



VALUATION OF LINEAR ACCELERATORS

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A Linear Accelerator (“Linac”) is a technically advanced medical device/system that is utilized in radiation oncology. A Linac customizes high energy x-rays/electrons to conform to a tumor’s shape to destroy cancerous tissue, while preserving the surrounding tissue. Major health systems and cancer centers around the world typically use some type of Linac as a cancer treatment tool. Other than the normal considerations in an equipment appraisal (*i.e.*, age/life, condition, replacement cost, etc.), there are special considerations that need to be taken into account when appraising a Linac, including vault structure, maintenance history, software, and technology.

BACKGROUND AND HISTORY

Linear Accelerators have been providing radiation therapy treatment to cancer patients for over 50 years. Technology has significantly improved since the first patient was treated at Stanford University Hospital in 1956, and it continues to advance with a smaller footprint, improved treatment process, and faster treatment times. The current notable Linac manufacturers include Varian (Linac models include: Halcyon, Edge, VitalBeam, TrueBeam, Trilogy, Clinac, Silhouette), Elekta (Versa, Infinity, Axesse, Synergy), and Accuray (Radixact, Tomotherapy, Cyberknife).

Linacs treat cancer using external beam radiation, where electrons are accelerated through a wave guide and collide with heavy metal, creating high energy x-rays. Multi-leaf collimators are used to shape the x-ray beams to conform to the tumor, which helps reduce damage to surrounding healthy tissue and organs. The beam typically exits through a gantry, which, in most Linacs, rotates around the patient (the exception being the Accuray Cyberknife, which uses a robotic arm instead of a gantry). The patient couch can also move in many directions, thus allowing the Linac to deliver radiation to the tumor from any angle.

APPRAISAL CONSIDERATIONS

- Normal Useful Life (“NUL”) – The software upgrades and maintenance of the machine (discussed below) can extend the life, but the typical NUL used in a cost approach appraisal is in the range of 10 to 12 years.
- Replacement/Reproduction Cost New (“RCN”) – The RCN of a Linac is impacted by many issues, including, make/model, vault structure, and technology. The average RCN is approximately \$3 million, but can range from \$2 million to \$4 million.
- Transferability of Software License – The ability to transfer the software license of a Linac can significantly affect its value. A software license is required to operate the Linac and can cost upwards of \$1 million, but is often heavily discounted when acquiring a new Linac from a manufacturer. This puts downward pressure on the price of a used Linac if the existing software license does not transfer with the sale of the Linac, which is often the case.



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- Transferability of Maintenance Contract – Similar to software licenses, maintenance contracts are costly reoccurring expenses needed to operate and maintain a Linac. Often discounted for the initial purchase, the transferability of these contracts significantly affects the resale value of a Linac. If the resale buyer has to purchase a contract separately from the manufacturer, the cost will be significantly higher than obtaining a maintenance contract in conjunction with a new purchase, likely upwards of \$500,000 per year.

CURRENT TECHNOLOGY

There are many different generations of Linac systems currently in use. These systems have varying options, including image-guided radiation therapy (IMRT), intensity-modulated radiation therapy (IGRT), on-board imaging (OBI), respiratory gating system, and MRI-guided radiation therapy, among others. The appraisal of these systems is highly dependent on the manufacturer, model number, vintage, and options included with the systems.

VAULT STRUCTURE

The vault in which a Linac is housed is either designed as having a maze or direct shielded door, with each design having its own advantages. The maze structure has the advantage of a door that will be significantly lighter and less expensive than a direct shielded door vault. The disadvantage of the maze vault is the vault footprint is larger, typically an extra 300 square feet, and access to the room for therapists takes longer, which, for busy cancer centers, impacts patient flow. A direct shielded door is heavy and expensive and typically needs to be controlled by a motor. The cost of the direct shielded door is typically offset by the decrease in vault size. All such factors affect the value of the Linac.

CONCLUSION

Linear accelerators are high-priced equipment used worldwide in the fight against cancer. Linac systems have been commercially produced for several years dating back to 1988. Knowledge of the different generations of technology and the additional options (IMRT, IGRT, OBI, RPM, etc.) is necessary when appraising these machines. In addition to the typical valuation considerations, the value of a Linac is heavily dependent upon the various special considerations discussed herein, which can only be properly accounted for by a qualified and knowledgeable expert in Linac valuations.

