



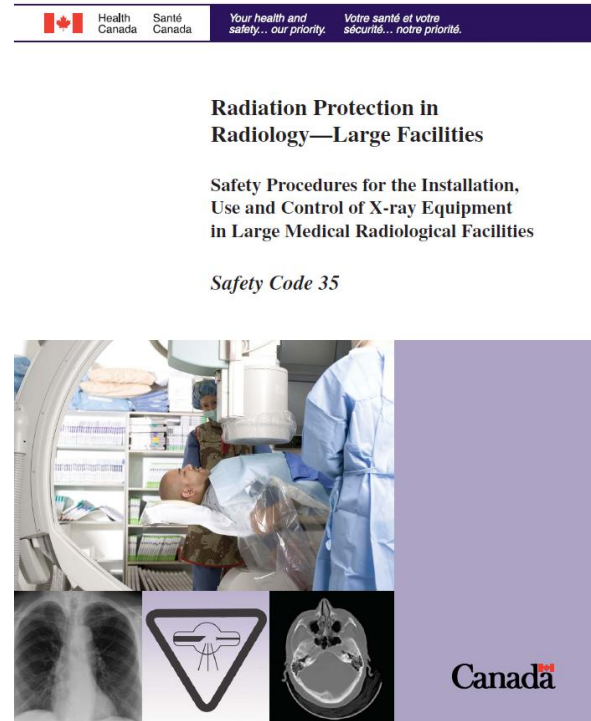
# Management of a Quality Control Program within a Large Healthcare Region

P. Seslija\*, K. Hammerstrom, H. Ross, T.  
Pel, R. Cropp, J. Chabot, Y. Thakur

RSNA 2012

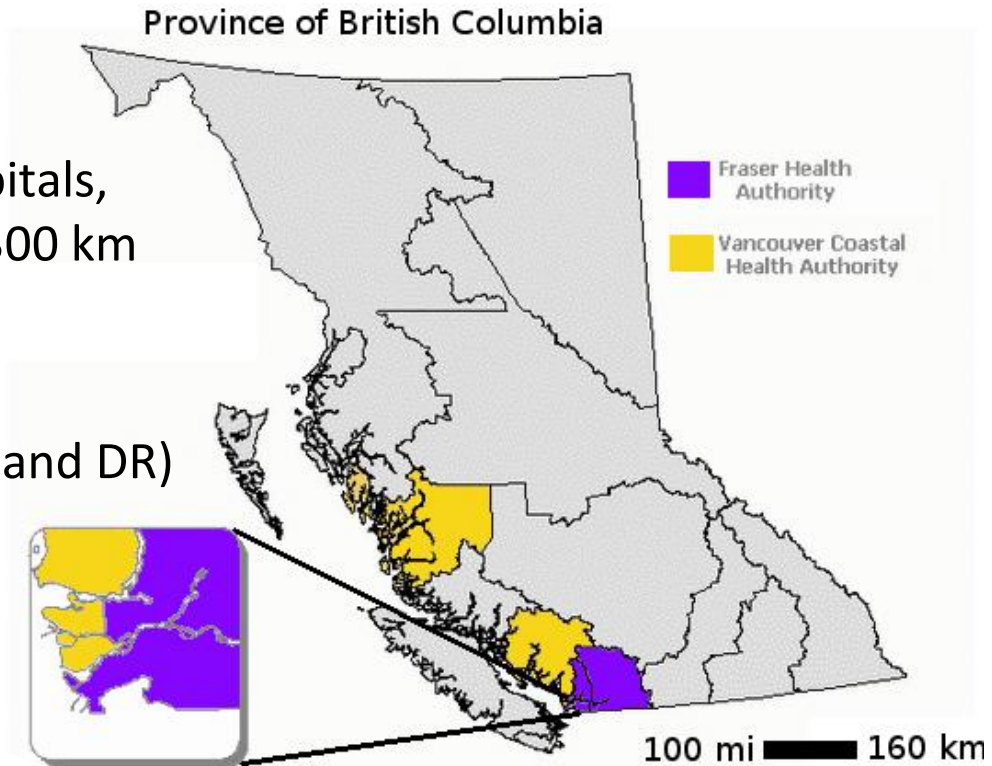
# Background

- Health Canada Safety Code 35 (HCSC35)
  - Federal regulation released in 2008
  - Adopted by British Columbia in 2010
  - QC intensive (defines acceptance, daily, weekly, monthly, quarterly, semi-annual, and annual testing requirements)
- Diagnostic Accreditation Program (DAP)
  - Sets performance standards in BC to ensure patient safety and high quality of diagnostic care
  - Adopted HCSC35 QC recommendations
  - Audits facilities with diagnostic medical imaging departments every four years



# Healthcare in Lower Mainland BC

- Consolidation of the health authorities occurred in 2011
  - Four health authorities, 27 hospitals, across a region spanning over 300 km
  - 33 CT scanners
  - 78 general radiology rooms (CR and DR)
  - 62 gen fluoro / IR / angio rooms
  - 60 mobile C-arms
  - 35 portable x-ray systems
  - Plus countless diagnostic displays, light boxes, lead aprons, CR cassettes, laser printers, etc. – all of which require regular QC testing

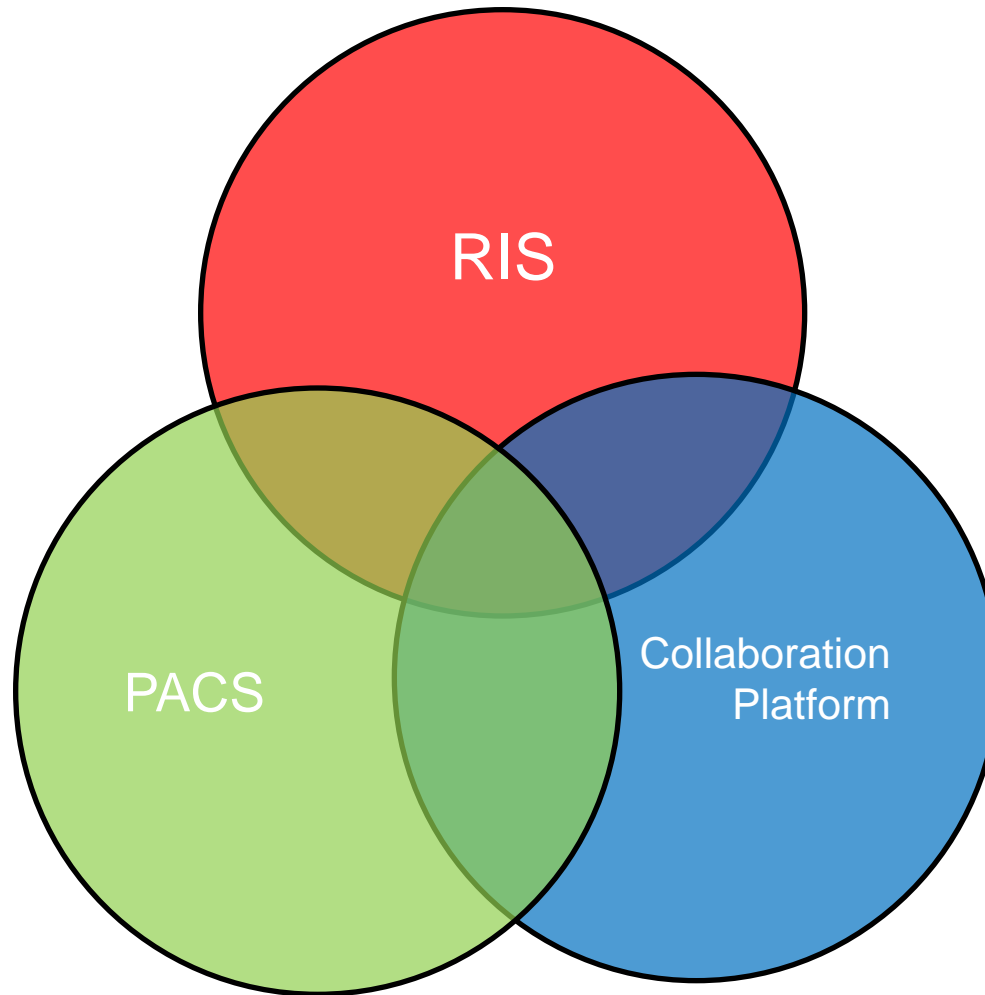


# Challenges

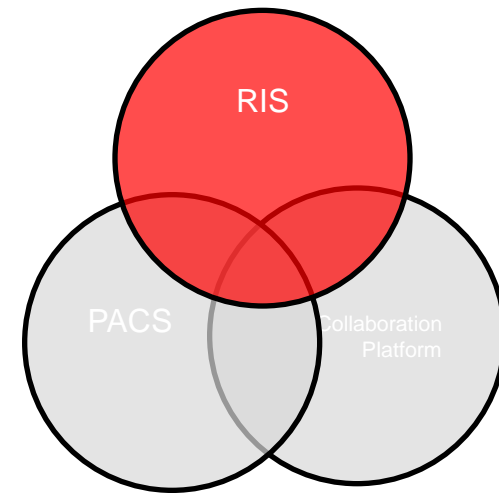
- Scheduling
  - Multiple groups (techs, biomed, quality coordinators, physicists) require QC time at different frequencies
  - Each modality has different testing requirements
- Documentation
  - Testing results and QC images need to be documented for monitoring and accreditation
- Accessibility
  - Multiple groups contributing to documentation
  - Must be accessible at numerous locations across the region
- Hospital Interconnectivity
  - Each HA has a different RIS/PACS and scheduling system
- Oversight
  - Ensure regional compliance
  - Provide timely follow-up in the case of deficiencies



# Our Approach



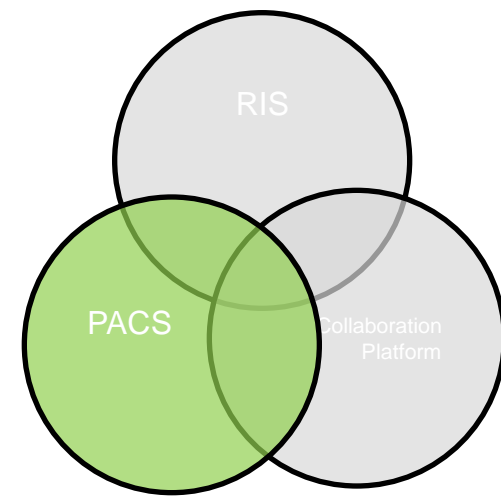
# RIS System



- Each x-ray unit is treated as a patient in RIS and given a unique name and identifier upon acceptance
- Various QC exams (weekly, monthly, semi-annual, etc.) are added to the exam dictionary within RIS
- Scheduling of QC exams follows similar workflow for patient examinations
- “QC Exams” are coded as non-billable, non-reportable

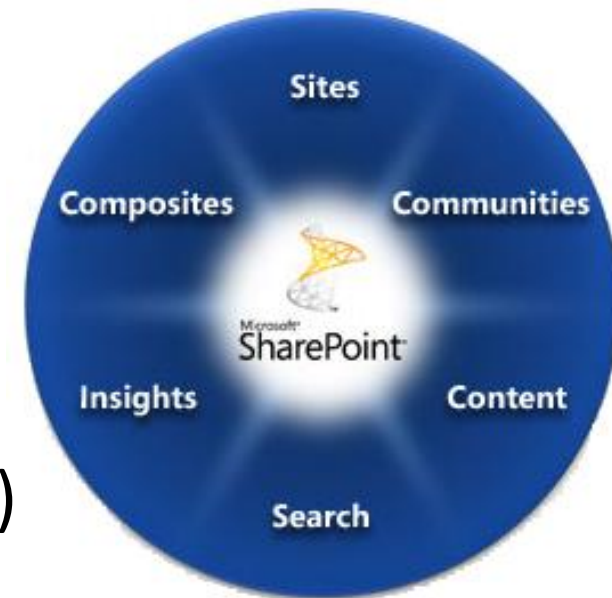
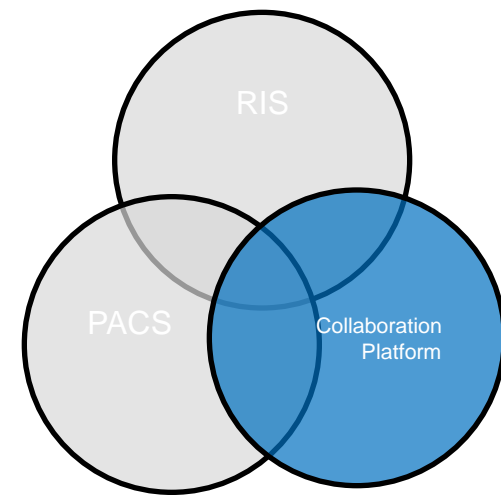
# PACS System

- PACS is used for archiving QC images acquired as a part of regular testing for the lifespan of each imaging unit
- Since PACS is accessible from remote locations across the region, images can be reviewed by multiple QC groups at different locations



# Collaboration Platform

- A collaborative documentation management system that allows contributions from various users and groups
- Cloud-based, therefore accessible through the web across the region
- Accessible with hospital login credentials
- Access control managed by QC department (minimal IT involvement)
- Allows setting of access controls for various users and groups





# An Example: Patient data and scheduling

## Patient info / selection

**Patient Record / Patient Data**

File Options Help

MRN:  Name: QCVH, CTEMERGONE DOB: 01-Jan-2010  
 Dept No: D962843 SSN:  Chart Loc.:  Age: 2Y Sex: U

Mother's Maiden Name:  Height:  Weight:

CT ROOM 5 H   
 G281 CT EMERG Alias:  W   
 SIEMENS SOM FLASH X

Patient Loc: AOPD Status: 0 DLA: 03-Oct-2012 Admitted:

Patient Report

## Exam selection

**Examination Dictionary**

Code	Description
QQ30	QC Quarter 30 minutes
QS120	QC Semi-Annual 120 minutes
QS150	QC Semi-Annual 150 minutes
QS180	QC Semi-Annual 180 minutes
QS240	QC Semi-Annual 240 minutes
QS30	QC Semi-Annual 30 minutes
QS60	QC Semi-Annual 60 minutes
QS90	QC Semi-Annual 90 minutes
QW10	QC Weekly 10 minutes
QW10GRP	QC TEST
QW20	QC Weekly 20 minutes
QY120	QC Yearly 120 minutes
QY180	QC Yearly 180 minutes
QY210	QC Yearly 210 minutes
QY240	QC Yearly 240 minutes
QY270	QC Yearly 270 minutes
QY30	QC Yearly 30 minutes
QY300	QC Yearly 300 minutes
QY330	QC Yearly 330 minutes
QY360	QC Yearly 360 minutes
QY420	QC Yearly 420 minutes
QY450	QC Yearly 450 minutes

OK Cancel More

## Population of local worklist

**Patient Browser**

Patient Transfer Edit View Filter Private Applications Options Help

Local Database

Scheduler QCVH, CTEMERGONE

CD-RW

Patient name QCVH, CTEMERGONE Date of birth 1/1/2010

## Schedule Exam

**Resources View**

File View Help

Site: VG Resource:

03-Oct-2012 Today 31

Wednesday, October 03, 2012

4AM 5AM

Resource Template

VG	CTERRO	↓
VG	CTERT	↓
VG	CTER	↓

QW10 CABKUB IN AND EMERGENCY P

Add Remove

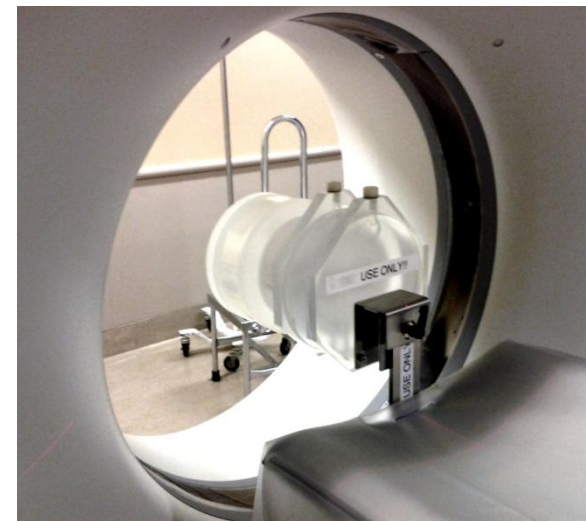
**Exam List for Resource CTER**

Name	Exam	Requesting Physician	Acc	
QCVH, CTEMERGONE	IN AND EMERGENCY PATIENT	QC, PHYSICIAN	8892646	More
	IN AND EMERGENCY PATIENT			

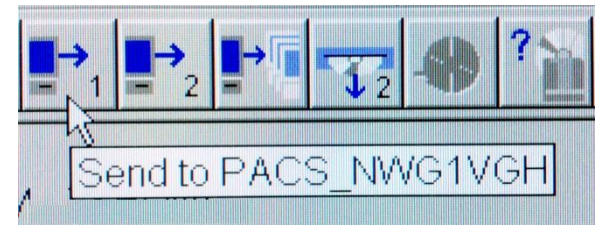
Close

# An Example: QC testing

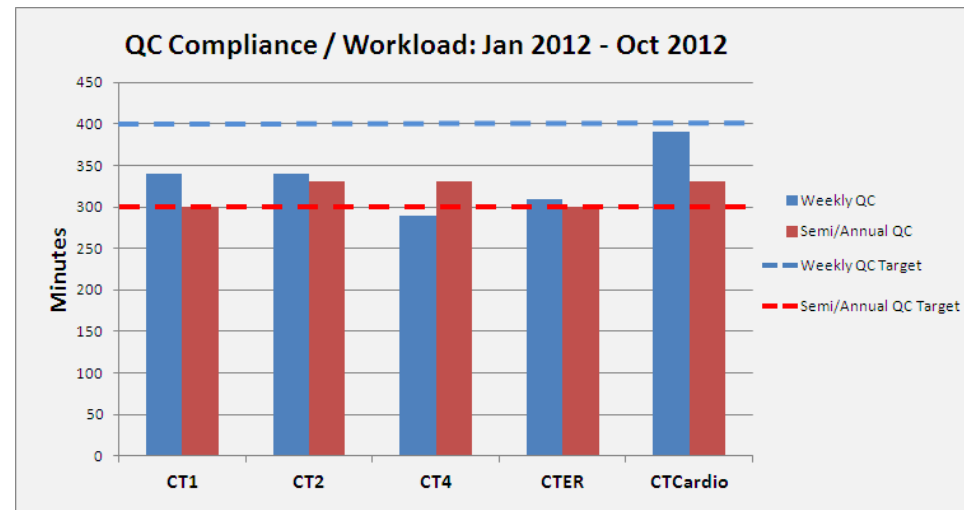
- QC testing performed by required personnel (weekly QC performed by technologists)



- Images are archived to PACS



- Records of completed QC exams are available in the RIS



# An Example: Documentation

- Results of the QC tests are recorded to the document management system

- Additional info
  - SOPs
  - Technical manuals
  - Standards
  - Calendars

Collaboration Team Sites > MI Quality Control Welcome [VA] | My Site | My Links |

Vancouver Coastal Health Providence HEALTH CARE All Sites Advanced Search

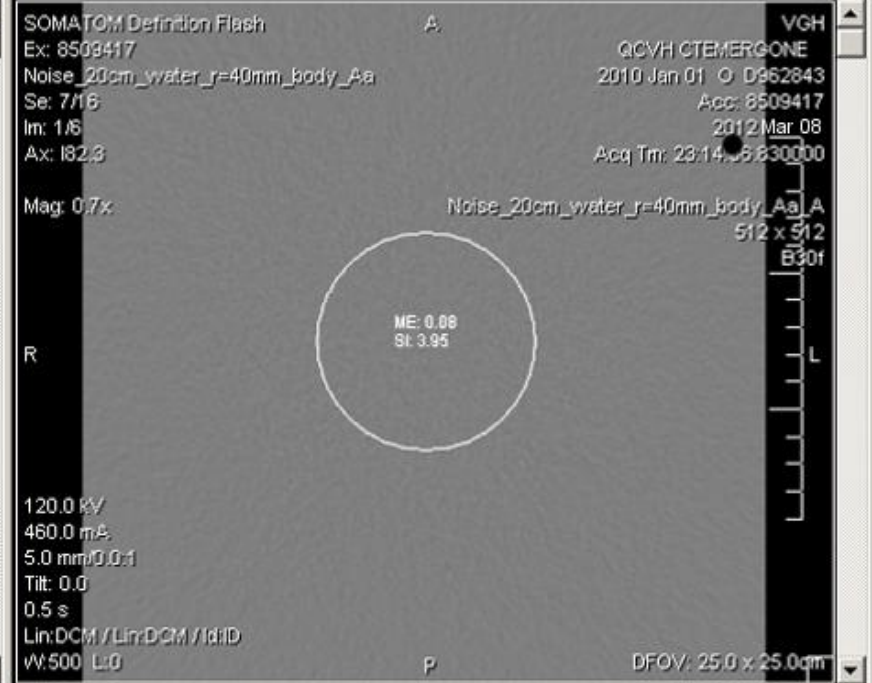
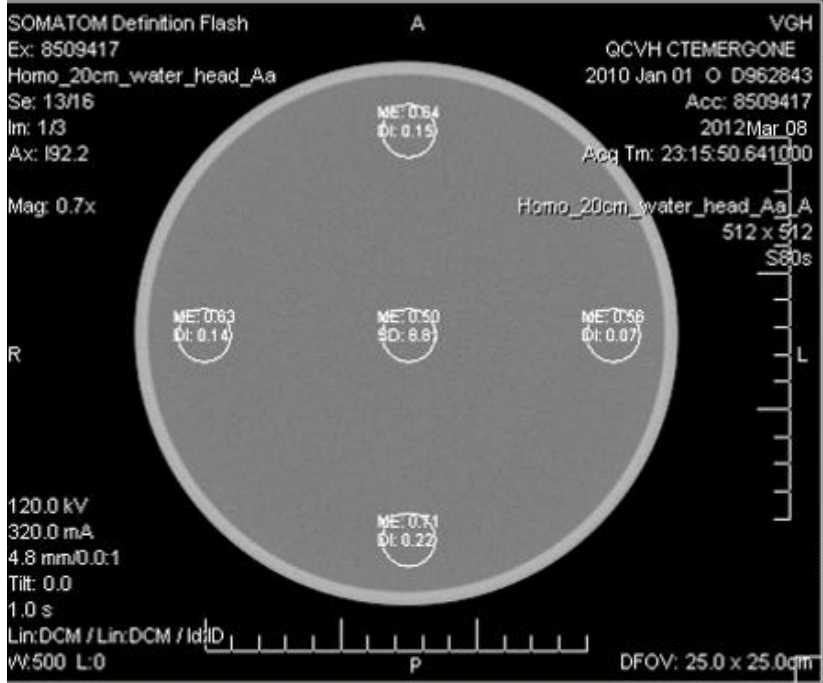
Home

MI Quality Control > Lower Mainland Sites  
Lower Mainland Sites

Listing of all LM MI depts.

Type	Name	Modified	View: All Documents
Folder	Abbotsford Regional Hospital (AB)	27/04/2012 5:20 PM	
Folder	BC Cancer Agency (CA)	26/01/2012 7:45 AM	[VA]
Folder	BC Centre for Disease Control	26/01/2012 7:46 AM	[VA]
Folder	BC Children's Hospital (CH)	26/01/2012 7:46 AM	[VA]
Folder	BC Women's Hospital and Health Centre (WH)	26/01/2012 7:46 AM	[VA]
Folder	Bella Bella (RW Large) Hospital (BM)	26/01/2012 7:47 AM	[VA]
Folder	Bella Coola General Hospital (BE)	26/01/2012 7:47 AM	[VA]
Folder	Burnaby Hospital (BH)	26/01/2012 7:47 AM	[VA]
Folder	Chilliwack General Hospital (CG)	26/01/2012 7:48 AM	[VA]
Folder	Delta Hospital (DH)	26/01/2012 7:48 AM	[VA]
Folder	Eagle Ridge Hospital (ER)	08/07/2012 10:04 AM	
Folder	Fraser Canyon Hospital (FC)	26/01/2012 7:48 AM	[VA]
Folder	JPOCSC (SU)	26/01/2012 7:50 AM	[VA]
Folder	Langley Memorial Hospital (LM)	26/01/2012 7:49 AM	[VA]
Folder	Lion's Gate Hospital (LG)	26/01/2012 7:50 AM	[VA]
Folder	Mission Memorial Hospital (MM)	26/01/2012 7:50 AM	[VA]
Folder	Mount St. Joseph's Hospital (MS)	26/01/2012 7:50 AM	[VA]
Folder	Peace Arch Hospital (PA)	21/08/2012 2:16 PM	
Folder	Pemberton Health Centre (PD)	26/01/2012 7:51 AM	[VA]
Folder	Powell River General Hospital (PW)	26/01/2012 7:51 AM	[VA]

Local intranet



### CT QC Results - Vancouver General Hospital - Siemens Flash (Dual-tube) - Weekly Tests

(as per Health Canada Safety Code 35, page 45, section 3.2.2, QC tests W4, W5 and W6)

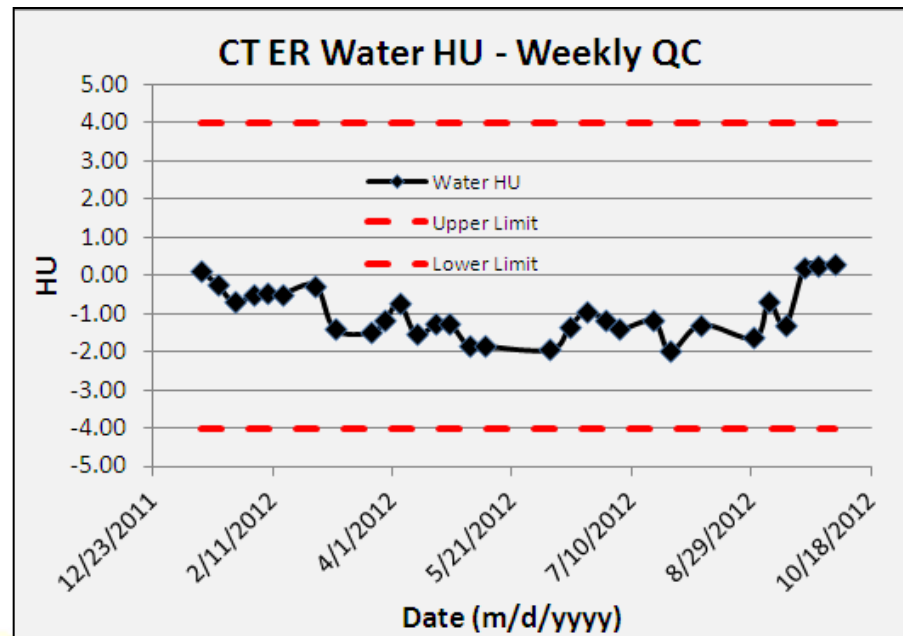
Note: For Absolute value calculation, perform subtraction with + or - values and then strip the + or - value from the result.

Example: A + 2, B x 1  
 ABS(A-B)  
 ABS(2-1) = 3 Correct  
 ABS(2-1) = 1 Incorrect

Air measurement not performed.

= Failed QC

Analysis performed on Series 16, Image number 3 of 6.	Control Limits	CT number_0 +/- 4 HU	Noise (S.D.) Range 3.825 to 4.675 HU (s.k.v. 4.25kV-10kV)	Dual-tube				Within Baseline's Average of (ABS(Centre ROI HU - Periph ROI HU) - 2 HU at each location).				Report QC Failures to Radiology Service.
				ROI CT # for each peripheral ROI	1.20	1.43	1.20	1.29	1.20	1.43	1.20	
Date	Tech Initials	Centre ROI CT #	Centre ROI Std. Dev.	12 o'clock	3 o'clock	6 o'clock	9 o'clock	12 o'clock	3 o'clock	6 o'clock	9 o'clock	Comments (Note calibration dates)
December 23, 2011	BA	-0.07	4.00	0.59	1.05	0.80	0.39	0.66	1.12	0.87	0.46	
January 12, 2012	BA	0.11	4.11	0.62	0.54	0.65	0.60	0.51	0.43	0.54	0.49	
January 19, 2012	BA	-0.23	4.13	0.23	0.33	0.48	0.31	0.46	0.56	0.71	0.54	
January 26, 2012	BA	-0.70	4.16	0.25	0.42	0.85	0.05	0.95	1.12	1.56	0.75	
February 3, 2012	BA	-0.52	4.10	-0.02	0.00	0.50	0.36	0.50	0.52	1.02	0.98	
February 9, 2012	BA	-0.47	4.28	0.56	1.06	1.12	0.55	1.03	1.53	1.59	1.02	
February 15, 2012	BA	-0.49	4.40	0.30	0.25	0.66	0.08	0.79	0.74	1.15	0.57	
February 23, 2012	BA	-0.27	4.26	0.57	1.06	1.26	0.70	0.84	1.33	1.53	0.97	
March 8, 2012	BA	-1.39	4.00	-0.61	-0.11	0.08	-0.53	0.78	1.28	1.47	0.86	
March 23, 2012	BA	-1.49	3.96	-0.22	0.17	0.44	-0.33	1.27	1.66	1.93	1.16	
March 29, 2012	BA	-1.18	4.26	-0.09	0.05	0.61	-0.18	1.09	1.23	1.79	1.00	
April 4, 2012	BA	-0.72	4.37	0.77	0.21	0.55	-0.18	1.49	0.93	1.27	0.54	
April 11, 2012	BA	-1.54	4.08	-0.31	-0.22	-0.07	-0.45	1.23	1.32	1.47	1.09	
April 19, 2012	BA	-1.27	4.32	-0.78	-0.50	0.19	-0.29	0.49	0.77	1.46	0.98	
April 25, 2012	BA	-1.24	4.01	-0.30	0.36	0.01	-0.12	0.94	1.60	1.25	1.12	
May 3, 2012	BA	-1.85	4.20	-0.48	-0.35	-0.28	-0.75	1.37	1.50	1.57	1.10	
May 10, 2012	BA	-1.94	3.95	-0.50	-0.30	0.03	-0.43	1.34	1.54	1.93	1.41	
June 6, 2012	BA	-1.93	4.37	-0.49	-0.40	-0.21	-0.54	1.45	1.53	1.72	1.39	
June 14, 2012	BA	-1.34	4.29	-0.18	-0.06	0.06	0.10	1.16	1.28	1.40	1.44	
June 21, 2012	BA	-0.94	4.36	-0.17	-0.12	0.32	-0.19	0.77	0.82	1.26	0.75	
June 29, 2012	RC	-1.17	4.31	-0.09	0.10	0.03	-0.07	1.08	1.27	1.20	1.10	
July 5, 2012	BA	-1.40	3.85	-0.35	0.04	0.36	-0.56	1.05	1.44	1.76	0.84	
July 19, 2012	BA	-1.18	4.20	-0.24	0.17	0.32	-0.02	0.94	1.35	1.50	1.16	
July 26, 2012	BA	-1.96	4.24	-0.62	-0.06	0.09	-0.36	1.34	1.30	2.04	1.50	
August 8, 2012	BA	-1.28	4.15	0.14	0.35	0.38	-0.12	1.42	1.63	1.66	1.16	
August 30, 2012	BA	-1.63	4.08	-0.46	-0.08	-0.12	-0.14	1.17	1.55	1.51	1.49	
September 5, 2012	BA	-0.70	4.31	0.40	0.45	0.94	0.09	1.10	1.15	1.64	0.79	



# Further Challenges

- Current system only used for CT QC
  - Long term objective: Image storage from equipment acceptance to decommission
- RIS limitations
  - system deployed on 3 or 4 RIS systems in region, 1 RIS is incompatible
  - Leads to image verification problems in PACS
  - RIS upgrade in process
- Electronic Scheduling
  - Not all sites have electronics scheduling, not utilizing full potential of QC scheduling system

# Conclusions

- Since the RIS and PACS are already part of the hospitals' infrastructure – no additional capital costs associated with their use for QC
- Scheduling follows typical clinical workflow
- Documentation and image archives are widely accessible, which aids local sites in their accreditation audits