Computed Tomography Simulation in Radiation Therapy

Student Researcher: Victoria Narbone

Faculty Advisor: Dr. Elaine Halesey, Ed.D., R.T.(R)(QM)(ARRT)

Abstract

The purpose of this research is to educate readers on the role of computed tomography (CT) simulation in the radiation therapy process, specifically for patients with lung cancer. The goal of radiation therapy treatment is to maximize the dose to a target, usually a tumor, while minimizing the dose to the normal surrounding tissue. CT imaging creates cross-sectional images of the patient's anatomy which can be used to create a treatment plan. In non-small cell carcinoma (NSCLC) there are four critical structures of concern including the spinal cord, esophagus, heart, healthy lung. CT simulation uses images to localize the tumor then define the size and shape of the treatment volume relative to the critical structures. For NSCLC treatment, a major concern in planning is breathing motion. The text utilized in the research included information on the principles of radiation therapy and CT simulation. Several studies are included to demonstrate the techniques used to manage motion including deep inspiration breath-hold (DIBH) and four-dimensional computed tomography (4D-CT). 4D-CT uses advanced respiratory motion management techniques including respiratory gating and tumor tracking to measure the respiratory phase during simulation. A limitation to this research is the lack of research and studies on the topic of CT simulation in radiation therapy. Future literature should be published to highlight the importance of CT use in radiation therapy.

Keywords: radiation therapy, computed tomography, computed tomography simulation, radiation oncology, non-small cell carcinoma, lung cancer, 4D-CT, DIBH, radiologic technology