

A Computer Generated Randomized, Sub-Specialized Over-Read System for Quality Assurance: Raising the Bar of the Peer Review Process

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Disclosures

- No disclosures or conflicts of interest

Introduction

- Peer review is mandated by The Joint Commission
- In order to achieve MRI accreditation, the ACR mandates that 5% of MRI studies be peer reviewed
- The peer review process is one mechanism to evaluate, improve and maintain the quality of radiology interpretations

Introduction

- Despite the requirements, and potential benefits of a peer review system, this process adds additional work to the busy day of the radiologist and is not reimbursed
- Failure or reluctance to comply is common

Purpose

- The purpose of this study was to build and evaluate a radiology peer review application that
 - Is paperless and web based
 - Randomly selects examinations in order to remove selection bias
 - Assigns examinations to a sub-specialists for review
 - Is configurable by an administrator
 - Is easy to administrate
 - Is able to provide data in a form that is usable by hospital quality management and credentialing departments
 - Is intuitive, and does not disrupt the radiologist workflow

Methods

- Rhode Island and The Miriam Hospitals are Brown University teaching hospitals and combined, do 487,000 exams per year
- There are 49 attending radiologists who participate in the peer-review process
- There are 28 radiology residents and 5 fellows.

Methods

- Vendor: Insight Health Solutions is a risk management and quality improvement software company based in Rhode Island
- Their products include OccurrenceInsight™, PerformanceInsight™ and now RadiologyInsight™
- The development of this application was a collaborative effort between Insight Health Solutions, the QA division of The Department of Diagnostic Imaging, and Lifespan IT

Radiology Insight: Technical Specifications

- Intel based server running Microsoft Windows Server and Microsoft SQL Server 2000 or above
- Developed in .NET and use .NET framework
- Microsoft Internet Explorer (IE) Browser

Equipment

- PACS: GE Centricity 2.1
- RIS: Siemens Novius Version 27
- Application is viewed using Internet Explorer (Microsoft) running on a virtual machine (VMware) loaded onto our PACS workstation.

Interfaces with RIS and HIS

- Application interfaces with
 - Radiology Information Systems for results via cloverleaf, using standard Health Level 7 (HL7) interface version 2.3
 - Hospital Information system for orders via cloverleaf using HL7 feed

Methods

- **We reviewed all of our examinations and selected the 97 that accounted for 90% of all exams performed.**
- **Each exam was assigned to 1 of 9 sub-specialty groups**
 - Chest
 - MR Neuro
 - MR Body
 - Body
 - Mammography
 - MSK
 - Pedi
 - Nuc and PET
 - Cardiac
- **Each of the 49 radiologists was assigned to one of the groups**

Number of Readers Assigned to Each Group

Cardiac	2
MR Neuro	5
MR Body	4
Mammo	5
Body	10
MSK	6
Pedi	6
Nucs PET	3
Chest	7

Percentage of Studies Assigned to Each Group

CHEST	2%	
PEDI	2%	
MSK	2%	
BODY	2%	
MRI NEURO	5%	ACR REQUIREMENT
NUCS	5%	LOW VOLUME
CARDIAC	20%	LOW VOLUME
SCREEN MAM	20%	LOW VOLUME
MRI BODY	20%	LOW VOLUME AND ACR

Number of Procedure Codes In Each Group

MSK	33
BODY	16
MRI NEURO	15
NUCS AND PET	15
CARDIAC	6
MRI BODY	7
CHEST	4
MAMMO	1
PEDI	BY AGE
TOTAL	97

Discrepancy Categories

Score	Language	Clinical significance		
1	Concur with Interpretation			
2	Interpretation not ordinarily expected to be made	a Unlikely to be clinically significant		
		b Likely to be clinically significant		
3	Interpretation should be made most of the time	a Unlikely to be clinically significant		
		b Likely to be clinically significant		
4	Interpretation should be made almost every time	a Unlikely to be clinically significant		
		b Likely to be clinically significant		
5	Technical Problem- not due to reader	a Unlikely to be clinically significant		
		b Likely to be clinically significant		

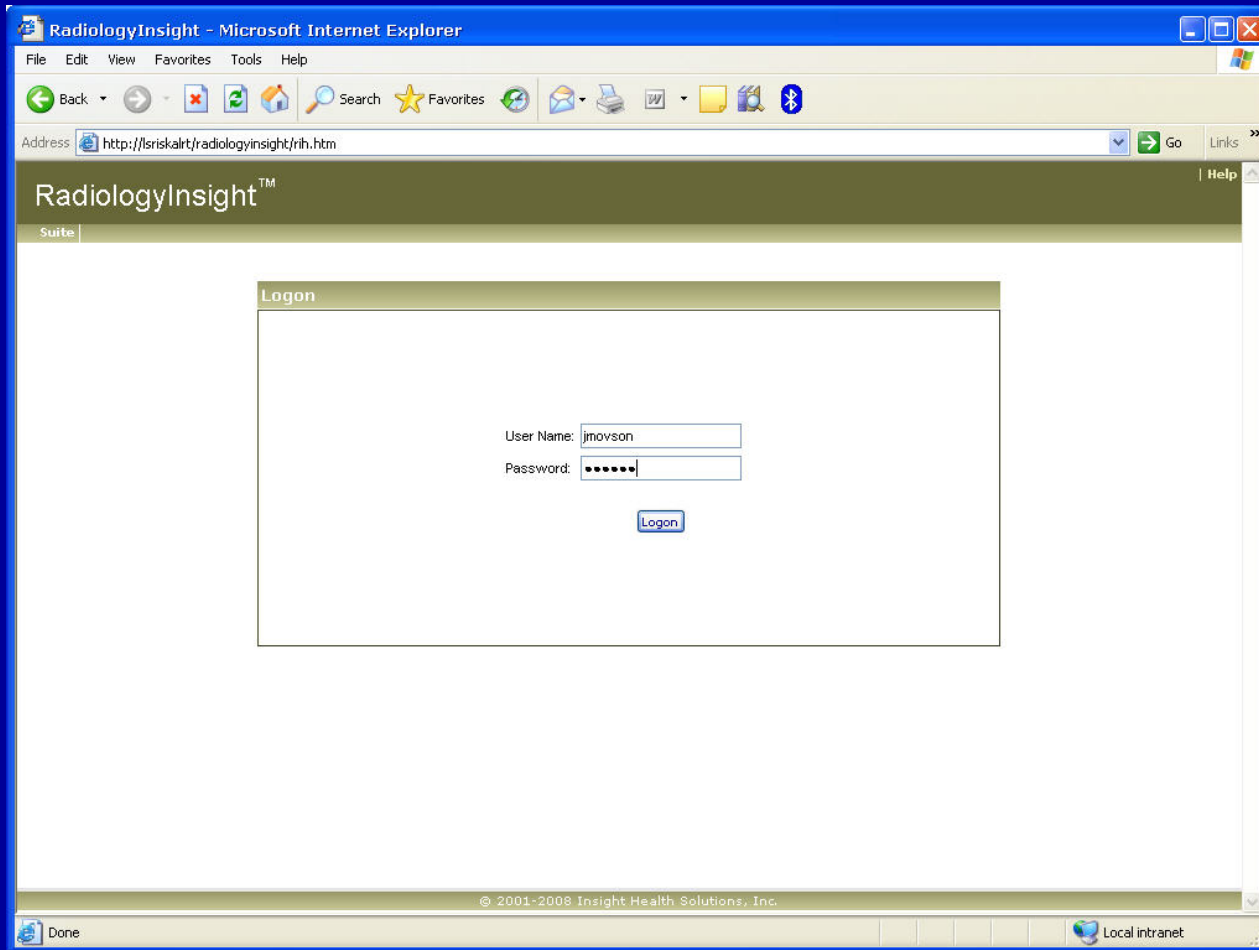
How The Application Works

- The application selects the 97 procedure codes from all of the procedures that cross over and matches them to the patient demographics from the ADT feed
- It selects the assigned percentage of exams based on administrator settings
- It then randomly distributes the cases amongst the pool of readers in each sub-specialty group
- An email is sent weekly to each radiologist reminding them that they have exams to review.

Radiologist Workflow

- Application is launched in Internet Explorer
- A list of studies to review is provided to each radiologist
- For web based PACS systems there is a URL link which could be used to launch the exam in PACS
- The examinations are reviewed in PACS.
- The very simple “electronic form” is completed
- The completed form with all pertinent data is stored in the database

Radiologist Workflow



Radiologist Workflow

RadiologyInsight™ Logout | Help

Suite | Radiology Insight Functions | Session Timeout in: 19:39 Refresh Session

Rhode Island Hospital | Movson, Jonathan

Report Occurrence

Select Report

Select an Occurrence Report: ▼

Radiologist Workflow

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Print Mail Stop Bluetooth

Address <http://sriskalrt/radiologyinsight/rjh.htm> Go Links

RadiologyInsight™ Logout | Help

Suite **Radiology Insight Functions** Session Timeout in: 12:36 Refresh Session

Rhode Island Hospital Movson, Jonathan

Report Occurrence

Select Report	Select Patient	Start Report						Random CHEST
Accession #	MRN	PACS	Account #	Last Name	First Name	Birth Date	Exam Date	
15318591		R15318591	143655074			12/05/1937	10/17/2009	
15319414		R15319414	143990273			02/18/1974	10/18/2009	
15319920		R15319920	143978732			03/10/1962	10/18/2009	
15324439		R15324439	143412617			08/08/1946	10/21/2009	
15344044		R15344044	144093358			03/28/1960	10/28/2009	
15344679		R15344679	143963437			10/24/1936	10/28/2009	
15353934		R15353934	143462638			04/09/1941	11/01/2009	
15354767		R15354767	144399292			06/16/1928	10/31/2009	
15355455		R15355455	144401122			09/02/1939	11/01/2009	
15358071		R15358071	144348638			09/23/1936	11/03/2009	

1

Radiologist Workflow

Report Occurrence		
Select Report	Select Patient	Start Report
Required Fields Appear in Dark Red.		
Random CHEST		
Is there a discrepancy?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Score:	I concur with interpretation ▼	
Press Finish To Save <input type="button" value="Previous"/> <input type="button" value="Finish"/>		

Radiologist Workflow

Random CHEST	
Is there a discrepancy?	<input checked="" type="radio"/> Yes <input type="radio"/> No
Nature of the discrepancy?	<input checked="" type="radio"/> Missed finding <input type="radio"/> Misinterpretation of finding <input type="radio"/> Finding not communicated <input type="radio"/> Wrong protocol <input type="radio"/> Technically inadequate study <input type="radio"/> Inappropriate f/u recommendation <input type="radio"/> Grammatical error in the report
Describe the discrepancy.	Missed Lung Nodule
Is the discrepancy clinically significant?	<input type="radio"/> No <input checked="" type="radio"/> Yes
Document Action Taken	<input checked="" type="radio"/> Call to responsible MD <input type="radio"/> Recommend for peer review conference <input type="radio"/> Finding known to clinician
Date MD Called:	11/18/2009
Score:	Diagnosis should be made most of the time
Press Finish To Save <input type="button" value="Previous"/> <input type="button" value="Finish"/>	

Administrator Tools: Adding Users

The screenshot shows a Microsoft Internet Explorer browser window displaying the RadiologyInsight web application. The browser's address bar shows the URL <http://lsriskalrt/RADIOLOGYINSIGHT/RIH.htm>. The application header includes the RadiologyInsight logo, navigation links for 'Suite' and 'Radiology Insight Functions', and a session timeout warning of 19:54. The main content area features a 'Create Occurrence Report' form with three steps. Step 2 is active, showing the 'Occurrence Report Name' as 'Random Mammo'. Below this, there is a section for 'Users that can Abstract' with a dropdown menu set to 'Choose One...' and an 'Add User' button. A list of users is displayed, each with a 'Delete' link and a checkbox:

- Donegan, Linda Delete
- Khalil, Hanan Delete
- Lazarus, Elizabeth Delete
- Mainiero, Martha Delete
- Hillstrom, Mary Delete
- Lourenco, Ana Delete

A 'Continue' button is located at the bottom of the form. The footer of the application displays the copyright notice '© 2001-2008 Insight Health Solutions, Inc.' and a session timeout warning of 19:54. The Windows taskbar at the bottom shows the Start button and several open applications, including 'Sent Items - Microsof...', 'Overreads week of 1...', 'FW: slides - Message ...', 'RadiologyInsight - Mi...', and 'Microsoft PowerPoint ...'. The system clock indicates the time is 2:33 PM on a local intranet.

Administrator Configuration : Percentage Over-Read

Create Occurrence Report

Step 1 | Step 2 | Step 3

Create Occurrence Report Modify Occurrence Report

Occurrence Report: Random Mammo

Patient Required:

Patient List:

Overread SQL:

```
SELECT * FROM vw_AccessNumbers WHERE  
Overread_Group_Main_Desc = 'Mammo' AND  
FACILITY_ID = 3 AND DAYS > 6569 AND PROC_DATE  
Between
```




Random Percent: 20

Quality Assurance Officer

Open Case Summary

No Reviews Pending (Action Required):

Show Filter Options ▾

View	CASE_ID	CASE_DATE	CASE_TYPE	REVIEW_TYPE	REVIEWER	REVIEW_COMP_DATE	REVIEW_DUE_DATE
	459	11/02/2009	HEENT				
	460	11/03/2009	Random Pediatrics				
	461	11/12/2009	Random Body				

Reviews Pending:

Show Filter Options ▾

View	CASE_ID	CASE_DATE	CASE_TYPE	REVIEW_TYPE	REVIEWER	REVIEW_COMP_DATE	REVIEW_DUE_DATE
------	---------	-----------	-----------	-------------	----------	------------------	-----------------

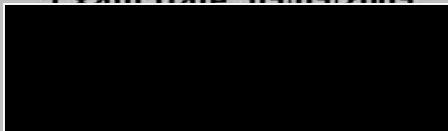
Quality Assurance Officer

View Case

[Return to Open Case Summary](#) | [Coordinator Screen](#) | [Edit Report](#)

Type : **Random Pediatrics**

Red Flag:


Item	Answer
Is there a discrepancy?	Yes
Nature of the discrepancy?	Missed finding
Describe the discrepancy.	focal patchy opacity posterobasilar segment right lower lobe (atelectasis vs infected atelectasis)
Is the discrepancy clinically significant?	Yes
Document Action Taken	Finding known to clinician
Date MD Called:	
Score:	Diagnosis should be made most of the time
Enter Accession Number:	Accession Number: 15223298 Exam Date: 09/09/2009 
User:	Name: ESTRELLA, OWEN Wallach, Michael

QA Officer: Exam Assigned for Adjudication

Open Case Summary


No Reviews Pending (Action Required):

Show Filter Options Choose One... ▾

View	CASE_ID	CASE_DATE	CASE_TYPE	REVIEW_TYPE	REVIEWER	REVIEW_COMP_DATE	REVIEW_DUE_DATE
	460	11/03/2009	Random Pediatrics				
	461	11/12/2009	Random Body				

Reviews Pending:

Show Filter Options Choose One... ▾

View	CASE_ID	CASE_DATE	CASE_TYPE	REVIEW_TYPE	REVIEWER	REVIEW_COMP_DATE	REVIEW_DUE_DATE
	459	11/02/2009	HEENT	HEENT-QA Officer Review	Golding, Daniel		11/27/2009

Results

- During the period between 12/1/08 and 9/30/09, 4378 studies were assigned to 9 sub-specialty radiology groups
- This represents 1.08% of all studies performed during that time period
- From 8/1/09-10/31/09, 2847 studies were assigned which equals 2.33% of all studies performed
- This variation in overall percentage resulted from
 - Adjustments made to percentages during the development period

Compliance Rate: Paper vs Electronic

	Assigned	Completed	Outstanding
Paper Based 12/1/07-9/30/08		737	
Web Based 12/1/08-9/30/09	4378	3658	720

Compliance increased by 500% between the two periods

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	Z	A	
		# of overreads completed per original reader		1 %	2a %		2b %	3a %	3b %	4a %	4b %	5a %	5b %		Total discrepancies (3-4)	% of 3-4									
1																									
2																									
3	At	22	22	100		0		0	0		0	0		0	0		0		0		0	0			
4	Bt	28	28	100		0		0	0		0	0		0	0		0		0		0	0			
5	Br	18	18	100		0		0	0		0	0		0	0		0		0		0	0			
6	Br	23	23	100		0		0	0		0	0		0	0		0		0		0	0			
7	Ct	6	5	83		0		0	1 17		0	0		0	0		0		0		1	17			
8	Ct	9	9	100		0		0	0		0	0		0	0		0		0		0	0			
9	Ct	19	19	100		0		0	0		0	0		0	0		0		0		0	0			
10	Ct	18	18	100		0		0	0		0	0		0	0		0		0		0	0			
11	Dt	13	13	100		0		0	0		0	0		0	0		0		0		0	0			
12	Dt	24	24	100		0		0	0		0	0		0	0		0		0		0	0			
13	Dt	17	16	94		0		0	0	1 6		0		0	0		0		0		1	6			
27	Lc	19	19	100		0		0	0		0	0		0	0		0		0		0	0			
28	Mt	29	29	100		0		0	0		0	0		0	0		0		0		0	0			
29	Mt	19	18	95		0		0	1 5		0	0		0	0		0		0		1	5			
30	Mt	28	28	100		0		0	0		0	0		0	0		0		0		0	0			
31	Mt	4	4	100		0		0	0		0	0		0	0		0		0		0	0			
32	Mt	39	39	100		0		0	0		0	0		0	0		0		0		0	0			
33	Nt	1	1	100		0		0	0		0	0		0	0		0		0		0	0			
34	Nt	21	21	100		0		0	0		0	0		0	0		0		0		0	0			
35	Pt	17	16	94	1	6		0	0		0	0		0	0		0		0		0	0			
36	Pt	13	12	92		0		0	0		0	0		0	1 8		0		0		0	0			
37	Rt	29	29	100		0		0	0		0	0		0	0		0		0		0	0			
38	Rt	10	10	100		0		0	0		0	0		0	0		0		0		0	0			
39	St	13	13	100		0		0	0		0	0		0	0		0		0		0	0			
40	Tt	16	16	100		0		0	0		0	0		0	0		0		0		0	0			
41	Wt	27	26	96		0		0	0		0	0		1 4			0		0		1	4			
42	Wt	7	7	100		0		0	0		0	0		0	0		0		0		0	0			
43	Yt	25	23	92		0		0	2 8		0	0		0	0		0		0		2	8			
44	Total	899	888	99	2	0	0	0	4	0	1	0	1	0	1	0	2	0	0	0	7	1			
45																									
46	Mean	43	22	99	1	#DIV/0!			1		1	0		0	1		1		#DIV/0!		0				
47	2- STDEV																							6.23	
48																									

Limitations Of This Study

- Data collection occurred during a period of “tweaking” of groups and code etc. We feel that the last three months of data reflect future numbers.

Limitations of the Application

- Lack of integration with our non-web based PACS vendor creates less than ideal workflow
- Application cannot differentiate between procedure codes that have images and those that don't

Future Improvements

- In the case of “bundled” exams such as CT Abdomen and Pelvis, it would be advantageous if the parent study (abdomen) containing the images, was chosen when the child (pelvis) was selected
- In a fully integrated system it should be possible to enforce compliance

Conclusion

- Using a web based application compared with a paper based system resulted in a 500% increase in compliance in our study
- The application we helped design, achieved virtually all of the requirements we established for a peer review system
- Peer review applications need to integrate with PACS in order to optimize radiologist workflow and enforce compliance