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2023 OUTLOOK FOR MEDICAL DIAGNOSTIC IMAGING EQUIPMENT: APPRAISAL CONSIDERATIONS WHEN DETERMINING FAIR MARKET VALUE OF A CT SCANNER

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WHAT IS COMPUTED TOMOGRAPHY?

A Computed Tomography ("CT") scan is a series of x-ray images of the body, depicting cross-sectional views of organs, bones, blood vessels, and soft tissues. Components of a CT scanner include a gantry, high frequency x-ray generator, a cooling system, and a corresponding computer system. Together, these components produce x-ray images or 'slices' of data which are then combined and viewed as a cross-sectional three-dimensional (3-D) image for the purpose of diagnosing disease, injury, or other abnormalities inside the body. The slice count for a CT scanner reflects the number of x-ray images taken during each rotation of the gantry. The higher the slice count, the more slices of data are recorded within a given period of time, resulting in a more detailed image on the CT scan.

HISTORY OF CT SCANNERS

Prior to CT scanners, radiographic images were limited to single-plane, two-dimensional (2-D) images (e.g., x-ray film images). The first commercial CT scanner became available in 1971 after physicians developed a way to capture a series of single-plane x-ray images and combine them to create a 3-D image. Initially used for scans of the head, early CTs helped detect skull fractures, brain tumors, and other head trauma. When compared to x-ray technology, CT scanners produced far more detailed images, particularly of blood vessels, which had proven difficult to capture with traditional radiographic systems.

CURRENT TECHNOLOGY AND LEADING MANUFACTURERS

CT scanners started out as 4- and 8-slice systems but are now widely available with 64- and 128-slice technology. A 128-slice system, such as the *Siemens SOMATOM® Definition or GE Revolution EVO*, can provide significantly more detailed images in less time than some 16-slice alternatives, such as the *SOMATOM® Emotion eco or GE Lightspeed 16*. 16- and 32-slice systems can be strong, affordable options for urgent care centers and emergency departments, whereas 64- and 128-slice systems are now standard in most hospitals and diagnostic imaging centers.

The technology of CT is constantly evolving to produce better images while reducing the concerns and limitations historically associated with CT screening, such as patient exposure to radiation, the size and weight of equipment, and access to CT scans, including in the case of in-the-field imaging for traumatic injuries. Some 160-slice systems, like the *Toshiba Aquilion Prime*, incorporate low dose technology that

can reduce patient exposure to radiation by up to fifty percent. A 256-slice CT scanner, such as the *Philips Brilliance iCT*, has the ability to provide a complete 3-D image of the heart within just two heartbeats, which is critical for advanced cardiovascular studies. The *NeuroLogica BodyTom* and *OmniTom* systems leverage portability to enable mobile CT scanning, including the performance of CT-based stroke assessments onboard ambulances.

The highest slice CT scanner currently available is the *Toshiba Aquilion One* with 640 slices. With dose-modulating technology, the scanner uses eighty percent less radiation than conventional CT systems, making it a superior choice for pediatric care. It has the ability to produce an image of a heart in a third of a second. This system makes it possible to diagnose coronary artery disease at earlier stages than ever before. It is also equipped with 4-D digital subtraction angiography, making it possible to scan the brain in mere seconds. This allows doctors to evaluate brain function within minutes or make real time assessments regarding stroke patients.

EMERGING TECHNOLOGY

The most significant breakthrough for CT came in 2021 with Siemens' introduction of photon-counting technology by way of the *NAEOTOM Alpha*, the world's first photon-counting detector ("PCD") CT scanner. Conventional CT scanners convert x-rays to images using a 2-step process involving visible light conversion to produce the final image. The process for PCD-CT removes the intermediate step of converting x-rays to visible light, where the risk of losing image clarity and contrast occurs, and instead uses a photon detector to convert the x-rays directly into digital signals that produce the final image. This technique allows the PCD-CT to measure photon energies with no electronic noise, delivering high spatial resolution. PCD-CT images are so clear they can provide insight into the progression of the disease, rather than simply confirming the diagnosis. Other benefits to PCD-CT include decreased radiation exposure, a reduction in utilization of contrast agents, and enhanced quantitative imaging opportunities.

APPRAISAL CONSIDERATIONS

- Normal Useful Life ("NUL") – The NUL for a CT scanner in a cost approach appraisal is estimated to be 10 years. The appraiser must consider software and hardware upgrades that have been performed on a CT Scanner, some of which can be costly but could extend the NUL well beyond 10 years. Costs associated with a software update can vary based on which feature(s) are being upgraded or added to the current system, as well as specific pricing structures and policies set by the various manufacturers. Hardware replacement/upgrade costs can vary too - the cost to replace an x-ray tube, for example, can range from $40,000 to $200,000.
- Installation/Deinstallation Costs – Site planning, lead shielding, cryogen storage, and proper ventilation are all necessary to install a CT scanner. Installation costs start around $40,000, but rural facilities or difficult-to-access spaces within a clinic or hospital can further increase these costs. Pricing for new systems is often inclusive of installation. The cost to deinstall a CT can also cost upward of $20,000. Depending on the premise of value, all of these costs should be considered in the context of an appraisal. If a clinic or hospital is upgrading to a new system, the seller will often deinstall the old system and offer a trade-in credit toward the new unit.
- Replacement Cost New – The slice count is the most important factor in determining the replacement cost new ("RCN") of a CT scanner. A potential purchaser may also consider refurbished units as an affordable alternative to new systems:
    - 16-slice CT scanners cost approximately $300,000 new or $100,000 refurbished
    - 64-slice systems range from $500,000 to $700,000 new or $150,000 refurbished
    - 128-slice units cost as much as $1 million new or $300,000 refurbished
    - 256-slice machines can cost over $2 million new, with few refurbished units generally available for sale
    - The Aquilion One 640-slice CT ranges between $2.5 and $3 million

- Functional Obsolescence – Slice count, radiation exposure, image conversion time, potential down time, maintenance and machine footprint are all important factors to consider when appraising a CT scanner. When appraising a CT scanner in place (*i.e.*, Fair Market Value Installed), it is important to note the specialty of the clinic to ensure the capabilities of the CT scanner are in-line with the demands of the clinic. Considerations such as outdated technology or overcapacity could significantly affect the FMV Installed of a CT scanner.
- Economic Obsolescence – Regulatory changes can significantly affect the value of a CT scanner, if that particular CT now fails to meet the qualifications needed for reimbursement of technical services. Effective January 2012, the Centers for Medicare and Medicaid Services ("CMS") requires providers of the technical component of advanced diagnostic imaging ("ADI") services to be accredited by one of three designated accrediting organizations – the American College of Radiology (ACR), the Intersocietal Accreditation Commission (IAC), or The Joint Commission (TJC) – in order to be eligible to receive reimbursement for the technical component of ADI services.[1] In 2014, Congress passed the Protecting Access to Medicare Act ("PAMA"), which added specific standards for radiographic accreditation requirements. The National Electrical Manufacturers Association ("NEMA") XR-29 Standard specifies four criteria regarding dose optimization and management, structured dose reporting, and radiation exposure controls. Starting in 2017, CT scanners in outpatient facilities must be XR-29 compliant to receive full CMS reimbursement; noncompliant systems are subject to a 15 percent reduction per scan for technical component reimbursement.[2]

CONCLUSION

CT scanners have revolutionized the way medical professionals detect and diagnose diseases and injuries and perform medical procedures. Knowledge of the different technological specifications and capabilities (slice count, radiation exposure, upgrades, etc.) is necessary to provide accurate valuation of these machines. Additionally, it is necessary that an appraiser have knowledge of what type of practice the CT scanner will be used in, the intended use applications and requirements for imaging, and the particularities of the clinical specialties and population that the scanner will be used for. In addition to the typical drivers of value, the fair market value of a CT scanner is heavily dependent upon the special considerations discussed above. HealthCare Appraisers' specialized team of asset appraisers have obtained industry credentials for the valuation of medical equipment and have a breadth and depth of healthcare equipment and asset valuation that spans decades. Contact us today to learn more.

[1] Centers for Medicare & Medicaid Services: Section 135(a) of the Medicare Improvements for Patients and Providers Act of 2008 (MIPPA) (P.L. 110-275) amended section 1834(e) of the Social Security Act (the Act).

[2] Centers for Medicare & Medicaid Services: Section 218(a) of the Protecting Access to Medicare Act of 2014 (PAMA) amends the Social Security Act (SSA) by reducing payment for the technical component (and the technical component of the global fee) of the Physician Fee Schedule service for applicable services furnished using equipment that fails to meet the attributes of the National Electrical Manufacturers Association (NEMA) Standard XR-29-2013.