

Value-based Imaging

CT, Care Protocols & Cutting Radiation Dose

Imaging, like all of healthcare, is in the midst of a drastic shift. Tried-and-true models based on volume will no longer suffice in the future. For decades, U.S. healthcare has outspent other nations, paying more than 141 percent of the average of other globalized economies. Yet, outcomes fail to reflect the investment; the U.S. trails globalized economies in terms of many health indicators, including life expectancy, which ranks a dismal 31st.

Demographics, politics and economics have merged, promising to re-invent the status quo. The aging population will translate into nearly 80 million new Medicare beneficiaries in the next 20 years. Meanwhile, healthcare reform spells increased demand, via another 32 million lives covered by 2019. And anticipated changes in physician payment mechanisms are expected to tie compensation to quality.

The change has rattled physicians and administrators across the country. But a few organizations are far ahead of the curve and have leveraged advanced CT imaging in strategic ways to employ a value-based approach, proving that the model can improve patient outcomes and save resources. Consider:

- › **Stony Brook University Medical Center** in New York has saved an estimated \$1.5 million for every 250 admissions avoided by employing cardiac CTA in the evaluation of patients who present to the emergency department (ED) with acute chest pain, slashing its admission rate for this group from nearly 50 percent to less than 15 percent.
- › **Millard Fillmore Gates Hospital** in Buffalo, N.Y., has garnered \$762,000 in risk-adjusted annual cost savings by implementing a CT-based stroke triage protocol.
- › **Cincinnati Children's Hospital Medical Center** has realized reductions in pediatric radiation dose exposure ranging from 10 percent to 80 percent depending on body part imaged and patient age since installing a state-of-the-art CT system.

The common ingredient among these diverse success stories is Toshiba America Medical Systems Aquilion™ ONE 320 detector row CT system.

Chest pain: The new model

“Imaging reimbursement is definitely declining, and people have asked ‘who is going to do imaging anymore.’ But we can’t look at the value of imaging based on reimbursement. We need to look at the entire picture of what imaging brings to patient management,” observes Michael Poon, MD, director of the Advanced Cardiac Imaging Program at Stony Brook University Medical Center.

In the case of chest pain in the ED, CT imaging delivers clear benefits over the standard of care. It provides a clear diagnosis, facilitates shorter lengths of stay and saves money.

The status quo for chest pain is woeful. Every year, 8 million patients present to the ED, costing more than \$18 billion. Yet many, even those admitted to the hospital, are discharged without a clear diagnosis, says Poon. “This standard is not quality care. It’s like playing Russian roulette,” opines Poon.

Stony Brook developed a new standard of care that is efficient, cost-effective and diagnostic. Since 2009, the center has used Aquilion™ ONE as the major imaging modality for the evaluation of chest pain in the ED. Patients whose initial biomarkers and enzymes exclude acute coronary syndrome are referred to CT right away.

“The length of stay shortened dramati-

cally from at least 24 hours to less than 10 hours,” says Poon. In addition, CT provides a clear-cut diagnosis for the index event and can exclude an acute coronary event, pulmonary emboli and aortic dissection within seconds. The alternatives include mandatory repeat enzyme testing after 8 hours, a labor- and resource-intensive nuclear stress test or observation for patients with suspected high likelihood of disease. “It’s very haphazard and does not always produce a definitive diagnosis.”

The ability to accurately diagnose patients using CT is associated with two key benefits. First, with a reassuring result, few patients bounce back into the ED, saving dollars and resources. Plus, hospitals that discharge patients with a diagnosis of chest pain but without a clearcut final diagnosis are not providing quality care, as chest pain is a symptom not a diagnosis.

“The CT model fits perfectly with the push for quality; it saves money and improves outcomes without adding more layers to the system,” Poon says. Comparative effectiveness studies, including CT-STAT, a 750-patient study scheduled for publication in September, show CT is more efficient and cost-effective than nuclear stress testing, echoing the results of Poon’s more than 4,000-patient study.

Individualized stroke treatment

Millard Fillmore Gates Hospital has changed the paradigm for stroke treatment and demonstrated improved outcomes at a



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hefty cost savings. The hospital has the highest stroke volume in New York and provides comprehensive stroke care that pairs sophisticated imaging with neuroendovascular treatment.

The neuroendovascular department embraced a new philosophy of stroke treatment about five years ago, shares Kenneth Snyder, MD, PhD, assistant instructor of neuroradiology at University of Buffalo. "It wasn't driven by a cost-benefit analysis, but instead by the philosophy that an event in a certain time window should not exclude or include a patient from treatment. Everybody's brain has a unique ability to find a new pathway or salvage tissue in a stroke event."

"Time has become less relevant," says Elad I. Levy, MD, director of the neuroendovascular fellowship program. "We've seen patients who are ischemic and symptomatic with viable brain tissue 14 hours after the event. Conversely, presenting within three to six hours does not guarantee viable brain tissue."

CT perfusion using the Aquilion™ ONE has been the cornerstone of the hospital's stroke model since late in 2008. Patients who present with possible stroke are immediately referred for CT perfusion and CT angiogram, enabling physicians to make a treatment decision in less than five minutes, explains Jodi Witherell, RN, senior director of stroke and neurosciences nursing.

If the CT perfusion algorithm shows viable brain tissue, the patient proceeds to the neurointerventional suite. "Seventy-five to

80 percent of our patients have significant clinical improvement compared to the national average of 25 percent to less than 50 percent," shares Levy.

The model delivers savings in acute care and rehabilitation costs, which account for the lion's share of the nearly \$20 billion in annual stroke costs. Prior to the Aquilion™ ONE-enabled model, 31.5 percent of the hospital's stroke patients were discharged home rather than to a nursing home. In 2009, that figure climbed to 51.3 percent, shares Witherell.

"Using CT perfusion we are able to offer interventions to patients who would otherwise have not received treatment at all....and we are sending half of these patients home independently," Snyder says. "If this trend continues, we will have made a major impact on the fourth leading cause of death not only for patients but also the community at large."

Optimized pediatric CT

Pediatric CT faces issues similar to adult CT; however, because children are not miniature adults and are more sensitive to radiation exposure, especially throughout a lifetime, these issues can be more pressing. When Cincinnati Children's Hospital Medical Center considered investing in a new CT system, three factors occupied center stage: radiation exposure, speed and image quality.

After a thorough market survey, the center selected Toshiba Aquilion™ ONE and installed it in April 2010. "The new system has become the everyday workhorse," shares

Daniel Podberesky, MD, chief, thoracoabdominal division, department of radiology.

In rigorous testing performed on pediatric phantoms, Podberesky and colleagues identified significant radiation dose savings compared to their 64-slice system. For example, a volumetrically-acquired sinus CT on a 5-year-old child yielded an effective dose of 0.2 mSv, compared to 1.1 mSv using similar parameters on a helical 64-slice scanner; an approximately 80 percent dose savings. In addition, repeat imaging because of motion has become nearly nonexistent because the typical volume scan is performed in less than one second, says Podberesky.

Finally, in general, many children may avoid the need for sedation when scanned on the Aquilion™ ONE due to its faster scan speeds, which improves the value of CT and makes the tradeoff between CT and MR a more difficult decision-making process, says Podberesky. That's because MR often requires sedation in young children, which poses its own risks and adds to overall healthcare costs.

As many in healthcare ponder and dread the monumental changes of the next decade, a handful of organizations have demonstrated that quality improvements and cost savings can be paired together. The recipe for success includes a committed and engaged clinical and administrative leadership team that can optimize state-of-the-art imaging infrastructure such as Toshiba Aquilion™ ONE to meet these divergent, but not mutually exclusive, imperatives. **■**