PART 2

RSNA 2014: A celebration of the past and future

Mary Beth Massat

Editor's note: This is the second part of a two-part recap of technological offerings at the Radiological Society of North America's 2014 Scientific Meeting and Exhibition. The first part appeared in the January 2014 issue of Applied Radiology.

The January edition of Technology Trends highlighted three hot topics from RSNA 2014: lung cancer screening, breast density, and ultrasound. This month's edition of Technology Trends focuses on two more hot topics—hybrid imaging and enterprise imaging workflow, including clinical decision support—and spotlights product news across interventional imaging, digital radiography and X-ray.

Hybrid imaging

The continuing growth of hybrid imaging was fully apparent at RSNA 2014, with an abundance of molecular- and interventional-based hybrid systems appearing in both of the cavernous North and South exhibit halls of McCormick Place in Chicago.

Toshiba America Medical Systems (TAMS) introduced two new hybrid systems. The first was the Infinix ^{4D}CT system, which the company says brings real-time CT imaging to the angiography suite. The integrated CT and angiography solution with SUREGuide technology, pending US FDA 510(k) clearance, enables clinicians to perform CT and interventional procedures in the same room to verify treatment success that, according to the company, can save hours.

Meanwhile, TAMS also introduced the newly FDA-cleared Celesteion PET/CT, offering the industry's widest bore (90 cm for CT and 88 cm for PET) and a 70-cm field of view for both modalities. Enhanced spatial resolution with 4 mm PET crystals and 0.5 mm CT detector elements, fast exam times with 20 cm PET Z-axis coverage, and 450 ps timing resolution round out the system's advanced features. According to Toshiba, the Celesteion can perform diagnostic CT imaging, CT interventions, PET/CT imaging and CT radiation oncology simulation scans. It also comes standard with Toshiba's most advanced CT dose reduction technology (Figure 1).

Molecular imaging is where hybrid imaging got its start. According to a study presented at RSNA, PET/CT may help differentiate post-traumatic stress disorder (PTSD) from mild traumatic brain injury (mTBI) in military veterans. Researchers used PET/CT to study the hypothalamus and pituitary glands of veterans who had suffered blast-related MTBI. FDG uptake in the hypothalamus was significantly lower in the MTBI-only group compared with normal controls. FDG uptake in the pituitary gland was significantly higher in the MTBI and PTSD group compared with the mTBI-only group.

The finding of higher FDG uptake in the pituitary gland of PTSD sufferers supports the theory that many veterans diagnosed with PTSD may actually have hypopituitarism. In addition to helping differentiate PTSD from mTBI, PET/CT may also offer more insight into the biological manifestations of PTSD (Figure 2).

Mary Beth Massat is a freelance writer based in Crystal Lake, IL.

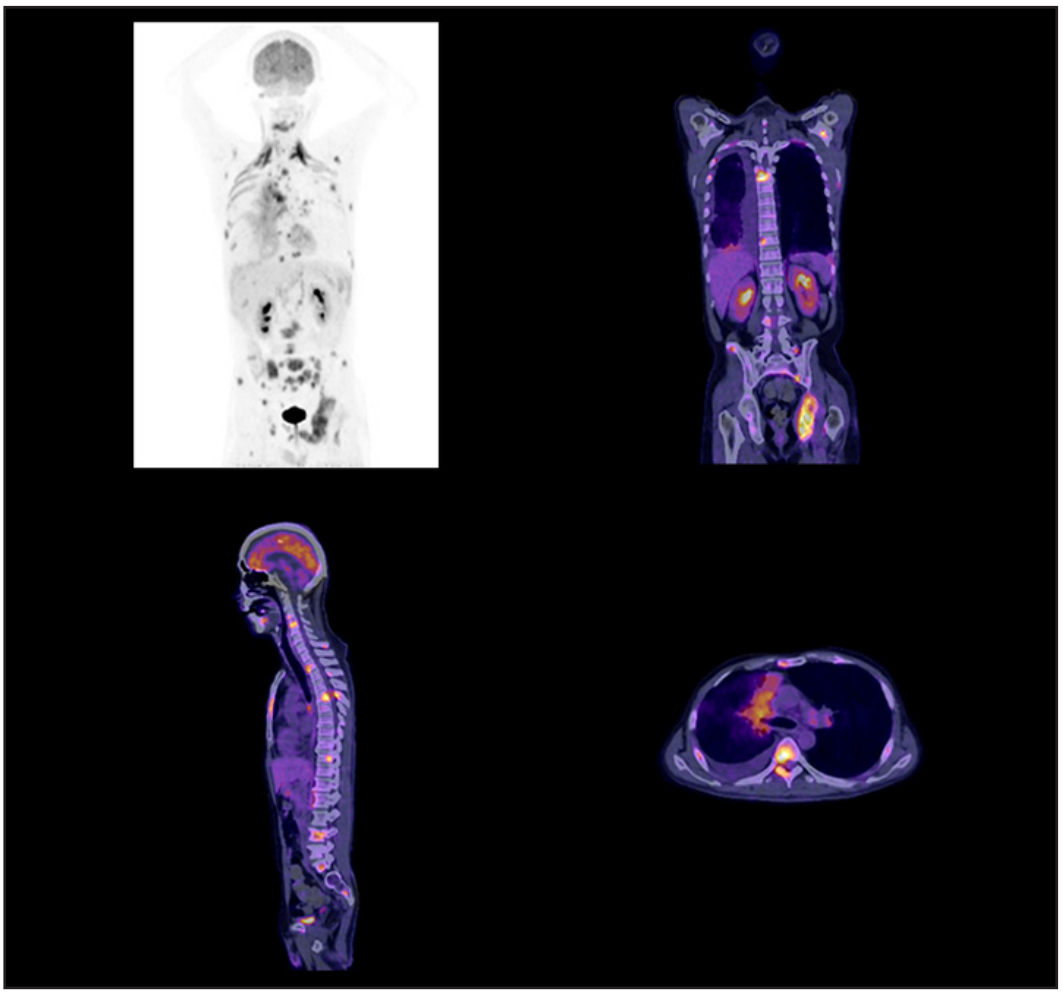

FIGURE 1. *Toshiba America Medical Systems' Celesteion PET/CT system.*

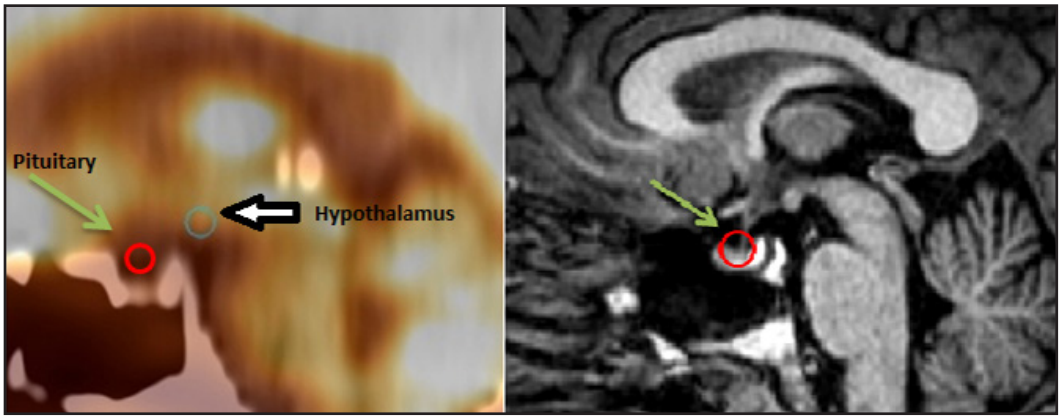

FIGURE 2. *PET/CT on the left and an MRI on the right demonstrating the relative locations of both the hypothalamus and the pituitary gland.*

Besides introducing its new SIGNA PET/MR, GE Healthcare also showcased new features for the Discovery IQ PET/CT and Discovery NM/CT 670 Pro. The former, with Q.Clear, enables imaging with half the usual PET dose and in half the usual scan time, according to the company. Meanwhile, the addition of GE's Q.Suite to the Discovery NM/CT 670 Pro enables quantitative accuracy with applications such as Q.Metrix and Q.AC for low-dose attenuation correction. The system also offers more advanced CT technology with the integration of

FIGURE 3. *Siemens Mobilett Mira Max.*

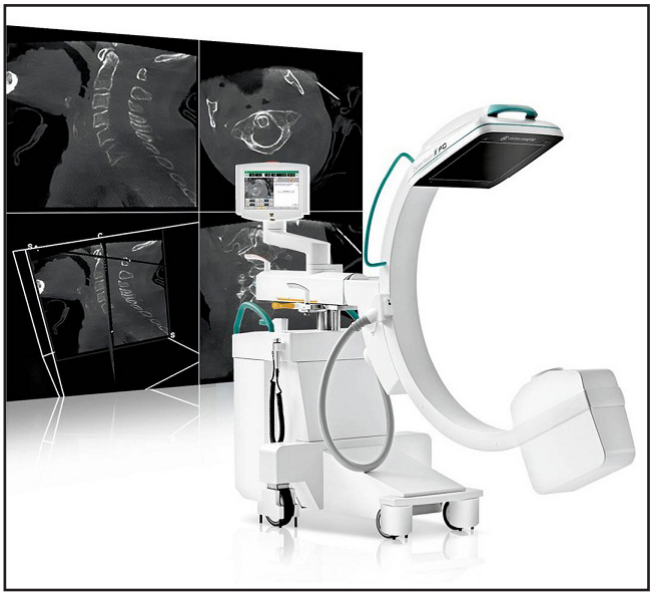

FIGURE 4. *Ziehm Vision RFD 3D.*

GE's Optima CT540 with ASiR dose management technology.

Siemens Medical Solutions showcased FlowMotion on the Biograph mCT Flow[5] PET/CT, a technology that enables protocols based on the individual organ of interest, leverages volumetric resolution, and expands accurate, reproducible quantification in all dimensions for precise disease characterization in therapy monitoring. The company also highlighted the Symbia Intevo[5], which generates high-resolution, accurate and reproducible quantitative images for SPECT.

Philips displayed its Vereos PET/CT, featuring Digital Photon Counting that converts scintillation light directly into a digital signal with no analog noise. The system offers approximately twice the volumetric resolution, twice the sensitivity gain, and twice the quantitative accuracy of analog systems, according to Siemens.

X-ray

Siemens introduced its Mobilett Mira Max, a digital mobile X-ray system that the company says has the widest tube angle reach for imaging in difficult-to-maneuver areas. Users can share the flat-panel detectors across the Max family of mobile X-ray systems. The system locks and unlocks with a PIN code option to protect patient data from unauthorized access. At roughly 827 pounds, the Mobilett Mira Max is one of the lightest mobile X-ray systems available, according to the company (Figure 3).

Toshiba highlighted the Kalare, which features a 17x17 flat panel for fluoroscopic imaging. The enclosed table can hold up to 400 lbs. and includes shielding that the company says can reduce physician exposure to radiation by up to 95%. The company's T.RAD R&F was also on display, and detectors can be shared across both of these X-ray systems, which can also accommodate up to 4 wireless flat panel detectors registered at once, decreasing the need to change detectors after each exam.

Philips expanded availability of its diagnostic X-ray systems—DuraDiagnost, DigitalDiagnost, MobileDiagnost wDR, and ProGrade—with new releases now available in the U.S. Currently, MobileDiagnost Opta and PrimaryDiagnost are not available in the US. Central to the solutions in the Philips DR portfolio is the new SkyPlate portable detector, which offers cassette-sized wireless sharing across Philips' compatible digital radiography systems.

GE highlighted its Optima XR646 table, which can lift patients weighing up to 705 pounds with unlimited or off-access capacity, moves in 8 different directions and drops to as low as 50 cm from the floor. The new Discovery XR656 Plus premium DR system is equipped with advanced applications such as VolumeRAD and Dual Energy can be used for lung nodule detection in the U.S.

The new U-Arm and Overhead Tube Crane (OTC) systems from Viztek include a new user-friendly interface, patient-side viewing and controls, unlimited pre-programming and low-dose software. Remote-control capabilities, which offer unlimited APR and presets, both manual and automatic options for movement mode, and advanced software that minimizes "clicks" and provides upgraded stitching functions are key new features of the OTC.

A new 3D C-arm with a 30x30 cm flat panel that provides a 16-cm edge

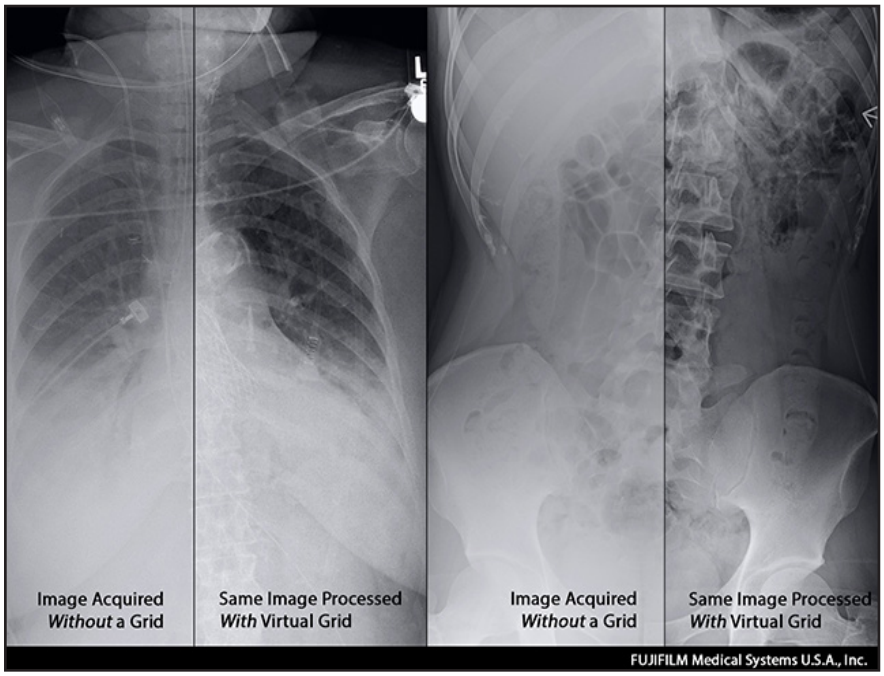

FIGURE 5. *FUJIFILM Virtual Grid.*

length per scan volume was introduced by Ziehm Imaging. The company says the 510(k)-pending Ziehm Vision RFD 3D is the only 3D C-arm that combines 25kW generator with iterative reconstruction algorithm and patented SmartScan rotation to offer 180° information of any anatomical structure (Figure 4).

Varian showcased X-ray imaging components PaxScan wireless digital image detectors, the company's family of OEM and replacement CT tubes, Nexus software and workstations process data from mixed inputs including older systems, and mammography imaging components.

Digital radiography

FUJIFILM Medical Systems USA introduced the FDR D-EVO II digital radiography detectors and a new image processing tool called Virtual Grid. The new detectors are 20% lighter than previous models and boast a sealed smooth surface and battery compartment that locks out moisture. The Virtual Grid intelligently adjusts contrast to improve image quality for exams taken without a grid, It also automatically adapts its processing to replicate grid use to reduce degradation of image quality caused by scatter radiation. This new feature analyzes the image for scatter effect based on exam menu and selected parameters and offers automated and selectable grid ratios to further adapt image quality to site preferences (Figure 5).

Konica Minolta Medical Imaging introduced several solutions. Designed for extreme environments such as the emergency room, trauma and intensive care/critical care units, the company's AeroDR XE provides the best weight-to-load ratio—up to 661 pounds—and the highest bend and liquid resistance on the market, according to a company statement. The AeroDR XE weighs 5.7 pounds and features grip strips to help technologists handle the panel. Konica Minolta also says the panel offers an improved lithium ion capacitor that now lasts a full shift, or through about 300 images (Figure 6).

Konica Minolta also introduced the ImagePilot Aero for orthopedic clinics, featuring the AeroDR wireless flat

FIGURE 6. *Konica Minolta AeroDR XE.*

panel detector and orthopedic toolsets backed by a 5-year total cost of ownership program. Other features include AeroSync automatic X-ray detection for integration with most X-ray systems, and AutoPilot single-click automatic imaging processing. With the new next-generation Informity, an automated cloud backup and recovery solution for the ImagePilot family of solutions, facilities can protect patient data and ensure data recovery in the event of disaster or other system failure.

Agfa launched the DX-D digital detector with Automatic Exposure Detection (AED). The wireless detector works with virtually any X-ray system and, when combined with a laptop or MUSICA image workstation plus a System Control Unit with integrated wireless workstation access point, it offers instant digital radiography. The company also recently received FDA clearance for dose reduction with its Cesium Bromide (CsBr) needle-based image plates and cesium iodide direct DR solutions. When used with the company's MUSICA processing, dose can be reduced by up to 60% compared to traditional barium fluoro bromide computed radiography systems.

A dedicated low-dose DR solution for the neonatal intensive care unit was on display in Kubtec's booth. The company says it is the world's highest resolution, low-dose imaging system available for neonates, clinically tested to reduce radiation exposure by up to 40% via the company's high-resolution

FIGURE 7. *GE Healthcare Discovery IGS 740.*

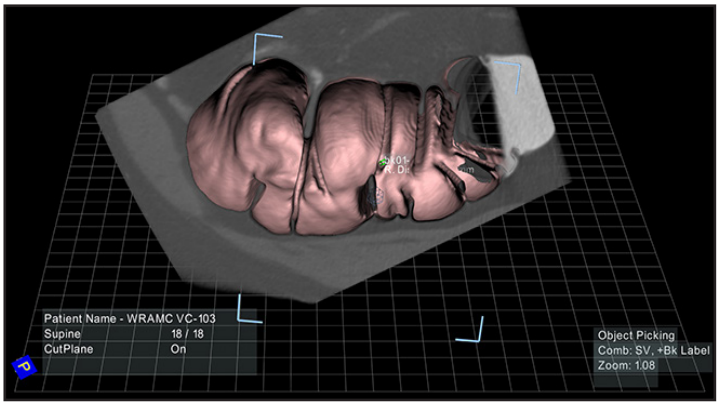

FIGURE 8. *EchoPixel True 3D.*

imaging technology that provides 96-micron resolution.

Interventional imaging

Siemens Medical Solutions introduced its *syngo* Dyna4D software, which enables time-resolved 3D imaging in angiography and which the company says allows for the first time 3D visualization of vessel volume and blood flow. By using this software, featuring a modified protocol that enables the user to combine temporal and spatial resolution, clinicians can track contrast media in real time and visualize how quickly and to what extent the patient's vessels are filled.

Under the theme of "Doc be nimble, Doc be quick," GE Healthcare launched the Discovery IGS 740, a rail-free, laser-guided interventional X-ray system that provides flexibility by keeping the ceiling unobstructed to freely position monitors, radiation shields and lights during procedures. The 41 x 41 cm (16.1 inches) detector offers one of the largest fields of view for imaging large anatomy at low dose in a single image (Figure 7).

Teledyne DALSA introduced four new detectors that the company says can replace TFT flat panel detectors and image intensifiers of up to 12 inches in size. According to Teledyne, the new Xineos detectors are the first flat-panel detectors to surpass the low-dose performance of image intensifiers and to combine this feature with the advantages of traditional amorphous silicon flat panels.

Advanced visualization

First-time exhibitor EchoPixel introduced its FDA-pending True3D visualization technology that uses virtual holography to enable clinicians to view tissue in open, 3D space as if it were a real physical object. Using a hand-directed stylus, clinicians can interact with the anatomy as if it were a real physical object—they can move through planes, rotate or perform cross-sections in any plane, and grab a portion of the anatomy and pull it out for further investigation. EchoPixel president Ron Schilling said radiologists will be able to communicate with surgeons in a language they are accustomed to—a surgeon's frame of reference is an object, not an image. Schilling also said he believes the technology will enable greater synergy between radiology and other specialties as it "helps make imaging data digestable by everyone." (Figure 8)

The newest release of Vital Images' Vitrea software, Version 6.7, includes improvements to STL export functionality, providing the flexibility to export imaging data for 3D printing applications, such as CAD modeling, computational modeling and surgical simulation. Also in Version 6.7 is an enhanced Image Denoising functionality that automatically smooths out tissue while preserving edges for a clearer view (Figure 9).

The new Materialise Hospital Solution incorporates the Mimics Innovation Suite software and 3D printing services, training and consultation. It offers hospitals access to the latest technologies for 3D printing backed by a comprehensive quality control system. Materialise said 3D printing can help improve outcomes and predicts it will be part of the future of personalized healthcare (Figure 10).

With Synapse 3D from FUJIFILM, physicians can use volumetric imaging to construct virtual 3D models for use in surgical or treatment planning. The company showcased a new kidney analysis package in addition to existing virtual colonography and four-chamber heart solutions.

iCad featured its advanced computer-aided detection (CAD) solutions for breast and colon cancers, including a new tomosynthesis workflow tool that the company plans to release as a future product.

Radiology IT/Enterprise Imaging Workflow

Big data technologies made an appearance in several booths. Hitachi, for example, showcased its new Health Care Group and Hitachi Clinical Repository through its Climbing the Mountain vision/theme. At the bottom

FIGURE 9. *Vital Images Vitrea Version 6.7 includes an enhanced Image Denoising functionality.*

FIGURE 10. *3D printed brain using Materialise's Mimics Innovation Suite software and 3D printing services.*

is the infrastructure to manage content followed by a clinical data exchange that performs as a repository for big data, including genomics. The next layer is mobility through the cloud, where patient information and physician reports can be tracked, audited and managed with controlled access. Next is clinical data analytics, which connects with electronic health records and has the capability to capture 450 types of data, including unstructured data. Finally, at the top is the ability to provide tools for population health management and utilize evidence-based data to drive patient care.

McKesson introduced its Clinical Data Exchange (CDE) 1.0, an enterprise solution that can help manage data and clinical collaboration and assist with workflow. According to McKesson, the solution addresses workflow across clinical sites via clinical workflow intelligence that allows teams to efficiently share workload via prioritized, automated work lists that include aging, alerts and notifications. Adhering to the XDS standard, CDE provides access for users to manage data in the context of an EHR and to use information that may be "hidden" in medical imaging. The company highlighted a population health study in Ireland that suggests imaging can play a broader role in the overall healthcare enterprise and enable earlier and more accurate and appropriate utilization of imaging technologies—a key tenet of a value-based healthcare model.

Carestream launched its web-enabled Clinical Collaboration Platform, where healthcare providers can capture, archive, manage and distribute clinical data such as images, videos, photos and reports related to the patient from ancillary departments such as endoscopy and dermatology. This creates a patient-centric clinical record that complements the EHR. Capturing structured data also will deliver greater clinical insight with interactive reports where a single click of a hyperlink takes physicians to the actual data. The platform also offers a secure digital patient portal that allows patients to download, view, store and share their medical imaging studies with physicians and specialists. The company also released its latest version of Vue Reporting on Vue PACS, delivering the ability to insert interactive hyperlinks to access critical images directly from the report (Figure 11).

For the past several years, the industry has talked about the need to break down the silos of data between the various "-ologies" of medicine and different types of imaging data. At RSNA, there was a heightened focus on bringing imaging together with pathology, followed closely by dermatology, ophthalmology and visible light (surgical).

OneDX and Long Island Pathology (LI Path) announced they have joined forces to produce what the companies say is the first-of-its-kind combined reporting capability for pathology and radiology. Once fully integrated, physicians will be able to access a single portal to view patient images, reports and notes from a single source.

FUJIFILM demonstrated its Synapse vendor neutral archive (VNA) with a workflow that includes pathology, dermatology and surgical videos. Tied to this is a new enterprise viewer that launches from the EMR for viewing of

FIGURE 11. *Carestream Clinical Data Collaboration.*

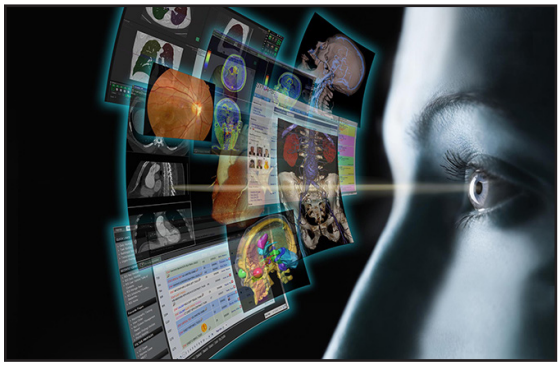

FIGURE 12. *FUJIFILM Synapse VNA.*

non-DICOM data, enabling the radiologist to see all relevant patient data (Figure 12).

Philips showcased the IntelliSpace Portal 7.0, which offers advanced analytics, visualization and data sharing across multiple systems and imaging scan types. If offers a broad set of clinical applications covering cardiology, vascular, oncology, neurology and other clinical domains.

GE's new Cross-Enterprise Display capability gives clinicians a consolidated view of a patient's medical history, including all relevant prior images. The web-based Cross-Enterprise Reporting provides tools such as voice recognition to clinicians via an internet connection.

In addition to announcing its upgrade program, "Any/\One," at RSNA, Tererecon introduced the latest version of its iNtuition and iNteract+ solutions. By combining the iNtuition advanced visualization solution with the new Interact+ interoperability capabilities, clinicians will have the ability to perform: universal viewing and image sharing for image-enabled EMRs; deconstructed PACS for future PACS replacement or PACS-on-PACS; and advanced visualization for extending decision support tools.

Vital Images announced enhancements in image management with VioStream software—a server-side software that enables a Web-based medical imaging viewer to connect to a variety of existing DICOM/PACS archives as well as non-DICOM data. The software converts data to a Web-friendly format and enables users to view images at a substantially reduced time-to-first-image without waiting for the full query/retrieve to begin interacting with a study.

A patient-centered approach focused on patient pathways was a key theme for Sectra, with an emphasis on tools, such as structured reporting and anatomical linking, and cross-enterprise access with specialists. Supporting referring physicians through these technology tools can help increase the visibility and relevance of radiology, the company said in a statement. A recently announced partnership will include Riverain Technology's lung disease detection software in Sectra's platform. In 2015, the company is planning to launch new capabilities for viewing pathology images side-by-side with diagnostic images on Sectra PACS, including for both its breast workstation and general radiology workstation. Sectra Digital Pathology Solutions is an extension of Sectra PACS enabling this capability (Figure 13).

CoActive introduced a fully cloud-based version of its advanced EXAM-RIS® solution, providing robust capabilities such as flexible rules-based exam routing, load balancing and immediate updating of multi-site worklists. A diagnostic version of the zero footprint EXAM-BROWSER is now available for high-fidelity reading capabilities on any high-resolution display. Enhancing its functionality, EXAM-CLOUD®/EXAM-VAULT® VNA can be deployed to image-enable an EHR without a VPN, thanks to CoActiv's patented EXAM-SENDER® image distribution system, which uses a standard Internet connection.

One of the initial PACS/teleradiology companies, founded in 1993, BRIT Systems announced its acquisition by Imaging Advantage. The company says it will operate as a wholly owned subsidiary with the ability to tap into the expertise of IA in areas of radiology workflow efficiencies and implementations. Other specific product news from the company included advanced 3D tools for its WebWorks zero footprint image browser, such as 3D rendering that can be rotated; MIPS and MPRs, magnification, cross reference and locate tools, measurement tools and snapshot tools so an image can be saved to the server as DICOM data for others to view. Also introduced was an optional module for Webworks that provides advanced study QC functionality by allowing changes to studies to be made in one place with the results automatically returned to multiple servers, such as to a PACS and a VNA, keeping them synchronized (Figure 14).

Medweb highlighted its new browser neutral enterprise viewer for distributed access to all DICOM imaging with 2D and 3D interactive capabilities. The viewer supports ECG and general telemedicine devices for data capture and

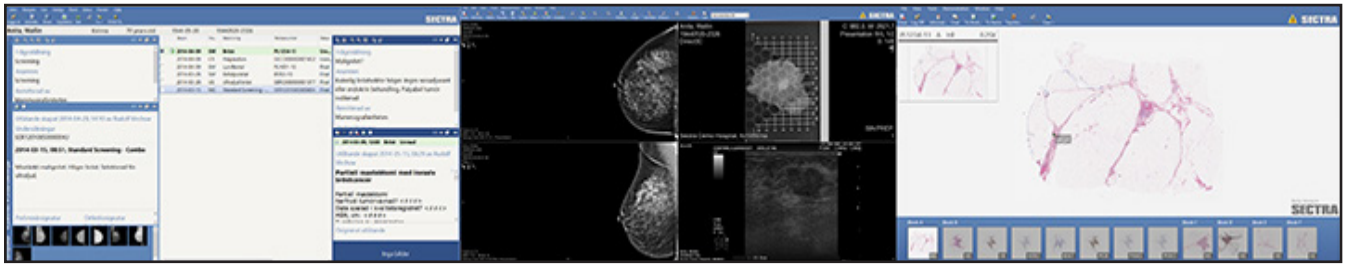

FIGURE 13. *Sectra's integrated diagnostics platform for radiology and pathology.*

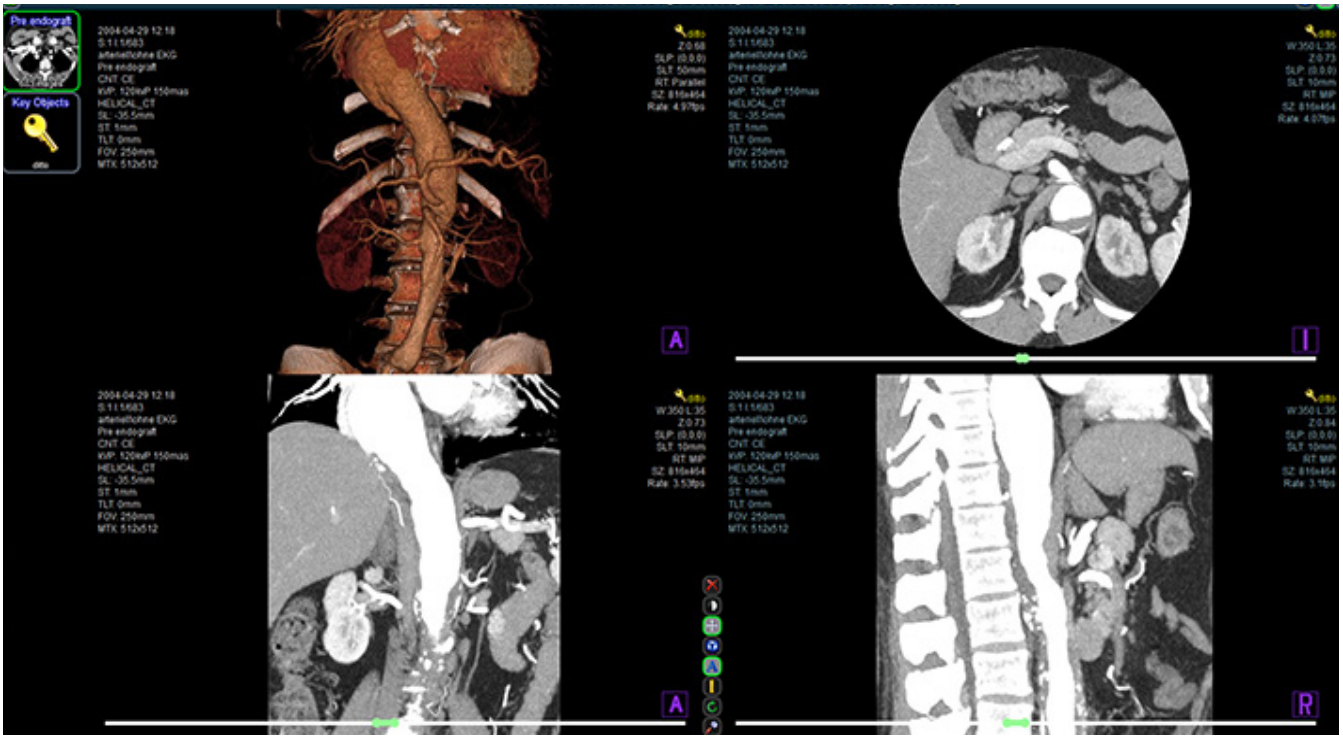

FIGURE 14. *BRIT Systems' WebWorks zero footprint viewer with advanced 3D tools.*

upload, as well as display in addition to conventional radiology devices. The company also highlighted its E-visit consultation engine that allows easy and fast video consultations between patients and physicians, with call routing and EMR /PACS integration.

With patient engagement an important focus of Stage 2 Meaningful Use requirements, there is a growing trend to provide patients with online access to their medical information. At RSNA 2014, Integrated Modular Systems, Inc., offered My Key to ImageWebGate (MKTI), a module that generates a secure, wallet-sized access card with a QR code that, when scanned by a smartphone, table or other device, allows the patient to view, download and transmit his/her own medical images and documents securely and easily anywhere there is Internet access.

Further expansion into LED backlight technology was evident in the NDS Surgical Imaging (NDSSI) booth, featuring the new Dome S6c LED 6MP, Dome S2c LED 2MP and the Dome S3 LED 3MP color diagnostic displays; the latter two are both scheduled for release in 2015. The company also highlighted its Dome Dashboard 3.0 software for total PACS display system management with enterprise-wide connectivity and secure remote access via the DomeAccess web portal.

Claron Technology debuted major enhancements to its Nil enterprise viewers with support for diverse data types, including the ability to display radiation therapy plans with support for contour sets, isodoses, dose graphs and beams across the enterprise. Specifically on the Nil 4.0, new advanced capabilities minimize or eliminate DICOM data pre-fetch and transfers. The company also showcased its 510(k)-pending automated vessel analysis package that separates vessels from bones in CT angiography studies while identifying and naming specific vessels.

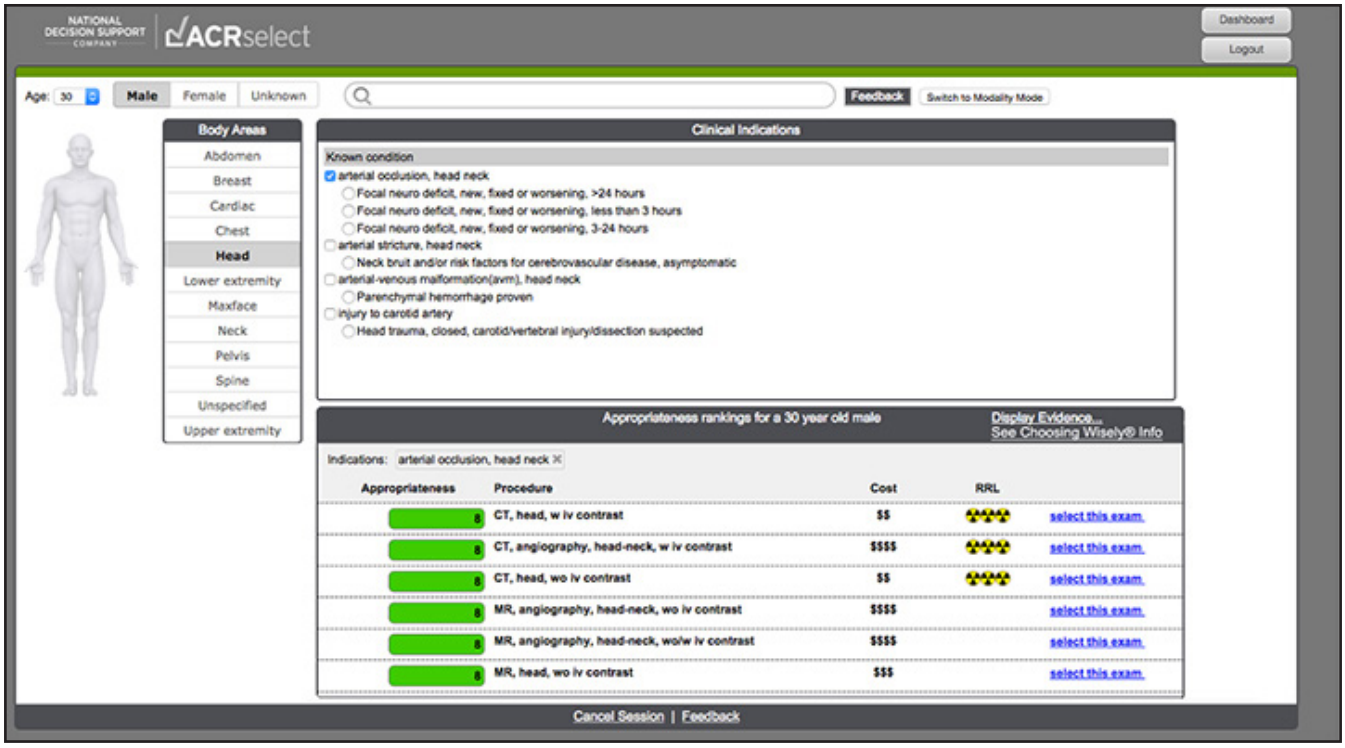

FIGURE 15. *National Decision Support is the exclusive distributor of ACR Select clinical decision support.*

It includes vessel lumens, thrombus areas and calcification.

Barco, also focused on LED technology, presented its re-engineered Coronis Fusion 6MP LED, a wide viewing angle for a screen area that is 100% compliant to the American College of Radiology's guideline for luminance ratio. New productivity tools include Stunning SpotView technology for focusing the light on lesions or abnormalities that require extra attention and DimView, which can be configured to automatically dim the auxiliary displays used for patient work lists or dictation. The company also provided a glimpse of is works-in-progress Coronis Fusion 10MP wide-screen diagnostic grayscale display system.

Clinical decision support

Finally, clinical decision support was another emerging technology trend at RSNA 2014, particularly with the increased focus on value-based care in the U.S. National Decision Support is the exclusive distributor of ACR Select, a complete web service version of the ACR's appropriateness criteria. Choosing Wisely is now fully integrated and delivered through ACR Select as supporting evidence that allows physicians to compare Choosing Wisely guidelines with ACR Select feedback as an integral part of the decision support workflow. Other integrated enhancements include the Isabel diagnosis checklist tool to provide physician access to differential diagnosis during the order-entry process and MR safety data from MRISafety.com to provide alerts at appropriate points in the EHR workflow regarding the safety of a patient's implant inside an MRI field strength. The company has also entered negotiations to integrate the American College of Cardiology appropriate use criteria through its delivery mechanism (Figure 15).

Nuance Communications, Inc. announced that the ACR and Massachusetts General Hospital will leverage the Nuance PowerShare Network, a cloud-based medical imaging exchange, to bring clinical guidelines to the radiologist's workflow and automate the process of collecting and reporting quality measures to meet industry regulations and guidelines. In partnership with the ACR and Nuance, MGH will deliver an initial set of radiology clinical decision support guidelines to the broader radiology community by integrating them into the PowerScribe workflow so that radiologists can access these evidence-based guidelines at the point of interpretation to improve clinical documentation consistency and quality.