo-reticular inclusions are not identified.



Trichrome: Interstitial fibrosis, inflammation and arteriolar section with hyaline.



A1	<input checked="" type="checkbox"/> LAMBDA (IFM)	PLACEHOLDER FOR 88346]
A1	<input checked="" type="checkbox"/> IGM (IFM)	88346 (CPT®) [BEAKER AP PB CHARGE BUNDLER PLACEHOLDER FOR 88346]
A1	<input checked="" type="checkbox"/> C3 (IFM)	88346 (CPT®) [BEAKER AP PB CHARGE BUNDLER PLACEHOLDER FOR 88346]
A1	<input checked="" type="checkbox"/> Fibrinogen (IFM)	88346 (CPT®) [BEAKER AP PB CHARGE BUNDLER PLACEHOLDER FOR 88346]
A1	<input checked="" type="checkbox"/> Albumin (IFM)	88346 (CPT®) [BEAKER AP PB CHARGE BUNDLER PLACEHOLDER FOR 88346]
A1	<input checked="" type="checkbox"/> CIQ (IFM)	88346 (CPT®) [BEAKER AP PB CHARGE BUNDLER PLACEHOLDER FOR 88346]
A1	<input checked="" type="checkbox"/> EM Charge Complete Prof	88348 (CPT®) [ELECTRON MIC DX]
A1	<input checked="" type="checkbox"/> EM Charge Complete Tech	88348 (CPT®) [HB ELECTRON MICROSCOPIC EXAMINATION]
A1	<input checked="" type="checkbox"/> Congo Red	88313 (CPT®) [CHG SPECIAL STAINS, GROUP II]

Order/Result Diagnoses

SNOMED

No SNOMED codes attached

Report Viewer

SnapShot

Chart Review

Care Everywhere

Results Review

Synopsis

Demographics

Growth Chart

Summary Wind...

Medications

Report Viewer

Location: None Res Org: None Weight (kg): 84.1 (2/4/16)
Allergies: Other Agent, Sulfa (S...) Iso: Standard BMI: 30.85 (2/25/15)
Attending: None Code: Prior Payor: MEDICARE A & B
Research: Active

MyChart: Code...

Report History | 1 View Pane 1 | 2 View Pane 2 | Split Up/Down | Split Left/Right | Detach Window

1 S16-015116 05/04/2016 0900 SURGICAL PATHOLOGY EXAM

Received in Formalin labeled with Fowler, Keith and date of birth, are two fragments of white-tan cylindrical soft tissue measuring 0.2 and 1.0 cm in length and 0.1 cm in diameter. All wrapped in A1 for light microscopy.

Received in Glutaraldehyde labeled with Fowler, Keith and date of birth, are two fragments of white-tan cylindrical soft tissue measuring 0.5 cm each in length and 0.1 cm in diameter. All submitted for electron microscopy.

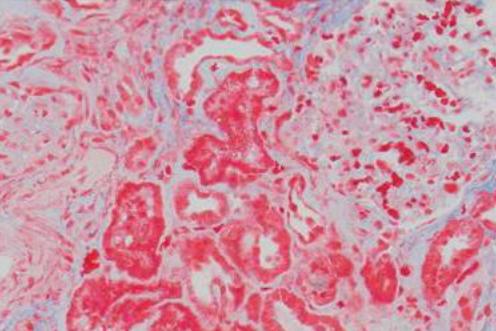
Received in Michel's solution labeled with Fowler, Keith and date of birth, are two fragments of white-tan cylindrical soft tissue measuring 0.1 and 0.7 cm in length and 0.1 cm in diameter. All submitted for immunofluorescent studies.

Microscopic Description

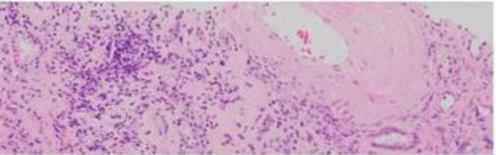
LIGHT MICROSCOPY: Sections stained with H&E, PAS, trichrome and Jones silver stains contain renal cortex with 15 glomeruli, 5 of which, globally sclerosed. The glomeruli are normocellular, or show mild mesangial expansion, capillary loop wrinkling and periglomerular fibrosis. There is severe interstitial fibrosis and tubular atrophy. Admixed in the predominantly fibrotic interstitium there is moderate amount of lymphoplasmacytic interstitial inflammation. There is moderate arteriosclerosis and arteriolar hyaline sclerosis. A Congo red stain for amyloid is negative.

IMMUNOFLUORESCENCE: Sections stained with IgG, IgA, IgM, C3, C1q, albumin, kappa and lambda light chains and fibrinogen contain renal cortex with 5 glomeruli, three (3) of which are globally sclerosed/ obsolete. Glomerular immunofluorescence staining is negative / nonspecific in the glomeruli for immunoglobulins, light chains, complements and fibrin. There is normal, mild linear albumin staining in the glomerular capillary loops, and tubular basement membranes. Tubular casts and tubular cell protein droplets present stain equally with kappa and lambda light chains. Negative control is negative.

ELECTRON MICROSCOPY: Toluidine blue stained sections contain renal cortex with 2 glomeruli, one (1) of which is globally sclerosed. Ultrastructural glomerular evaluation shows segmental glomerular basement membrane corrugation. There is moderate podocyte epithelial foot process effacement. There is no evidence of immune complex mediated type electron dense deposits. Tubulo-reticular inclusions are not identified.



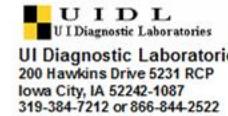
Trichrome: Interstitial fibrosis, inflammation and arteriolar section with hyaline.



S16-015116

Preview Case Report

Result Report



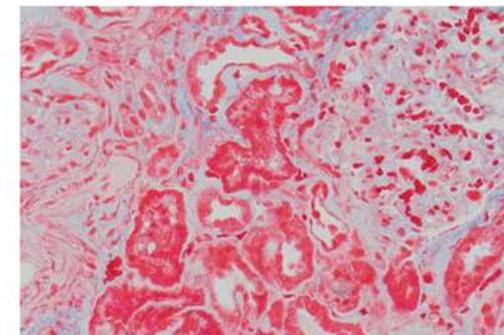
UI Diagnostic Laboratories
200 Hawkins Drive 5231 RCP
Iowa City, IA 52242-1087
319-384-7212 or 866-844-2522



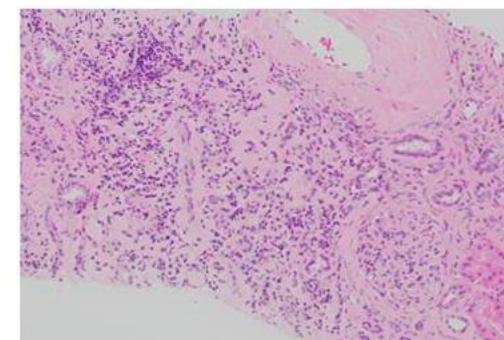
S16-015116

immunofluorescence staining is negative / nonspecific in the glomeruli for immunoglobulins, light chains, complements and fibrin. There is normal, mild linear albumin staining in the glomerular capillary loops, and tubular basement membranes. Tubular casts and tubular cell protein droplets present stain equally with kappa and lambda light chains. Negative control is negative.

ELECTRON MICROSCOPY: Toluidine blue stained sections contain renal cortex with 2 glomeruli, one (1) of which is globally sclerosed. Ultrastructural glomerular evaluation shows segmental glomerular basement membrane corrugation. There is moderate podocyte epithelial foot process effacement. There is no evidence of immune complex mediated type electron dense deposits. Tubulo-reticular inclusions are not identified.



Trichrome: Interstitial fibrosis, inflammation and arteriolar section with hyaline.



H & E: Interstitial inflammation

On the other hand...

...sometimes an HL7 interface is useful

- An interface engine/middleware may add more flexibility
- Ability to use rules to intercept and/or alter certain messages

Advantages of an Integrated LIS

- Modular components allow easy expansion of future modules
 - Most EHRs have basic AP and CP modules
 - Surgical Pathology
 - Cytology
 - Hematopathology
 - Clinical Chemistry
 - Microbiology
 - Molecular, HLA, Cytogenetics, Blood Banking may be added on

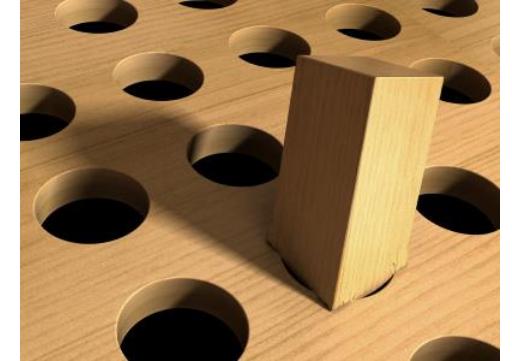


Advantages of an Integrated LIS



- Maintenance
 - LIS analysts specializing in stand-alone systems are quickly going the way of the dinosaurs...
- Central IT can help support it!
 - Hard to keep and find replacements for IT personnel specializing in both LISs and the Labs themselves
 - Share resources amongst all of Central IT
 - Allows for easier cross-training and buy-in from other IT-areas within the institution (eliminates the labs as a “black-box” area, not for the faint of heart)

Disadvantages of an Integrated LIS



- One size doesn't fit all
- Specialized laboratory functions may not be available or may be “in development”
 - Blood Bank (requires FDA approval)
 - HLA
 - Cytogenetics
 - Molecular
 - Autopsy/Morgue
 - Laboratory Outreach
 - Client Relations Management (CRM) and specimen tracking

Disadvantages of an Integrated LIS



- Supported by central IT
 - Upgrades on an institutional schedule
 - Must fight for priority and resources among other departments
 - DO YOU UNDERSTAND YOUR CENTRAL IT GOVERNANCE STRUCTURE???
 - Some IT people don't view Pathology as a clinical area...
 - Depending on the institution, IT specialists for Pathology may have no lab-experience
 - Report writing requests go in queue with every other department

Disadvantages of an Integrated LIS

- Front-end EHR integration can create major back-end technical issues
 - Harder for unified databases to serve several different applications
 - Making a minor tweak may require the alteration of substantial sections of code
 - Changes may have additional unintended consequences – substantial testing is required
 - Vendors always amenable to work with you to resolve YOUR issues
 - Fee for services can run into the hundreds of thousands to millions for some implementations

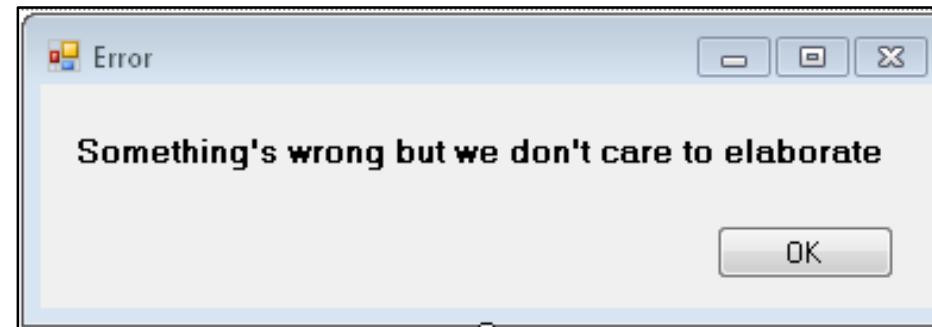


Image from: <http://unixwiz.net/images/bogus-error.png>

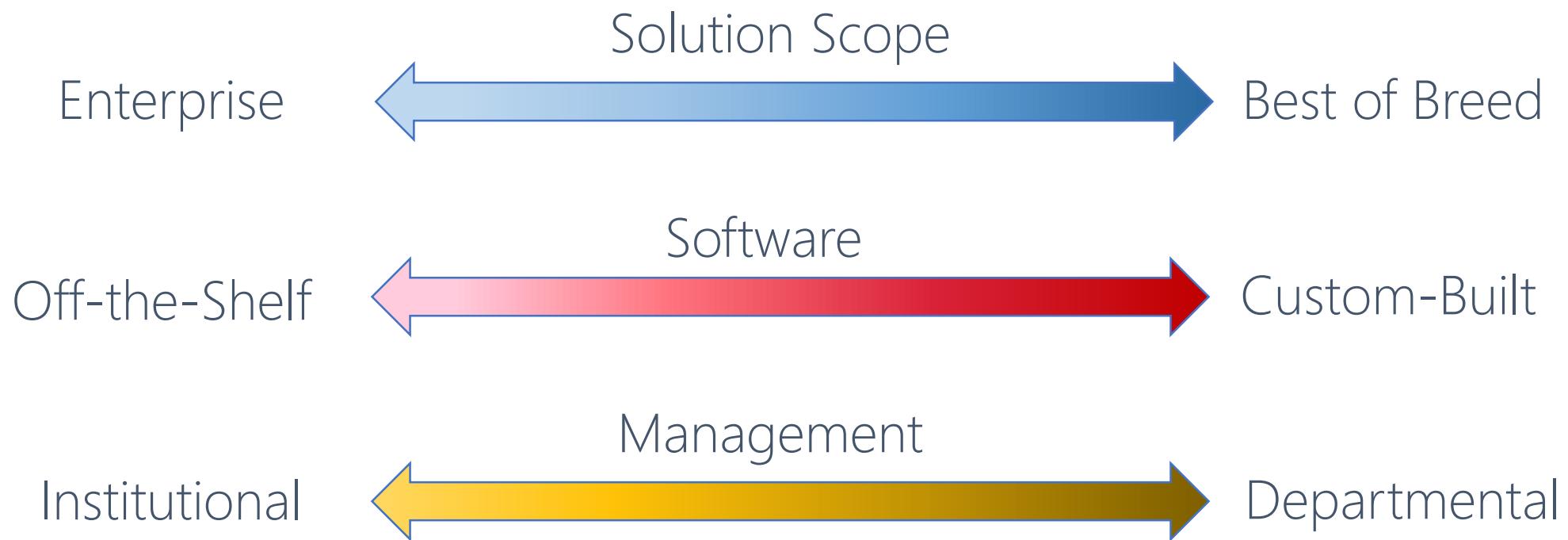
Disadvantages of an Integrated LIS

- Lack of interoperability with other information systems



From: <http://searchhealthit.techtarget.com/feature/CIOs-address-EHR-problems-focus-on-lack-of-interoperability>, May 2016

Reality is a Spectrum



Future Integration Issues

- Imaging and Integration
 - Where does digital pathology lie on the integration vs interoperability spectrum?
 - Should the LIS and the Digital Pathology PACS/Viewer/System be integrated or interoperable?
 - Should a Digital Pathology system integrate with the EHR? With the Radiology PACS? Be a standalone product?
- What else?
 - This is where you come to the microphones and say stuff...

Questions?

- david.mcclintock@uchospital.edu
- john-blau@uiowa.edu