

Sonia Jong  
Thomas A. Edison CTE High School  
December 13, 2019

### **Imagine a World Without Radiology**

Suppose a family member has displayed changes in their physical appearance: a pallid face, jaundiced eyes and an emaciated frame after a lifetime of emanating health and vigor. They are unable to eat without throwing up and often display a pained expression from intense bodily pain in their stomach. Such was the case with a member of my family. As I witnessed these changes in health, I grew concerned. Not only did no one understand why this relative had suddenly become so ill, many other relatives worsened their own fears by researching diseases and making hypothetical diagnoses. Our family was fortunate, however, to have had access to computed tomography (CT) scans and magnetic resonance imaging (MRI) to clarify the truth of the condition and work toward a path of treatment.

Such is not the case for the entire world, though. According to the video, “RAD AID 2-min Animated Intro Video 2019” from RAD-AID, a non-profit organization seeking to expand radiology resources and knowledge to impoverished and developing communities around the world, “Two-thirds of the world lacks access to radiology services.” (RAD-AID, 2019)<sup>1</sup> As a result of this deficiency, many people are dying who could be helped. Radiologist Irene Githinji in Nairobi, Kenya states in an article, “Most of the World Doesn’t Have Access to X-rays,” from The Atlantic, “We once lost a young man with head injury, because he had to be taken out for a CT scan, but before he

---

<sup>1</sup> RAD-AID. (2019). “RAD AID 2-min Animated Intro Video 2019.” Retrieved from: <https://www.rad-aid.org/programs/>

Sonia Jong  
Thomas A. Edison CTE High School  
December 13, 2019

could be taken into surgery, he died.” (Silverstein, 2016)<sup>2</sup> Githinji was describing the effect of inadequate radiology services in Kenya: people needing CT scans had to travel long distances to obtain a free screening from Mbagathi Hospital that treats families but is inconveniently located in a slum neighborhood, due to the lack of transportation. Also, treatment was often inefficient due to the plethora of patients overdue for checkups and treatments. Alternatively, patients had to pay a \$60-\$200 fee at a private facility, which most cannot afford, discouraging identifying and treating serious conditions such as brain lesions or tumors.

As has been established, radiology is an essential component of modern healthcare, and to be expanded upon it, it is necessary to understand its origins. Radiology makes use of radioactive substances, or substances that emit radiation, to perceive the condition of soft tissue and bone structures under the skin. The earliest, and probably the most well-known, form of radiology are x-rays. X-rays were invented by German physicist Wilhelm Conrad Röntgen in 1895, when he covered the cathode ray tubes in his experiments with cardboard, causing a fluorescent light of invisible rays to glow and permeate his wife’s hand and show the bone structures in her hand. (Chodos, 2020)<sup>3</sup> Many years following the x-ray, even more advanced forms of radiology were created: computed tomography (CT) scans, positron emission

---

<sup>2</sup> Silverstein, Jason. (2016). “Most of the World Doesn’t Have Access to X-rays.” Retrieved from: <https://www.theatlantic.com/health/archive/2016/09/radiology-gap/501803/>

<sup>3</sup> Chodos, Alan. (2020). “November 8, 1895: Roentgen's Discovery of X-Rays.” Volume 10, Number 10. Retrieved from: <https://www.aps.org/publications/apsnews/200111/history.cfm>

Sonia Jong  
Thomas A. Edison CTE High School  
December 13, 2019

tomography (PET), magnetic resonance imaging (MRI), and ultrasound scanning. CT scanning uses a rotating camera to provide images of tissue densities from various perspectives for a more accurate and detailed diagnosis. For the same purpose, PET uses x-rays to measure metabolic activity, helping treat Alzheimer's disease, brain tumors, and strokes. In contrast, MRI does not use radiation, but rather a strong magnetic field that interacts with protons within the human body, aligning them to visualize problems with organs and tissues that can then be used to diagnose many conditions, including cancers. Lastly, ultrasound scanning uses sound waves conducted through a gel material to produce an image when the sound waves bounce off the internal structures of the body. (Pearson, 2018)<sup>4</sup>

With the multitude of radiograph technology available, the range of illnesses that can be detected and diagnosed has grown vast - to the point that there are debates over whether abnormalities detected by MRI and CT scans unrelated to a patient's current issue (incidental findings) should be reported to the patient. Having this issue illustrates how advanced radiology has become: not only helping doctors diagnose illnesses, but also revealing information regarding a patient that might not otherwise be known. (While incidental findings save lives by revealing health problems early, they also create confusion and anxiety should the finding be serious.)

Further proving their extended uses, radiology is versatile, applicable to patients of all ages and medicine of all forms. Before the birth of an infant, pregnant mothers

---

<sup>4</sup> Pearson. (2018). Radiology and Diagnostic Testing. In *Pearson's Comprehensive Medical Assisting* (pp.1183-1196). New York, NY: Pearson Education, Inc.

Sonia Jong  
Thomas A. Edison CTE High School  
December 13, 2019

obtain fetal ultrasounds to detect abnormalities early, such as spina bifida (defective formation of the spinal cord). Throughout childhood, adolescence, and adulthood, radiology can be used for small purposes (x-rays at the dentist), as well as more significant ones (chest x-rays testing for tuberculosis or mammograms to detect breast cancer.) In the geriatric population, radiology can be used in the form of dual-energy X-ray absorptiometry (DXA), a bone density test determining the likelihood of osteoporosis.

As an interdisciplinary liaison, radiology can enhance acupuncture care. According to a scholarly article from the *Journal of Physics: Conference Series 186*, x-ray fluorescence techniques can be used to “explore the structural character of acupoints,” which include the discovery that the element calcium is found inside of acupoints. (Yan, et.al, 2009)<sup>5</sup>

Regarding my family member, they returned to Taiwan, where they were born, to undergo CT scans and MRI scans, discovering that they had Stage III gastrointestinal cancer. Being a fairly advanced stage of cancer, our family was devastated. However, we could now address the issue at hand rather than make unhelpful predictions as we had done before. Consequently, my relative was able to make an educated choice and began to receive treatment in the form of nutritional supplements and pain killers since they refused chemotherapy in hope of dying a natural death. Despite ultimately passing

---

<sup>5</sup> Yan X., Zhang X., Liu C., Dang R., Ando M, Sugiyama H., Chen H., Ding G. (2009). “Imaging Study on Acupuncture Points,” Retrieved from: <https://iopscience.iop.org/article/10.1088/1742-6596/186/1/012100/meta>

Sonia Jong  
Thomas A. Edison CTE High School  
December 13, 2019

away, we are still thankful for having the means and accessibility to radiology and the health care that followed. By knowing the severity of the illness, we were able to prepare for the outcome and make the most of our remaining time together. Therefore, without radiology, patients would be unable to fully know their health conditions and make choices on their treatments.

Sonia Jong  
Thomas A. Edison CTE High School  
December 13, 2019

### **Bibliography:**

1. Chodos, Alan. (2020). "November 8, 1895: Roentgen's Discovery of X-Rays."

Volume 10, Number 10. Retrieved from:

<https://www.aps.org/publications/apsnews/200111/history.cfm>

2. International Society for Computed Tomography (ISCT). (2016). "This Week In Radiology: Tackling The Global Radiology Gap & The Over-Diagnosis

Controversy." Retrieved from: [https://www.isct.org/computed-tomography-](https://www.isct.org/computed-tomography-blog/2017/2/10/this-week-in-radiology-tackling-the-global-radiology-gap-the-over-diagnosis-controversy)

[blog/2017/2/10/this-week-in-radiology-tackling-the-global-radiology-gap-the-over-diagnosis-controversy](https://www.isct.org/computed-tomography-blog/2017/2/10/this-week-in-radiology-tackling-the-global-radiology-gap-the-over-diagnosis-controversy)

3. Lagnado, Lucette. (2020). "When a Medical Test Leads to Another, and

Another." Retrieved from: [https://www.wsj.com/articles/when-a-medical-test-](https://www.wsj.com/articles/when-a-medical-test-leads-to-another-and-another-1472494983?utm_content=buffercb8ac&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer)

[leads-to-another-and-another-](https://www.wsj.com/articles/when-a-medical-test-leads-to-another-and-another-1472494983?utm_content=buffercb8ac&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer)

[1472494983?utm\\_content=buffercb8ac&utm\\_medium=social&utm\\_source=twitter.com&utm\\_campaign=buffer](https://www.wsj.com/articles/when-a-medical-test-leads-to-another-and-another-1472494983?utm_content=buffercb8ac&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer)

4. National Institute of Biomedical Imaging and Bioengineering. (2019). "Magnetic Resonance Imaging." Retrieved from: [https://www.nibib.nih.gov/science-](https://www.nibib.nih.gov/science-education/science-topics/magnetic-resonance-imaging-mri)

[education/science-topics/magnetic-resonance-imaging-mri](https://www.nibib.nih.gov/science-education/science-topics/magnetic-resonance-imaging-mri)

5. Pearson. (2018). Assisting with Life Span Specialties: Geriatrics. In *Pearson's Comprehensive Medical Assisting* (pp. 970). New York, NY: Pearson Education,

6. Yan X., Zhang X., Liu C., Dang R., Ando M, Sugiyama H., Chen H., Ding G.

(2009). "Imaging Study on Acupuncture Points," Retrieved from:

<https://iopscience.iop.org/article/10.1088/1742-6596/186/1/012100/meta>

Sonia Jong  
Thomas A. Edison CTE High School  
December 13, 2019

7. Pearson. (2018). Radiology and Diagnostic Testing. In *Pearson's Comprehensive Medical Assisting* (pp.1183-1196). New York, NY: Pearson Education, Inc.
8. RAD-AID. (2019). "RAD AID 2-min Animated Intro Video 2019." Retrieved from: <https://www.rad-aid.org/programs/>
9. Silverstein, Jason. (2016). "Most of the World Doesn't Have Access to X-rays." Retrieved from: <https://www.theatlantic.com/health/archive/2016/09/radiology-gap/501803/>