RSNA attendance rebounded from the effect of last years 11% drop associated with the 9/11 attacks. In fact, there was about an 11% increase over last year indicating that most of us are OK with travel these days. Why the preoccupation with attendance? I suppose some people think it is a measure of the health of radiology. Certainly by most measures the field is very healthy: shortage of radiologists, medical physicists, technologists, booming equipment sales, rapid introduction of new technology (at least technology used in new ways). So, yes, times are good. Certainly that means we had better be on our guard. We may have our own 9/11 scenario looming in the shadows.

As always I found the RSNA strong in continuing education but weak in science. This is especially true for the nuclear medicine on the program. I could not find even one session devoted to nuclear medicine physics and instrumentation. Something is wrong with that.

I arrived on Monday evening. It was supposed to be Monday afternoon but there was snow falling in Chicago and what turned out to be a 4 hour delay in our takeoff from Boston. This is to be expected in Chicago at this time of year. As it turned out it was a very minor amount of snow that only served to beautify the city. A stroll along North Michigan Ave was a real treat.

With a Thursday evening departure that left only 3 days to do some continuing education, find some science, catch up on infoRAD exhibits, view posters, and visit the exhibitors. Oh, yes Chicago is rich in cultural events this time of year so that had to be squeezed in too. I should have arrived on Saturday as in past years. It can be much more relaxed. Culture is mostly after RSNA hours so it does not directly compete so it was Sweeney Todd at the Chicago Lyric opera on Wednesday nite and the Chicago Art Institute's current exhibit "The Medici, Michelangelo and the Art of Late Renaissance Florence" on Thursday afternoon on the way to the airport.

**Continuing Education Courses**

Even though I registered in August many of the most desired courses were filled. I did attend a few useful ones however:

**Course No. 328**
Pacemaker and Defibrillator Safety and MR Environments: New Thoughts for the New Millennium

Rod Gimbel

Panel Discussion, Point/Counterpoint, and Ask the Experts Session

Emanuel Kanal, Pittsburgh PA, Joel Felmlee, Rochester MN, Rod Gimbel, Knoxville TN, Gerald Pohost, Los Angeles CA, Frank Shellock, Los Angeles CA, Christopher Wood, Rochester MN

We learned how to image patients that have implanted pacemakers and defibrillators. In a word, very carefully.

Course No. 426

Update on PACS Acquisition, Display Technology, and DICOM

PJ Chang, JA Carrino, CH Willis, KP Andriole

http://www.radiology.upmc.edu/

This was one of a 7 part series on PACS. The acquisition and DICOM parts were OK but I found the presentation on displays the most relevant to me. Displays are the most troublesome and expensive part of the PACS system. Resolution of 1K for B/W displays are the most cost effective if they have good zoom and pan controls in the software. More than 2 monitors are not required with a good GUI and fast software support. Color is not for most of radiology. Regular display QC is necessary requiring a light meter and test pattern (SMPTE) although DICOM Part 14 with its specification of a perceptually linearized gray scale is preferred. Keep spare parts around.

Course No. 626

A Survival Guide to Quality Control for PACS

PJ Chang, JA Carrino, CH Willis, KP Andriole

http://www.radiology.upmc.edu/

CQI, Continuous Quality Improvement is a team approach requiring fellows, residents, techs, IT and PACS personnel to form a cohesive team. Routine queue checks, swap space who, whodo, etc. Monthly graceful reboots. Reports, logbooks, email are used to keep people informed. Automated QC: ping every 15 min, systems logs with autopage, verify daily backups, free space check should show 36-48 hours available, Monthly monitor cleaning and performance check. See Michael Flynn 1999 Nov-Dec pp1653-69 Radiographics for info on human visual system and the need for a perceptually linearized gray scale. Monitor needs 1024 pixels and 75 ft lamberts (260 cd/m2). See AAPM TG 18: http://deckard.mc.duke.edu/~samei/tg18 and http://www.scarnet.org/ for more info.
Scientific Posters

I suppose I am getting old and jaded but the posters were not so scientific, educational, maybe, but certainly not many were scientific.

304PH-p

Use of Lead Aprons for Patients Undergoing CT: Does it Reduce Patient Dose?

Michael Bruesewitz, Cynthia McCollough, James Kofler, Frank Zink
Rochester, MN

Yes, the aprons do help, when used with care.

305PH-p

Dose Optimization in Pediatric CT by Variation of Tube Voltage for Different Object Sizes and Shapes

Christoph Suess, Marilyn Siegel, Xiao Chen, Bernhard Schmidt, Stefan Schaller, Willi Kalender.
Forchheim, Germany

Also looked at modulation of tube current. Certainly looks like the way these machines should work now.

318PH-p

LCDs versus CRTs, A Comparative Performance Evaluation

Hans Roehrig, Jia-Hua Fan, Elizabeth Krupinski, Kunal Gandhi, Toshihiko Furukawa, Mitsuo Ohashi.
Tucson, AZ

LCD display are pretty good, but they do need calibration just like CRTs. There can be surprising glitches in the output curve for LCDs.

319PH-p

Color vs Monochrome CRT Displays: Effect on Pulmonary Nodule Search and Detection

Elizabeth Krupinski, Hans Roehrig. Tucson, AZ
Off-the-shelf color monitors do not cut it for this task. Maybe some day...

321PH-p

*A Method to Achieve Optimum Display of Images on a CRT Based on the CRT’s Physical Characteristics and the Visual Characteristics of the Human Observer*

Yoshiharu Hirata, Takefumi Yamane, Toshihide Ogawa, Fumihiko Tanino, Hans Roehrig, Nobuo Okazaki. Yonago, Japan

To improve detection rates it is important to properly set up or calibrate a CRT display. Using software from U Arizona for measuring Just-Noticeable-Difference perception it was found that dynamic range should be maximized leading to the surprising that lower than maximum brightness was best. DICOM Supplement #28 was found to be relevant. More on the software was reported at: *infoRAD* Exhibit: Space 9623PACS-i

322PH-p

*Development of a Digital Watermark Method Suitable for Medical Images with Error Correction*

Masato Nishio, Yutaka Ando, Nobuhiro Tsukamoto, Hironao Kawashima, Shinya Nakamura. Yokohama, Japan

Authors report on a way to use a cheap reader to read the watermark, and thus authenticate an image.

326PH-p

*The Usefulness of Liquid Crystal Display (LCD) Which Can Display 1800 Gradations for the Diagnosis of Digital Chest Radiographs*

Yasuhiro Fujiwara, Masato Tanaka, Kyouji Higashimura,

Harumi Itoh, Mituo Oohashi. Yoshida, Japan

Viewbox wins! But not by much.

336PH-p

*Performance of a New Low Noise and Dose Dual Energy Detector*

JA Seibert, Robert Alvarez, Elizabeth Moore. Sacramento, CA and Aprend Technology
The new detector consists of 2 plates to get both a high and low energy images. It works much better than a sandwich of 2 CR plates containing a Cu plate.

352PH-p

*Cone-beam Multi-Slice CT: Sampling in the Z-Dimension*

Dominic Heuscher, Steve Utrup, Kevin Brown, Mani Vembar. Highland Heights, OH and Philips Medical Systems

Axial sampling is compromised in cone-beam CT. Authors show that filtering and interlacing can reduce effects on images.

364NM-p

*Evaluation of Combined Emission and Transmission Tomography in the Diagnosis of Splenosis after Splenectomy in Patients with Haematological Diseases*

Marius Horger, Martina Eschmann, Anna Pfannenberg, Claus Claussen, Roland Bares. Tuebingen, Germany

Found 100% accuracy!

369NM-p

*The Concept for a High Speed Simultaneous Dual-Radionuclide SPECT of the Pulmonary Ventilation/Perfusion Using Multiple-Rotate Continuous SPECT Acquisition: 10 Minute Method*

Hiroki Takenaka, Hidefumi Fujisawa, Tamio Kusihashi, Ryutarou Ukisu, Takashi Kitanoisono, Tamaki Ichikawa. Yokohama, Japan

Doing 5 rotations in 10 min. with Tc99m-MAA and Kr81m the authors showed that a complete V/Q exam could be performed quickly. This is a good idea.

375NM-p

*Epidermal Growth Factor Receptor Imaging with 99mTc-eC-C225*

Euishin Kim, K. Ang., Naomi Schechter, David Yang, Donald Podoloff. Houston, TX

This was an animal and human study that showed rather low contrast images but encouraging enough to...
377NM-\(p\)

*A Very Accurate Method for Sentinel Lymph Node Investigation: Gamma Detecting Probe Associated with SPECT Examination for Depth*

Giorgio Ascoli, Paolo Cinti, Marco Nonni, Brunella Rossi. Ancona, Italy

Authors think that SPECT was very helpful to surgeon.

**Scientific Paper Sessions**

653

*Metal Artifact Reduction in Medical CT: Image-based vs. Rawdata-based Approaches*

Oliver Watzke, Willi Kalender. Erlangen, Germany

One of many contributions form the Kalender group at the U Erlangen. In fact the group seems to have commercialized some of their work as seen in infoRAD 9309. In this contribution it was shown, unconvincingly, that metal artifact reduction can be done almost as well in image space as in raw data space.

654

*Investigation of the Feasibility of Image-based Scatter Artifact Correction in CT Using Monte Carlo Techniques*

Bernhard Schmidt, Thomas Riedel, Willi Kalender. Erlangen, Germany and VAMP.

As the detector area goes up so does the scatter detected. Something we know a lot about in nuclear medicine. VAMP is working on an algorithm to reduce it, with some success.

655

*Reconstruction of Motion-Free Pericardial Lung Images from Standard Spiral CT Scans Using Kymogram Correlation*

Marc Kachelriess, Dirk-Alexander Sennst, Willi Kalender, Erlangen, Germany
Trying to get away without an EKG signal. Uses center-of-mass tracking. Some success.

656

*Performance Results from Pre-clinical Flat-panel-based Volumetric CT Systems*

William Ross, Samit Basu, Peter Edic, John McLeod, Armin Pfoh, GE Global Research Center, Niskayuna, NY

Can a research scanner be made using existing DR panels? Looks like it!

657

*A Fast and Efficient Method for the Correction of Defective Channels in X-ray CT Area Detectors*

Tillman Riess, Qurin Spreiter, Theobald Fuchs, Thomas Von der Haar, Willi Kalender. Erlangen, Germany

By using space-time interpolation the bullseye artifact can be reduced and the detector will not have to be replaced. Patent-pending.

658

*An Analysis of Noise and Resolution for Area Detector CT Systems*

Theobald Fuchs, Christianne Leidecker, Willi Kalender. Erlangen, Germany

Theoretical expectations were confirmed with simulations. Dose does indeed go up by 100 when resolution element decreases by 10. Effect of convolution kernel and KV still being studied.

659

*Volumetric CT with a Large Array Scanned Source*

Taly Gilat, Rebecca Fahrig, Edward Solomon, Norbert Pelc ScD. Stanford, CA

So you can reduce the cone-beam artifact by scanning the x-ray beam. Still very experimental but looks like it could work and reduce the artifact.
Low Contrast Detectability: Implications for a 24-Detector Gigahertz Multislice CT Scanner

Himanshu Shukla . Philips Medical Systems, Cleveland OH

Reconstructed slice thickness plays a major role in low contrast detectability. But not much you can do for very small targets.

Measurement of X-ray Tube Focal Spot Sizes and Spatial Resolution of αCT Systems Using Thin Tungsten Wires

Ulrike Taubenreuther, Andreas Lutz, Klaus Engelke, Theobald Fuchs, Marek Karolczak, Willi Kalender . Forcheim, Germany

They achieved measuring 6.3 i resolution with 0.1 i accuracy.

Performance Evaluation of the First Model of 4D CT-Scanner


Bench top system demonstrate progress in this area.

Feldkamp-type Reconstruction Algorithm for Spiral Cone-Beam (CB) Computed Tomography (CT)

Katia Sourbelle, Marc Kachelriess, Willi Kalender . Erlangen, Germany

They obtained better results with Feldkamp algorithm than with Advanced Single-Slice Rebinning (ASSR) algorithm and could handle arbitrary pitch, too.

Education Exhibits

There were a few gems here but you had to use a lot of shoe leather to find them.
0571PH-e

Understanding MTF and DQE
Mark Rzeszotarski, Cleveland, OH

Very good poster with the author available for 1.5 hr/day for 4 days during RSNA. A lot of work.

0576PH-e

A Guided Tour of Scintillators Used for Digital Imaging
Taeko Farman D., Allan Farman, Dsc, Alex Lempicki, Charles Brecher, Stuart Miller, Vivek Nagakar. Louisville, KY and R Watertown, Ma and ALEM Associates.

A good exhibit on scintillators used for DR and info on new Lu2O3:Eu.

0663NM-e

Potential CT Blind Spots: Lessons Learned from PET Imaging
Ba Nguyen, Michael Roarke, Panol Ram. Scottsdale, AZ

Their answer: Get PET.

0682NR-e

3D Brain Surface Imaging: Multislice CT vs 3D-MR
Tohru Hirano, Sumiyoshi Tanabe, Masafumi Ohtaki, Naoya Yama, Michio Bandoh, Mari Hirano. Sapporo, Japan

Veins are imaged better with CT.

0754NR-e

Pitfalls in the Diagnosis and Confirmation of Brain Death
William Flowers, Cynthia Powers, George Benashvili. Jackson, MS

Informative.
0773NR-e

Non-invasive Assessment of Carotid Artery Stenosis: Comparison of 16-slice Spiral CTA and MRA

Michael Lell, Franz Fellner, Ulrich Baum, Werner Lang, Willi Kalender, Werner Bautz. Erlangen, Germany

It seems that both work equally well.

0796MK-e

CT Guided Radiofrequency Thermal Ablation of Osteoid Osteoma

Mark Robbin, Patrick Getty, Peter Young, Nagina Malguria, Jason Kirkham, Jonathan Lewin. Cleveland, OH

12 patients- Results OK.

infoRAD Exhibits

9309IMA-i

Syngo Explorer (SX): An Extensible Software-based CT Image Reconstruction and Evaluation Platform for Arbitrary CT Image Data and Rawdata Formats

Marc Kachelriess, Dirk-Alexander Sennst, Oliver Watzke, Theobald Fuchs, Stefan Ulzheimer, Willi Kalender. Erlangen, Germany

Products are coming out of the Medical Physics program in Erlangen. For more info see: http://www.vamp-gmbh.de/

9623PACS-i

Image Quality Control and Image Quality Measurements for Display Systems

Hans Roehrig, Hartwig Blume, Jia-Hua Fan, Dev Chakraborty. Tucson, AZ

Worthy of close study.

**9403RI-1**

*Simple DICOM Receiver: An Easy to Use DICOM SCP which Automatically Anonymizes and Stores Studies in a Customized Hierarchical Directory Structure*

TongJin Chun, Steve Uttecht, Paul Chang . Pittsburgh, PA

A HIPPA compliant DICOM utility. Seems useful if we indeed have to worry so much about this. Have a look at: [http://www.radiology.upmc.edu/Public/public_resources/software/index.html](http://www.radiology.upmc.edu/Public/public_resources/software/index.html)

**9404RI-1**

*Developing an Indexing Method for Digital Medical Images in a DICOM Database*

Ana Cleveland, Herman Oosterwijk, Jung-Won Yoon, Jodi Philbrick, Nicholas Welsh, Peter Zhang . Denton, TX

It is necessary to index DICOM images for teaching, troubleshooting, etc. A method for indexing and expanding the collection of images is described. Uses ezDICOM a free DICOM viewer: [http://www.psychology.nottingham.ac.uk/staff/cr1/ezdicom.html](http://www.psychology.nottingham.ac.uk/staff/cr1/ezdicom.html)

**Technical Exhibits**

PET was a big deal here this year. At least for the big three, Siemens, GE and Philips. Positron Corporation was here too but appeared to be a little forlorn. They do not seem to be sharing in the enthusiasm surrounding the Big 3. Maybe they need PET-CT. I should be writing Big 4 since CTI and Siemens are trying to go their separate ways, it seems.

The CT part of PET-CT can be had with 4, 8 or 16 slices. Wow! Can this be justified? Single slice CT was not even mentioned. Not good enough, I guess.

Philips continues to roll out the Gemini with PET and CT gantries that can be widely separated for increased utility, maybe. The PET system is the recently introduced instrument based on the Allegro that uses the scintillator GSO. It will be interesting to have independent evaluation of this PET machine.

Siemens is pushing LSO machines, for the most part, as is CTI, for the increased throughput. But it seems evident that the very best images are still done on the HR+ machine. But of course you do not always need the very best images. Sometimes good enough is, well, good enough.
GE still has only BGO machines to offer. But this meeting they introduced a BGO machine that is "improved". Seems that they have improved the electronics (multiplexers) and changed some detector blocks a bit to give up some axial resolution and have achieved a higher NEC, thus improved imaging times. The new machine is called Discovery ST when the CT scanner is attached. Not sure if the new PET is available without the CT.

GE thinks nanomachines will impact radiology and nuclear medicine soon as they had a major amount of space hyping it.

**Philips Medical Systems**

In addition to the PET stuff we also saw the SkyLight once again. Imagine a 2 head gamma camera where the heads could each be scanning a separate patient. Seems incredibly versatile and Philips has some of their best gamma camera technology in this system.

**dilon technologies inc**

Dilion was showing the DILON 6800 Gamma Camera for breast imaging. A pixelated detector with 3 mm resolution for scintimammography. There is an array of PSPMTs for position information viewing the 3 x 3 mm NaI(Tl) array of crystals. [http://www.dilon.com/6800.html](http://www.dilon.com/6800.html)

**Gamma Medica**

Gamma Medica was showing their latest product – a SPECT-CT machine for (very) small animals - MicroSPECT. They also introduced LumaGEM 3200S, a CZT instrument for scintimammography with 2.5 mm pixels with 6% energy resolution.

**General Electric**

I noted that GE has acquired yet another bit of technology. A microCT machine introduced by Enhanced Vision Systems of London Ontario, a spin off of the Robarts Research Institute of London, Ontario This just happened about Nov 6 so the ink has hardly dried. GE calls it the eXplore RS and it is for mice.

**Numa**

When I need someone who understands all the NM file formats, I have always relied on Numa. Now Numa is offering a file server for NM and radiology that speaks DICOM as well as the native NM
formats. I wish them luck. NM has been poorly served by the big companies that claim DICOM support. Perhaps it will take their special expertise to make a truly vendor independent archive. www.numa-inc.com