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CT Protocols: Use of Web-Based Tools to Double-Check our Changes

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Overview:

- Facilities must have a system to review CT protocols
 - Specified by The Joint Commission and the ACR

- Most sites rely on:

- Self-identification and documentation of protocol changes
- Committee review



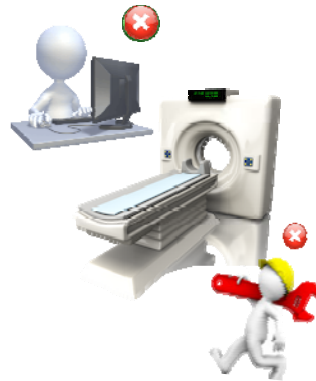
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2

The issue(s)

- Even with oversight
 - Miscommunication or mistakes can cause inadvertent changes
- Changes also occur behind the scenes
 - Calibration / Software upgrades
- 'Paper-based' master protocols may not reflect what is actually programmed
 - Satellite CT offices can be distant from oversight and experts
 - Difficult to identify and troubleshoot issues



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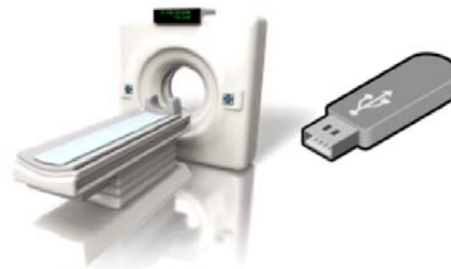
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3

Our solution: Methods

Part 1 – Conversion of XML to Web-Pages

- XML protocol files were exported from 14 CT units
 - Siemens scanners
 - Files represent the programmed protocols
 - Monthly
- A web application was developed to display protocol files on a hospital intranet



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4

Webpage display: Protocol Parameters

Acquisition (beam on) Reconstruction

Range	Abd/Pet	Series Description	Abd/Pet 5.0 B30F	Abd/Pet 2.0 SPO	Abd/Pet 2.0 SPO
MA	900	SliceEffective	5	2	2
Voltage	120	ReconOrder	5	2	2
AECReferenceMAS	200	NoOfImages	100	135	230
CustomMAS	160	Kernel	B30F medium smooth	B30F medium smooth	B30F medium smooth
Care	on	Window	Abdomen	Abdomen	Abdomen
CareDoseType	CARE Dose4D	Comment1	diaphragm to pubic symphysis	diaphragm to pubic symphysis	diaphragm to pubic symphysis
CTDIw	13.48	Comment2			
DI.P	736.68	Transfer1	GFPACS	GFPACS	GFPACS
DoseNotificationValueCTDIvol	50	Transfer2			
DoseNotificationValueDI.P	-1.00	Transfer3	VIMS	VIMS	VIMS
RefTime	0.5	PhaseStart			
ScanTime	9.89	Multiphase			
Delay	30000				
PitchFactor	1				
Feed					
SlicePhysical	1.2				
SliceEffective	5				
Acq.	24A—1.2mm				
Appld	INSPIRATION				
Pulsing	MW(HINDI)				
PulsingStart					
PulsingEnd					

CT committee members can review / audit protocols without physically being at each scanner



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5

Part 2 – Month to Month Review

- The application also compares CT parameters
 - Versus prior month's XML files
- Deviations indicated in red
- Analysis & review requires < 3 hrs/month (all 14 scanners)



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6

Part 2 – Monthly review screenshot – 2 changes

CAREkV	On	On
OptimizeSliderPosition	11	11
Care	On	On
CareDoseType	CARE Dose4D	CARE Dose4D
CTDIw	41.61	41.70
AECReferenceMAs	<-blank->	<-blank->
FastAdjustLimitScanTime	<-blank->	<-blank->
FastAdjustLimitMaxMAs	75%	75%
DoseNotificationValueCTDIvol	50	<-blank->
DoseNotificationValueDLP	<-blank->	<-blank->
RotTime	0.285	0.285
ScanTime	<-blank->	<-blank->

← Insignificant dose change

- This dose notification was inadvertently removed from one coronary CTA protocol at a single CT scanner
 - Difficult to identify without a computer-based analysis



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7

Part 2 – Tally of monthly changes from one scanner

	Total identified			With filters		
	# of protocol variable changes			# of dose* or image quality variable changes		
	Inpatient CT scanner #3			Inpatient CT scanner #3		
	2015	2016	2017	2015	2016	2017
Jan	9	2	0	6	2	0
Feb	77	13	0	74	6	0
March	4	11	0	0	4	0
April	667	40	11	0	2	4
May	0	0	0	0	0	0
June	10	3	0	0	0	0
July	5725	8	0	449	6	0
Aug	0	0	0	0	0	0
Sept	10	18	0	4	8	0
Oct	37	0	15	18	0	2
Nov	4	59		1	15	
Dec	371	1335		2	0	

There were high amounts of changes in 4/2015, 7/2015, 12/2015, and 12/2016

Smarter filters focusing on changes in dose and image quality were applied

Filters reduced reviewable items to manageable levels

Remaining high volume changes were due to added features (e.g.: CarekV)



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8

Part 3 – Comparison to Master XML

- Master Protocols
 - Google docs shared spreadsheet
 - Exported to XML
- Ideal comparison
- Slow iterative process
 - ~ 1 protocol / month
- Month-month comparisons remain as a stopgap



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9

Policy recommendations:

- CT protocol reviews should be performed monthly for new CT installations or if complex / high dose / research scans are commonly used
 - Physician, physicist and CT technologist input is necessary
 - Quarterly reviews may be sufficient when protocols have been standardized
- Use of computer analysis of protocol deviations is recommended to ensure the validity of programmed protocols
- Documentation of protocol changes is needed for committee review
- Vendors must notify the facility when software upgrades can affect the CT calibration or protocol files
- Maintain backup protocol files in case of inadvertent deletion

Thanks for watching!





10