Generalized Terms for Radiation Delivery Systems

- **External Beam Radiation Therapy**
- **Internal Radiation Therapy**
- **SBRT (Stereotactic Body Radiotherapy)**
- **SRS (Stereotactic Radiosurgery)**
- **IMRT (Intensity-modulated radiation therapy)**
- **3-D Conformal (Three-dimensional conformal radiation therapy)**
- **IGRT (Image-Guided Radiation Therapy)**

External Beam Radiation Therapy
This type of radiation therapy is given through an external radiation source directed at the tumor, thus passing through healthy tissue to varying degrees. The most common types of external beam radiation for ACC include various delivery systems that deliver Photon, Neutron and Proton beams. Photon radiation therapy has historically been the most common approach used in treating all types of cancer. Many ACC patients have received this type of radiation following surgery. Neutron beam (offered at the University of Washington Seattle and Fermilab near Chicago) has been used in a significant number of ACC cases and has been published to be particularly effective for inoperable ACC tumors. Proton radiation is expanding in both availability and popularity with some precision related advantages. Each of these forms of radiation has a different set of strengths, weaknesses, costs and benefits that need to be assessed by each patient and their medical team.

Internal Radiation Therapy (Brachytherapy)
The most common name for this type of radiation is known as Brachytherapy. This approach involves placing a radiation therapy source very close to, or inside of a tumor. The radiation source is placed inside an implant, seed, or device and then inserted surgically with a needle, tube, probe, or catheters through external tissue or down through the trachea or esophagus. This type of radiation may involve an inpatient hospital stay. Some ACC patients have been treated with both external and internal radiation therapy in the course of their initial treatment plans.

Stereotactic Body Radiotherapy (SBRT)
Stereotactic Body Radiotherapy is a technique that allows your radiation oncologist to precisely focus beams of radiation to destroy certain types of tumors that are located in various areas of the body such as lungs. Since the beam is so precise, your radiation oncologist may be able to spare more normal tissue than with conventional external beam therapy. This additional precision is achieved through rigid immobilization, such as with a head frame as is used in the treatment of brain tumors. Although often performed in a single treatment, the patients may receive up to five treatments if necessary. Two of the platforms used for many ACC patients have been Varian Trilogy, CyberKnife and Novalis TX

Stereotactic Radiosurgery (SRS)
According to many treatment centers, SRS is a precise radiation delivery system used only for brain and spine and is delivered in a single treatment. Gamma Knife is the classic and widest used SRS platform and is only used to treat brain lesions. Some of the newer platforms such as Varian Trilogy, Novalis TX and CyberKnife can be used for SRS, but they have the additional flexibility to treat other areas of the body, which is considered to be SBRT. SRS has been defined by various treatment centers and manufacturers in various ways with some emphasizing the region treated while others emphasize the single fraction treatment dose as being the defining component.

Intensity-Modulated Radiation Therapy (IMRT)
IMRT is a specialized form of 3D Conformal Radiation Therapy that allows radiation to be more exactly shaped to fit the tumor, whose path changes to match the shape of the tumor and whose intensity varies to match its depth. This is accomplished with a combination of beam shaping, cross-fired from multiple angles, with dosage control to minimize damage to good tissue and target the tumor site for maximum dosage. With IMRT, the radiation beam can be broken up into many "beamlets," and the intensity of each beamlet can be adjusted individually. Using IMRT, it may be possible to further limit the exact amount of radiation that is received by normal tissues that are near the tumor.

3-D Conformal
Three-dimensional (3–D) conformal radiation therapy uses computer technology to allow doctors to more precisely target a tumor with radiation beams (using width, height, and depth). Many radiation oncology treatment centers now use this technique. A 3–D image of a tumor can be obtained using computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET), or single photon emission computed tomography (SPECT), and the radiation oncologist can then shape the radiation beams exactly to the size and shape of your tumor. Because the healthy tissue surrounding the tumor is largely spared by this technique, higher doses of radiation can be used to treat the cancer.

Image-Guided Radiation Therapy (IGRT)
In some facilities, radiation oncologists are using image-guided radiation therapy (IGRT) to help them better deliver the radiation dose to the cancer. Normal structures and tumors can move between treatments due to differences in organ filling or movements while breathing. IGRT is conformal radiation treatment guided by imaging equipment, such as CT, ultrasound or stereoscopic X-rays, taken in the treatment room just before the patient is given the radiation treatment. All patients first undergo a CT scan as part of the planning process. The digital information from the CT scan is then transmitted to console in the treatment room to allow doctors to compare the earlier image with the images taken just before treatment. During IGRT, doctors "fuse" these images to see if the treatment needs to be changed. This allows doctors to better target the cancer while avoiding nearby healthy tissue. In some cases, doctors will implant a tiny piece of material called a fiducial marker near or in the tumor to help them localize the tumor

during IGRT. CyberKnife is one of the more common types of radiation platforms that utilizes IGRT.