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Achieving Significant Workflow and Clinical Improvements in PET·CT

How the University of Tennessee Medical Center is doing it.

Answers for life.

Serving a 21-county area in and around Knoxville, TN, the University of Tennessee Medical Center (UTMC) is the region's only academic medical center, Magnet® recognized hospital, and Level 1 trauma center. The 581-bed organization provides comprehensive care to all the patients in these communities. In fact, UTMC's Department of Radiology performs more than 200,000 procedures annually and receives a large range of referrals from surgical oncology, medical oncology, and radiation oncology.



“The mCT FlowMotion allows me to be more secure in my diagnosis, which means greater security for patients and referring physicians.”

Yong C. Bradley
Chief of Nuclear Medicine
University of Tennessee Medical Center

The facility recently acquired a Biograph mCT Flow™ to better support its positron emission tomography/computed tomography (PET-CT) imaging for these patients. “Our goal was to increase the efficiency and throughput of our PET-CT exams while simultaneously increasing the complexity of the exams we could perform,” says Dustin Osborne, PhD, assistant professor and director of Clinical Research, UTMC. “We expected to raise imaging volume by at least one patient per day and use gating on all lung patients.”

And while decision-makers believed the Biograph mCT Flow could support these goals, some wondered how much of a difference a continuous scan system would make. “When we first started using the mCT with FlowMotion versus step-and-shoot, we were wondering whether or not it would really make a difference,” says Yong C. Bradley, chief of Nuclear Medicine at UTMC. “But when we started actually imaging, I realized the customization that we could do for each patient.”

Continuous Scan Reduces Motion, Improves Efficiency

The Biograph mCT Flow uses unique FlowMotion™ technology, which eliminates the need for step-and-shoot imaging in PET-CT. With it, planning and scanning are based on continuous PET data acquisition with a single continuous motion of the patient table. And, the system combines the anatomic detail of a premium CT with the precise metabolic information of PET to help improve therapy planning and support more efficient and cost-effective PET-CT imaging.

Unlike other PET-CT technology, FlowMotion enables a continuous scan process, which can improve image quality by reducing artifacts associated with patient movement from unexpected table motion or movement. Before FlowMotion, UTMC followed a standard workflow, which was a CT scan at an outside facility; then scheduling patients for a fixed PET-CT. Afterwards, radiologists would fuse the two images with their radiation treatment planning system.

“It required multiple visits for the patients, more work for the physicians, staff, and radiation oncology department, and it generated the potential for errors,” says Joseph Kelley, MD, PhD, associate professor at UTMC. “The continuous flow motion with the new Siemens PET-CT really benefits my patients. It allows us to do a faster scan so the patients have less time on the table. In one continuous scan motion, we’re able to scan the entire body, get the imaging, and then focus on the area of interest with higher resolution.” In addition, these faster, continuous scans can support higher levels of patient comfort and satisfaction. And, more comfortable patients tend to move less, further supporting higher levels of image quality.

With Biograph mCT Flow, you can:

- Virtually freeze respiratory motion for full HD lesion detection and accurate standard uptake value quantification with features like HD-Chest.
- Perform precise organ imaging in a single scan.
- Achieve an up to 25 percent reduction in diagnostic scan time, including patient set up through the completion of scan, over conventional multi-scan protocols.
- Reduce the need to rescan patients thanks to high image quality.
- Lower injected dose by up to 50 percent with options like TrueV and HD-PET.
- Achieve an up to 60 percent dose reduction in medical radiation with advanced CT technology option Saphire (Sinogram Affirmed Iterative Reconstruction)*.



Reduced patient motion is just one of several ways the Biograph mCT FlowMotion is engineered for better workflow and departmental efficiency. According to Shelley Acuff, clinical research leader at UTMC, FlowMotion decreases the number of steps technologists need to set up before performing a scan. In fact, with this technology, technologists can create personalized imaging for each patient with fewer steps—easily adjusting speed, image resolution, and motion management to each patient’s specific organ dimensions. And since the workflow is easier, UTMC’s technologists are routinely incorporating these steps into one single scan for every patient who needs it.

Expanded Services, Higher Clinical Confidence, More Volume

With the more efficient workflow, UTMC’s Radiology Department has also expanded its capabilities to include more advanced imaging like HD-Chest optimal amplitude-based gating, which the staff can now perform on all lung patients. Through an innovative combination of hardware and software, HD-Chest virtually freezes respiratory motion, enabling full HD lesion detection and accurate standard uptake value quantification.

At UTMC, greater workflow efficiency—without losing clinical confidence—has made a significant impact on patient volume. “With the mCT Flow, we’ve been able to increase our patient volume by nearly two patients per day,” says Osborne. According to Acuff, “the workflow improved tremendously and is a lot easier. Dr. Osborne agrees, noting that the set-up for the Biograph mCT FlowMotion is comparable to a CT set-up. “An easier workflow for our technologists enables us to obtain much more consistent images without overlap throughout the entire scan range,” he says. “And with the continuous bed motion system, we’ve actually been able to make our gated protocols, which are much more complex workflows, more efficient too.” Today we are able to offer gating on all lung, liver, pancreas, and gastric cancer indications. We now use gating on 40-50% of all of our PET-CT imaging procedures.”

Dr. Bradley sees reducing the complexity of gated protocols as well as the ability to customize scanning parameters for each patient as significant benefits. “This allows me to personalize all the medicine for each patient that I have. FlowMotion is the key to all of this,” he says. UTMC’s physicians seem to agree. “We’ve done several studies where we blindly gave physicians continuous bed motion or step-and-shoot images. In the vast majority of cases, the physicians chose the continuous bed motion images” says Dr. Osborne.

And when it comes to gated radiation treatment, the advantages for patients and physicians are significant too. “By integrating FlowMotion PET-CT with gated radiation treatment, we’re able to accurately focus on much smaller targets and have much better confidence that we’re treating the tumor and avoiding normal tissue,” says Dr. Kelley. This eliminates radiation dose from CT over-scanning, further supporting efforts to enhance patient safety.

With better workflow efficiency, enhanced image quality and improved patient safety, the Biograph mCT FlowMotion has a significant and important impact at UTMC. “The mCT FlowMotion allows me to get a better diagnosis and be more secure in my diagnosis, which means greater security for patients and referring physicians,” says Dr. Bradley. “This system will definitely change how you view the images from your patients.”

*In clinical practice, the use of SAFIRE may reduce CT patient dose depending on the clinical task, patient size, anatomical location, and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task. The following test method was used to determine a 54 to 60% dose reduction when using the SAFIRE reconstruction software. Noise, CT numbers, homogeneity, low-contrast resolution and high contrast resolution were assessed in a Gammex 438 phantom. Low dose data reconstructed with SAFIRE showed the same image quality compared to full dose data based on this test. Data on file.

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