

Nuclear Medicine Imaging

Student's Name

University Department

Date

To: Patients anticipating an NMI treatment, general public audience, and medical practitioners

CC: Dr. Sarah Read, Dr. Paul Collins, Professor Covey, and WR227 course members

From: [Insert your name][<-Fill in]

Date: Sunday 8/16 at 11:59 PM PST

Subject: Medicine Documentation- Nuclear Medicine Imaging

The modern society requires sophisticated methods of identifying and fighting disease. Currently, there have been new diseases that prove difficult to treat; thus, effective technology should be employed in medicine. Suffice it to remark that Nuclear Medicine Imaging is the only reliable technology that can replace the traditional methods of treating diseases. Usually, the traditional methods of identifying sickness involved drawing blood from the patients, then testing it for any pathogen.

With the technology of Nuclear Medicine Imaging, a person does not experience any pain since they inhale radionuclides mixed with their blood and travel to the affected body organs. Through the use of scanners, medical practitioners can trace any tumor or complication in the human body. The machine used in nuclear medicine is known as a cyclotron, and apart from scanning the human body, it gives details about molecular status.

For that reason, this paper gives details on the importance of Nuclear Medicine Imaging. It is an inspiration for the medical practitioners, student nurses, patients, and the general audience to embrace Nuclear Medicine Imaging. If technology is used in hospitals, people will benefit enormously.

I am thankful for the time you have taken to read through the letter.

Regards

[Name]

[Signature]

Abstract

The information provided in this research paper is about the history of Nuclear Medicine Imaging (NMI), the procedure used by medical practitioners, and the importance of using NMI. It targets the general audience, including medical practitioners and patients. Nuclear medicine refers to the technology of using radiopharmaceuticals, also known as radioactive materials. The radiopharmaceuticals are used during the examination of the structure and function of human body organs.

The technology of NMI began with the invention of the machine called cyclotron by scientist Ernest Orlando Lawrence. Lawrence lived between 1901 and 1958. Lawrence built the first 4-inch diameter cyclotron in 1930. The device used 2 D- shaped-magnets to form the magnetic fields. The magnets were arranged such that they left a thin gap between them. Lawrence placed a particle at the outer side of the magnetic field. When the machine was started, the magnetic fields increased the radius of the beam path, eventually reaching the target particle.

Lawrence's idea has been modified over time to produce the best cyclotron devices in the world. The machines are small in size and have proven effective in diagnosing and treating diseases such as neurological, endocrine and gastrointestinal disorders, heart disease, and cancer, among other diseases. Radiopharmaceuticals can be inhaled, injected, or inhaled. Once the radiotracers are in the bloodstream, scanners are used to trace the radiotracers' emission of radioactive energy in the red blood cells. Apart from the imaging of body organs under examination, the cameras also give molecular information. It is, therefore, an effective diagnosis method.

Keywords: Gastrointestinal, endocrine, tagging, Nuclear Medicine Imaging, and radiopharmaceuticals

Contents

Version history	6
List of Figures and Tables	6
Introduction	6
Methods	6
Results	7
How technology was developed.....	7
Benefits of Nuclear medicine imaging.....	7
Nuclear imaging procedures	8
Discussion.....	8
Procedure used to detect diseases.....	9
Clinical guidance in nuclear medicine imaging.....	9
Conclusion.....	10
References	11

Version history

Version	Description	Name	Date
v.0.3	Publication of v2.0 document: “Nuclear Medicine Imaging”		

List of Figures and Tables

- I. Figure 1: Gamma Camera used in Nuclear Medicine
- II. Figure 2: A doctor performing nuclear medicine imaging procedure to a patient
- III. Figure 3: Brain scan using Gamma cameras in nuclear medicine imaging equipment
- IV. Figure 4: Detected lung tumor using Nuclear Medicine Imaging procedure

Introduction

Instead of drawing blood from patients for testing pathogens and physiological complications, nuclear medicine imaging serves the diagnosis purpose without causing any pain to particular patients. It is a technology that depends on radiopharmaceuticals to examine the health status of a patient. There is a need for contemporary society to embrace the technology of NMI. Usually, traditional methods of diagnosing diseases do not effectively identify diseases at their early stages. With NMI, people can fight diseases even before their first symptoms. For that reason, this paper purpose of informing medical practitioners, patients, and the general audience about the procedure used in NMI and the importance of using the technology in medicine.

Methods

The entire paper is borrowing from secondary sources. The information, which is presented qualitatively, relies on several pre-existing scholarly articles. These sources provide information about NMI's history, the procedure and guidelines used in NMI, and the importance of the technology (“Nuclear Medicine” n.d).

Results

How technology was developed

The proponent of nuclear medicine is Ernest Orlando, who invented the first machine used in NMI in the year 1930 (Reilly, 2019). The machine was 4-inch in diameter with 2 D shaped-magnets that provided magnetic fields for enlarged particles. At first, the machine was used to increase the radius of particles (Reilly, 2019). Later, it was developed to the modern cyclotron machine.

Figure 1: Gamma Camera used in Nuclear Medicine (shutterstock)



Benefits of Nuclear medicine imaging

NMI is beneficial in that it is a safe and painless, cost-effective method of diagnosing diseases. The method is convenient in testing diseases that may require medical practitioners to use more risky traditional methods of conducting diagnostic tests (Love & Palestro, 2016). The technology of NMI is usually sensitive to any abnormalities in human tissues and organs. The method is beneficial in that it facilitates the diagnosis, treatment, management, and prevention of such diseases like cancer, blood imbalances, bone pain, and other abnormalities (Love & Palestro, 2016)s. Most importantly, the technology is used to detect diseases in their early stages,

for that reason. It becomes convenient for patients to seek the right treatment.

Nuclear imaging procedures

NNI diagnostic test procedure applies to detect diseases in several physiological conditions. The patients inhale, inject, or swallow radiopharmaceuticals, which are radioactive material (Cho et al. 2017). Then the patient lies down on a special bed where a camera scans the affected area. Usually, the radiopharmaceuticals in the blood move and concentrate on the affected body organ. Then scanners are used to trace any radioactive energy emitted by the radiotracers in the bloodstream (Bar-Sever et al. 2018).

Figure 2: A doctor performing nuclear medicine imaging procedure to a patient (“General Nuclear Medicine”)



Discussion

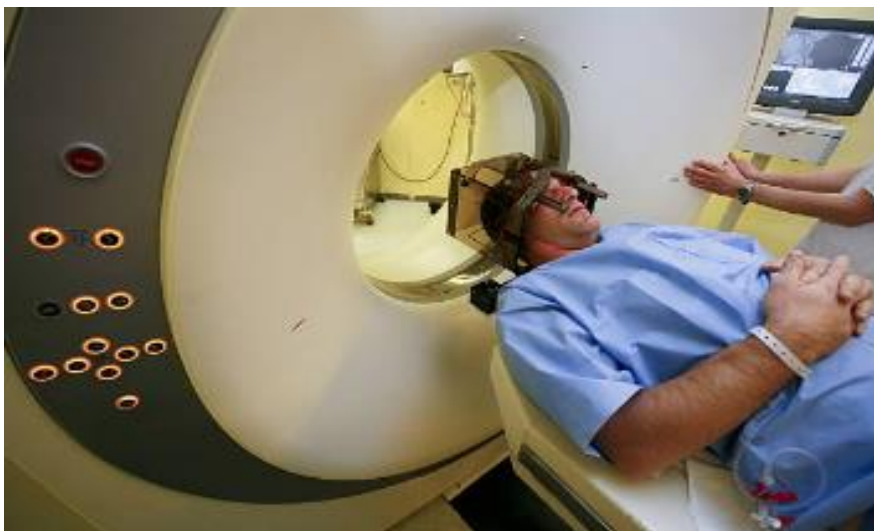
The technology of NMI is important in that it provides, besides the identified problems in the human body, cellular information (Donohoe & Ahuja, 2019, March). A disease affecting any particular patient can be traced long before the patient experiences symptoms. Over the last 50 years, NMI has been embraced in many developed and developing countries. The technology facilitates room for personal profile based treatment (Donohoe & Ahuja, 2019, March). Generally,

technology has facilitated improved healthcare services.

Procedure used to detect diseases

There are different procedures used to detect disease using scanners. Medical practitioners use two forms of scanning: PET (Position Emission Tomography) and SPECT (Single-Photon Emission Computed Tomography). PET and SPECT are used to diagnose heart diseases, cancer, thyroid disease, Alzheimer's, and dementia (KqA Reilly, 2019). However, NMI can also obtain molecular information using Magnetic Resonance Imaging (KqA Reilly, 2019). Usually, medical practitioners superimpose NMI with MRI or CT (computed tomography). It suffices to note that PET/CT and SPECT/CT bring about effective results. Currently, hospitals are using PET/MRI to detect diseases, but technology has not universally embraced.

Figure 3: Brain scan using Gamma cameras in nuclear medicine imaging equipment (“94 Gamma Scan stock pictures and images”



Clinical guidance in nuclear medicine imaging

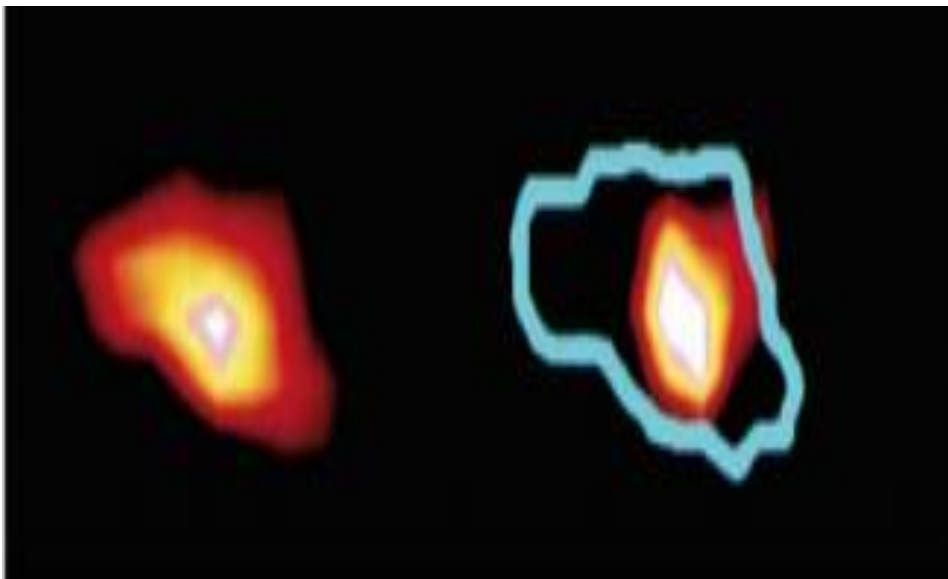
The following are the guidelines used in NMI:

1. Medical practitioners are encouraged to give the client the details of the procedure to be used (KqA Reilly, 2019). They are not supposed to violate patient's values in their giving

services.

2. The doctors and nurses should ensure they embrace procedural elements that facilitate quality examination (KqA Reilly, 2019).
3. During the tagging process, the patient should be given the right Pharmaceutical dosage. It should be a small amount (KqA Reilly, 2019). When conducting molecular or nuclear imaging, radioactive agents should be administered in small amounts.

Figure 4: Detected lung tumor using Nuclear Medicine Imaging procedure (Buvat et al. 2014)



Conclusion

In conclusion, the technology of NMI has rapidly improved over the years. It is embraced worldwide, especially in developed countries. Stakeholders in medicine consider NMI the best method to diagnose all physiological diseases. For that reason, the technology should never be taken for granted for it identifies tumors, pathogens and gives molecular information. It is, therefore, suitable in dealing with modern diseases.

References

“94 Gamma Scan stock pictures and images” retrieved from

<https://www.gettyimages.com/photos/gamma-scan?mediatype=photography&phrase=gamma%20scan&sort=mostpopular>

Bar-Sever, Z., Biassoni, L., Shulkin, B., Kong, G., Hofman, M. S., Lopci, E., ... & Lambert, B.

(2018). Guidelines on nuclear medicine imaging in neuroblastoma. *European journal of nuclear medicine and molecular imaging*, 45(11), 2009-2024.

Buvat, I., Frey, E., Green, A., & Ljungberg, M. (2014). Quantitative nuclear medicine imaging: concepts, requirements and methods. *Human Health Reports*, 9.

Cho, S. G., Kim, J., & Song, H. C. (2017). Radiation safety in nuclear medicine procedures. *Nuclear medicine and molecular imaging*, 51(1), 11-16.

KqA Reilly, R. M. (2019). Nuclear Medicine Imaging Technology. *Medical Imaging for Health Professionals: Technologies and Clinical Applications*, 27-43.

Love, C., & Palestro, C. J. (2016). Nuclear medicine imaging of bone infections. *Clinical radiology*, 71(7), 632-646.

Shutterstock. Nuclear Medicine Images. Retrieved from

<https://www.shutterstock.com/search/nuclear+medicine>

Reilly, R. M. (2019). Nuclear Medicine Imaging Technology. *Medical Imaging for Health Professionals: Technologies and Clinical Applications*, 27-43.

Donohoe, K., & Ahuja, S. (2019, March). Society of Nuclear Medicine and Molecular Imaging Efforts Toward Standardization: From Procedure Standards to Appropriate Use Criteria. *In Seminars in Nuclear Medicine* (Vol. 49, No. 2, pp. 153-160). WB Saunders.

Nuclear Medicine” retrieved on 2/04/2020 from <https://www.youtube.com/watch?v=oWVsnFz->

“General Nuclear Medicine” retrieved on 10/08/2020 from

<https://www.radiologyinfo.org/en/info.cfm?pg=gennuclear>