

**FEDERAL UNIVERSITY, NDUFU-ALIKE, IKWO, EBONYI STATE**

**STUDENT'S INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES)**

**A REPORT OF SIX (6) MONTHS STUDENT INDUSTRIAL WORK EXPERIENCE**

**AT**

**FEDERAL TEACHING HOSPITAL, ABAKALIKI (FETHA)**

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## **DEDICATION**

This work is dedicated to the Trinity- God the father, God the Son and God the holy spirit, who through his infinite wisdom and mercy gave me the strength and grace to write this report Also I want to dedicate this to my parents for all their support in the cause of my Industrial training exercise.

## **ACKNOWLEDGEMENT**

I want to acknowledge God for his faithfulness, guidance throughout the period of my industrial training exercise .I also want to acknowledge my beloved family for the moral support, love, care ,provision and encouragement they gave me throughout the period of this program and making  
of this report.

I also acknowledge my friends in their little ways because they gave me a considerable support and assistance I needed throughout the period of my 6 months industrial training.

Also I want to thank my Industry based Supervisor Mr Fabian Udom for his thorough discipline throughout the cause of my industrial training.

## **Abstract**

This report reviews the knowledge got from six (6) months of student industrial work experience scheme (SIWES) at General Hospital Ikot Ekpene, Akwa Ibom State. SIWES is an acronym meaning student industrial work experience scheme. It is the accepted skill training program which forms part of the approved minimum academic standards in various degree programs for all the Nigerian university. Its main aim and objective is an effort to bridge the gap between theories and practical class.

General Hospital Ikot Ekpene is a health care system that caters for people in the Ikot Ekpene senatorial district of Akwa Ibom state and the environs. The hospital was built by the colonial administrators in 1904. This establishment comprises of different department and units but this report is mainly based from five (5) department which includes; mortuary section, histopathology, and radiology.

In mortuary section, this is where embalming and preserving of deceased body are practiced, types of embalming includes; arterial embalming, cavity embalming, hypodermic embalming and surface embalmment. It has many workers and different rooms.

Histopathology; this is section of the establishment that deals with collection and processing of histological and cytological specimen. The sequence of processing this specimen ranges from reception, documentation, grossing, fixing, dehydration, clearing, embedding, blocking, sectioning and staining. It encompasses different workers and working equipment.

Radiology; this is another depart of this hospital that uses different imaging modalities to produce the internal image of patient and then send the report to the doctor that request for it to carry on medication and treatment. This is normal performed by a radiographer and interpreted by radiologist. The modalities includes; X-ray, ultrasound, computed tomography, magnetic resonance imaging and other modalities which are not enumerated here.

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## **CHAPTER ONE**

### **1.0 INTRODUCTION**

#### **1.2 MEANING AND HISTORY OF SIWES**

SIWES is an acronym for Student Industrial Work Experience Scheme. In the earlier stage of science and technology education in Nigeria, students were graduating from their respective institutions without any technical knowledge or working experience. It was in this view that students undergoing science and technology related courses were mandate for students in different institution in the view of widening their horizons so as to enable them have technical knowledge or working experience before graduating from their various institutions It was established by the Industrial Training Fund (ITF) in 1973 to enable students of tertiary institutions have basic technical knowledge of industrial works based on their courses of study before the completion of their program in their respective institutions. The scheme and major background behind the embankment of students in SIWES was to expose them to the industrial environment, educate students on industrial based skills essential for a smooth transition from the classroom to the world of work and enable them develop occupational competencies so that they can readily contribute their quota to national economic and technological development after graduation. Students of tertiary institutions are given the opportunity of being familiarized and exposed to the needed experience in handling machinery and equipment which are usually not available in the tertiary institutions.. The major benefit acquiring to students who participate conscientiously in SIWES are skills and competencies they acquire. The relevant production skills remain a part of the recipient of industrial training as life-long assets which cannot be taken



away from them. This is because the knowledge and skills acquired through training are internalized and become relevant when required to perform jobs or functions.

Partaking in SIWES industrial training has become a crucial pre-condition for the award of diploma and degree certificates in specific disciplines in most institutions of higher learning in Nigeria in line with the Government education policies.

The scheme is funded by the Federal Government, the operators are: the ITF, the coordinating agencies – NUC, NBTE, NCCE Employers of Labour, and various Institutions.

### 1.3 OBJECTIVES OF SIWES TO STUDENT

Specifically, the objectives of SIWES are to;

- Prepare students for the work situation they are likely to meet after graduation
- Provide an avenue for students in the Nigerian Universities to acquire industrial skills and experience in their course of study
- Make the transition from the University to the world of work easier, and thus enhance students contacts for later job placements
- Enlist and strengthen employers' involvement in the entire educational process of preparing university graduates for employment in industry
- Provide students with an opportunity to apply their theoretical knowledge in real work situation, thereby bridging the gap between university work and actual practices
- Expose students to work methods and technique in handling equipment and machinery that may not be available in the universities

#### 1.4 IMPORTANCE OF SIWES

- It provides students with an opportunity to apply their theoretical knowledge in real life situations
- It exposes students to more practical work methods and techniques
- It strengthens links between the employers, universities and industrial training fund(ITF)
- It also prepares the students for the labour market after graduation

#### 1.5 THE ROLE OF FEDERAL GOVERNMENT

- To make it mandatory for all ministries, companies and government parastatals to offer industrial attachments to students
- To make it a policy to include a clause in every major contract lasting over six to nine months being awarded for contractors to take students on attachment
- Make adequate funds available to the federal ministry of industry to fund the scheme.

#### 1.6 ROLE OF COORDINATING AGENCIES (NUC)

- In collaboration with ITF, compile lists of employers for institution's placement lists
- Establish SIWES coordinating units
- Evolve a minimum national guide programme for supervised industrial training activities for approved SIWES course
- Appoint full time industrial coordinators to operate the scheme at agency level
- Evaluate and approve SIWES master and placement lists and forward to ITF

#### 1.7 ROLE OF THE INDUSTRIAL TRAINING FUND (ITF)

- Organize bi-ennial conference and seminars on SIWES

- Provide logistic material needed to administer the scheme
- Compile lists of employers and available training places for industrial training attachment and forward such lists to the co-ordinating agencies (i.e NUC, NBTE,NCCE).

## 1.8 ROLE OF EMPLOYERS

- Accept students and assign them to the relevant on-the-job training
- Control and discipline students like permanent staff
- Provide medical care for students within the limits of the employers conditions of service during attachment
- Attach experienced staff to students for effective training and supervision.  
Supervisors should not handle more than ten students at a time.
- Pay students monthly allowance as and when due

## 1.9 ROLE OF UNIVERSITIES

- Prepare and submit master and placement lists to the respective coordinating agency and IT
- Place students on attachment with employers
- Establish SIWES coordinating units and appoint department/ faculty SIWES coordinators within the institutions
- Organize orientation programmes for students to prepare them for industrial training.  
ITF representative may be invited to give a talk to the students during the orientation programme
- Appoint full-time industrial coordinators to operate the scheme at industrial level

## ROLE OF STUDENTS

- Comply with the employers rules and regulation
- Arrange their own living accommodation during the period of attachment
- Be regular and punctual at respective place of attachment

## **HISTORY OF GENERAL HOSPITAL IKOT EKPENE**

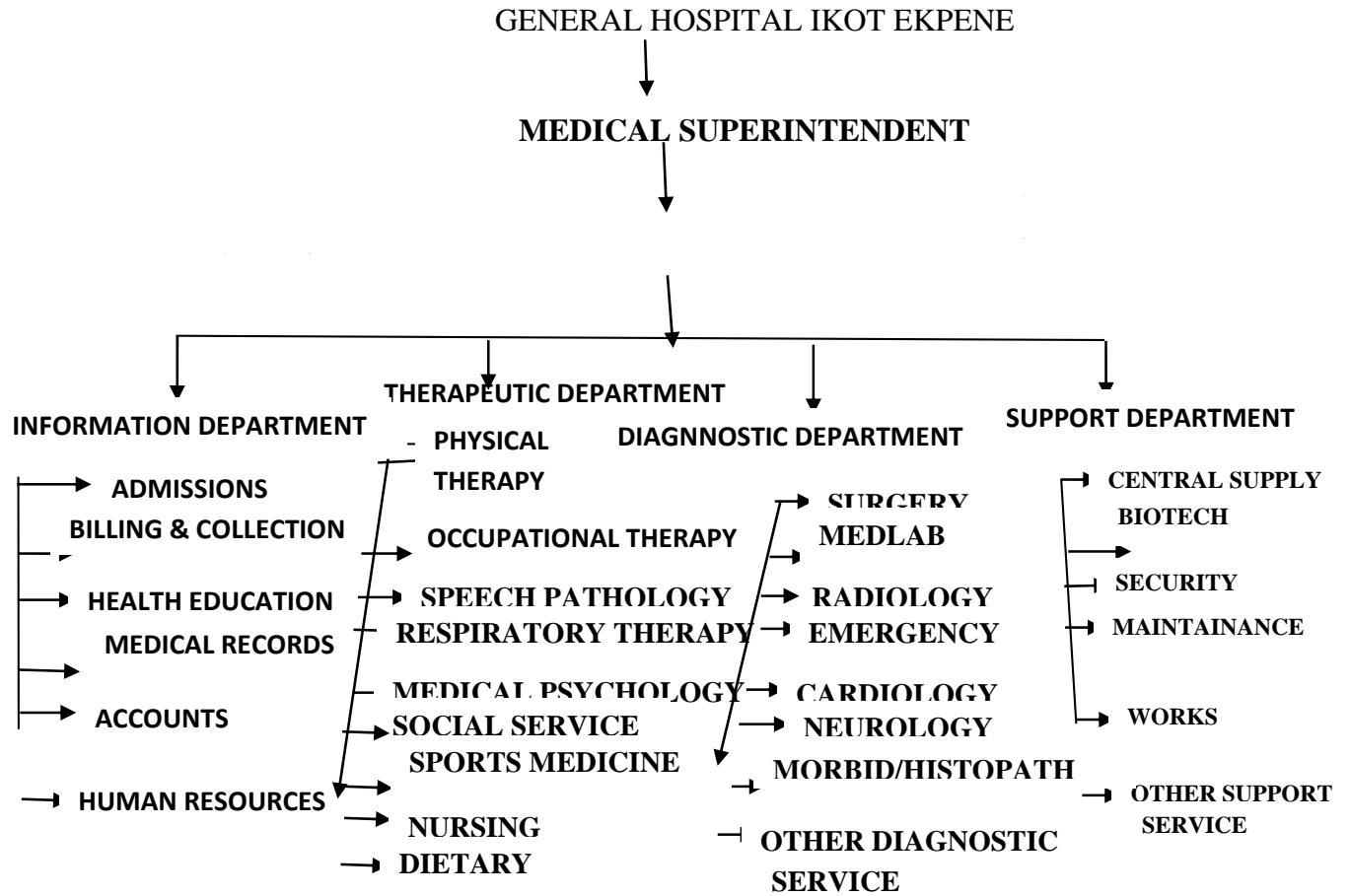
The hospital was built by the colonial administrators in 1904 for the purpose of providing good and reliable Health care for the society.

The General Hospital is a tertiary health institution in Ikot Ekpene, Akwa ibom state, Nigeria. The hospital provides world class health care services to the people of southern region and beyond.

The hospital now has consultants in most clinical departments and has been able to reactivate wards that were dormant because of death of Staff. Attendance has crept up steadily with outpatient load of about eight thousand month.

The General Hospital ikot ekpene in Akwa ibom state is indeed mega with retinue of Consultants in various specialties, 504 bed capacity distributed in various departments and a capacity for 150 House Officers. This foremost Health Institution which is continually growing in strength and capacity caters for all the people from ikot ekpene senatorial districts and it's environs. It comprises various departments such as medical, surgical, nursing, laboratory, pharmacy, accounts, and administrative department. The hospital is headed by the chief medical superintendent. The hospital is also saddled with the responsibility of training internship medical doctors (house officers) whose accreditation was given two years ago by the Nigerian medical and dental association.

## 2.3 Organogram



**DIRECTOR OF ADMINISTRATION**

## **CHAPTER 2**

### **REPORT ON DIFFERENT SECTION OF THE ESTABLISHMENT.**

#### **1. Mortuary section**

This is the section of the establishment that undertakes the process of embalming and preserving of a deceased body or dead bodies. It consists of chief mortician and other mortuary attendants in order of hierarchy. This section is fully air conditioned for evacuating the reflux and actions of formalin reactions, and to avoid much inhalation of formalin and embalming chemicals.

This section encompasses different apartments which includes; the embalming and reception room, documentation room, storage hall, dressing and autopsy hall and last the resting room convenient room. This section is fully equipped with embalming tools, reagents and trolleys for ease the job.

#### **2. Histopathathology /Tissue processing section.**

This is the section of the establishment that deals with the collection and processing of histological and cytological tissues. The aim is to process tissues that can be evaluated by the pathologist to examine the health status of the tissue. in this section, it consist of a large hall which has different units and different processing machines ranging from automated tissue processing machine, embedding machine, microtome machine, tissue container, Bunsen burner, hot air oven, staining containers; in fact it is fully equipped in order to

facilitate the work. This section consists of different rooms which includes; reception and processing room, H.O.D room, H.O.U room, pathologist and examination room and convenient room.

## **2. Radiology section.**

This is a section on this establishment that takes the job of imaging and examination of internal organs of human which are invisible with naked eye. Within this section, X-rays, ultrasound, computed tomography, magnetic resonance imaging modalities are used to produce the images of human body depending on the area of interest which can be analyze by the radiographer and send the report to the doctor who requested for that to carry his medication and treatment.

This section consists of workers that manage its affairs ranging from; H.O.D, H.O.U, Registrar, radiologist and radiographer, receptionist and other admin workers. In its apartment, it has the H.O.D and H.O.U room, Registrar room, radiology and radiographer's room, reception room, examination and machine room, convenient room. It is fully equipped with radiology machines.

## **Instrumentation**

The instrument used in different sections will be discussed below;

### **Instrument in embalming section**

1. Trolley; use to move the corpse from embalming place to storage place.
2. Tray; where the deceased body will be laid on
3. Needle and thread; use for sewing and stitching.
4. Surgical blade; use for cutting the body.
5. Forceps; use for holding the muscle of the body.
6. Gravity tank; for storing embalming fluid.
7. Cotton wool; for closing orifice.
8. Cold chamber refrigerator; for storing the corpse.
9. Reagents for embalming such as formalin, glycerin, methylated spirit.
10. Scissors for cutting.



### **Instrument used in tissue processing.**

1. Hot air oven; for melting of paraffin wax
2. Automated tissue processor; for routine tissue processing.



3. Embedding machine; for casting or burring of tissues in the paraffin wax.



4. Incubator; for incubating the tissues.
5. Refrigerator; for cooling of tissues.

6. Hot plate



7. Tissue container; for fixing and processing of specimens

8. Tissue Cassette



9. Saw, knife, surgical blade, for grossing.

10. Microtome machine; use for sectioning.



11. Tissue slide; for mounting of tissues.

12. Paraffin wax for embedding specimen.



13. centrifuge

**Instrument used in radiology.**

1. X-ray machine; for imaging.
2. X-ray detector; for detecting ray beams.
3. CT machine; for imaging.

4. MRI for imaging
5. Ultrasound; for imaging.
6. Imaging bed; for laying the patient
7. Ultrasound gel; for robbing on the patient body.

### **Other Relevant experiences**

This program has expanded my knowledge in different field of endeavor. It has taught me a lesson more than class room teaching, which has bridged the gap between the theoretical class and impact this know into a retained knowledge. Thus it has exposed me to different experiences.

Mostly this program has exposed to know the radiologic anatomy of different part of human body; how they appears in the film of x-ray, ultrasound, magnetic resonance image, computed tomography and to differentiate on the images produced by these modalities and how they appears.

It has also exposed me to understand the secret behind tissue processing and how to mount them and stain it in microscopic slide. In museum technique, it has enlightened me on how to pot tissue, mostly how to prepare mounting fluid such as the kaiserling solution 1-3. Which are the major fixing, restoring and preserving fluid.



## CHAPTER 3

### TEST CARRIED ON DIFFERENT SECTION.

#### **Mortuary science**

##### **Principle**

Embalming is the art and science of preserving human remains by treating them with modern form and chemicals to forestall decomposition. The intension is to keep them suitable for public display at funeral, religious, medical or scientific purposes.

Embalming allows mourner or the deceased relation to remember and encode the past memory picture of their late relative. Embalming also has the potential to prevent mourners from having contact with the rotting and putrescence of the corpse.

Embalming is also a general legal requirement international repatriation of human remain, although exceptions also occurs and by a variety of laws depending on locality and religions such as for extended time between final deposition the above ground entombment, with help of embalming, a corpse can be transported from to another, thus rendering it harmless and avoid putrefaction and autolysis.



## **Types of embalming**

The actual embalming process usually involves four parts;

1. Arterial embalming; this involves the injection of embalming chemicals into the blood vessels, usually through the carotid, femora, tibia, brachial arteries. While the embalming fluid is circulating, it displaces the interstitial fluids and blood is expelled through the corresponding veins. The embalming fluid is injected by centrifugal pump.
2. Cavity embalming; this refers to replacement of internal fluid inside body cavities with embalming chemicals through the use of an aspirator and trocar. The embalmer makes a small incision just above the navel and pushes the trocar into the chest and the stomach cavities to puncture the hollow organs and aspirate their contents. He then fills the cavities with concentrated formaldehyde. The incisions is then closed with trocar button.
3. Hypodermic; this is a supplemental type of embalming in which hypodermic needle and syringe is used to inject the embalming chemicals into the tissues, especially those areas where arterial embalment could not get, depending on the trauma prior to the death.
4. Surface embalming; this is another type of supplemental method; here, the embalmer take corpse and dip into solution of embalming chemical to preserve and restore areas directly on the skin's surface and other superficial areas.

## **Procedure**

Prior to embalming, there is certain procedures one need to consider.

### **Pre-embalming procedure**

- a. When a body is brought to mortuary;
  - i. The body must be certified death by a medical doctor who is not part of the embalming.
  - ii. Pulsation, breathing, rigor mortis must be noted.
- b. The body must be registered and have a document pertaining the cause of death, date, in which the body will leave the mortuary.

### **Embalming procedure**

1. After the above processes, the corpse is undressed.
2. The body is wash and clean by disinfectant and germicidal solution.
3. The body is placed inn anatomy supine position, the arm, hand, legs are flexed to release rigor mortis.
4. An incision is made along the femoral triangle to locate the femoral artery. Carotid artery, brachial artery and tibia may be use depending ones choice, but mostly use is the femora and carotid arteries.

5. An embalming fluid is infused into the femoral artery with the help of trocar.
6. The fluid is allowed to circulate within the body.
7. The blood and other tissue fluids are drained through the corresponding vein.

### **Dressing embalmed body.**

Before a deceased body can be send to funeral home, the morticians have to make them look in life manner.

### **Steps**

1. The body is washed with a solution of disinfectant and germicidal solution.
2. The eyes are forced to close using adhesive glues.
3. The mouth is also closed using glues or sewing with needle to gently close it in order to look lively.
4. Shieving may be done to clear the mandibular hairs if overgrows.
5. The body is dressed with cloth, hand glove, stockings and other applicable clothing material.
6. Dyes, cosmetics and jewelries may also be applied.
7. Glycerine oil may also be applied on the face to look like the deceased body is sweating.
8. The body laid on coffin and ready to be transported to the funeral home.

## **Histopathology/Tissue processing**

### **Principle**

Histopathology refers to microscopic examination of tissue in order to study the manifestation of disease. It is an examination biopsy or surgical specimen by pathologist, after the specimen has been processed and histological sections have been placed onto glass slides.

Histology is the microscopic examination of normal tissues .it is the microscopic study of anatomy of cells and tissues of plants and animal. This is done by examining the cell or tissue under light microscope or electron microscope, the specimen having been sectioned, stain and mounted on the microscopic slide. Histological studies may be conducted using tissue culture, where human or animal cells are isolated and maintained in an artificial environment for various research projects. The ability to visualize or differential identify microscopic structure depends through the use of histological stains.

Histopathology in the other hand is the microscopic examination of disease tissues. it is an important tool in anatomical pathology because cancer and other diseases usually requires histopathological examination of samples. this is usually done by a trained physicians licensed pathologist who will provide diagnostic information based on their findings.

## **Aims of tissue processing**

The principle aim of tissue processing is to remove water from tissue and replace with a medium that solidifies to allow a thin section to be cut. Biological tissue must be supported in a hard matrix to allow sufficiently thin sections to be cut, typically 5 $\mu$ m, 1mm for light microscope and 80-100nm for electron microscope. With tissue processing, tissue are rendered to more optical densities which increases the differential visibility in a microscope.

For this tissues to be prepared, paraffin wax is mostly frequently used since it is immiscible with water, the main constituent of biological tissues are removed in the process of dehydration. Samples are transferred to a bath of a progressively more concentrated ethanol to remove the water. This is followed by a hydrophobic clearing agent such as xylene to remove alcohol and finally molten paraffin wax, the infiltration agent which clears the xylene. Paraffin wax does not provide a sufficiently hard matrix for cutting very thin sections for light microscope.

## **Procedure**

When tissues are brought to be processed, they are certain procedures that are taken, though tissues can be processed in two methods which are the routine and the rapid method, but in any of the afore mention methods, the following procedures are considered.

### **Reception**

On arrival of tissue in the department, the specimen is checked at the earliest time for the following.

1. To note that the specimen is for histological examination or cytological examination.
2. To note that the container is clearly labeled and followed by a complete request form
3. That the sufficient fixative is in the container or if the specimen is not in a fixative or wrong fluid.
4. To note that the request form is detailed and stamped; the specimen is given an identity which will remain throughout the processing period till pathologist examination.
5. The tissue will be registered, documented.

The tissue is allowed to settle in container with the fixative fluid till grossing.

## **Grossing**

Grossing is the macroscopically examination of the tissue with naked eye. the tissue is observe, measured, weighed, the color, any adjoining tissues and the type of tissue are noted by the pathologist. After this physical examination, the tissue will be cutted using surgical blade and knife or saw depending n the type of tissue. After this process is fixation.

## **Fixation**

Fixation is the preservation after death of the shape, structure and constituent of tissues. Chemical fixatives are used to preserve tissue from degradation and to maintain the structure of the cell and of the sub cellular component such as cell organelles, e.g. nucleus, endoplasmic reticulum, mitochondria.

The commonly used fixative is 10 formal saline, which contains water, formaldehyde and common salt. The tissues are then completely immerse in this solution and allow for a period of a day for it to be completely fixed and restore cellular component.

## **Aims of fixation**

- a. To prevent autolysis and putrefaction.
- b. To restore the cellular component.
- c. To stop any shrinkage or swelling of tissue.
- d. Should penetrate the tissue and cell rapidly even deeply.
- e. Prevent distortion by any reagent used subsequently.
- f. Should impart a suitable hardness and texture to allow easy section.
- g. To render the tissues receptive of stains.
- h. Should not be toxic non corrosive and non inflammable
- i. Should allow for long time storage of specimen.



## **Dehydration**

This is the removal of water. At this stage, the tissues are passed from a progressive or sequence of alcohol media ranging from 70%-90%-100% and from absolute 1, absolute 11, absolute 111- alcohol at an interval of 2hours for each percent alcohol series. Dehydration is very important because most embedding are not miscible with water and the removal facilitate the subsequent impregnation with the embedding media. Dehydration is done by using a reagent that is miscible with water. The best reagent is the ethyl alcohol which has the advantage of not being poisonous. To check presence of water at tissue in bath, add small amount of dried copper sulphate, if water is present, it turns tinge of blue, when this haapens; the alcohol should be replace. In histopathology, ethyl alcohol, methylated spririt, isopropanol, amylalcohol, rebutanol, textiarybutanol may be used. Acetone may be use because it is very good dehydrating agent and are cheap but volatile.

## **Clearing**

This is the stage of tissue processing called de-alcoholization; here the tissues are passed into a progressive xylene solution. Xylene has the tendency to absorb alcohol thus it is miscible with alcohol. This solution is an ante-media because it clears the xylene in the tissue and renders the tissue transparent. The tissues here are passed from xylene 1, xylene

11, xylene111, at an intervals of- 2hours for each solution of xylene. Xylene is mostly use as clearing agent.

### **Embedding**

Embedding is the process of casting the tissue in a paraffin wax and allowing then to solidify and set in order to facilitate cutting of section. At this stage, a molten paraffin wax is poured on the embedding mould, while the tissue is buried or casted on it. The tissues are arranged in such that the face to be section is facing up and allow to solidify and form a block of tissue. The paraffin wax is always heated to 2<sup>0c</sup>

The embedding mould could be of leukharts moulds which are more of traditionally made from L-shaped heavy metal such as brass and bass of copper plates. Others could be made of plastic trays which are mainly for conventional busy laboratories. This particular mould consists of disposable plastics.

### **Trimming**

When the block has been harden, they are removed from the mould by cold water or refrigerator, the identity number is carefully removed and the block is free from the mould. Excess wax is trimmed from the block so that the block forms a four sided prism. The essence is to produce opposite sided parallel serial sections. The trimming away of excess

wax prevents the block from cracking. Later the trimmed block will be attached to the block holder by placing a hot spatula between the block and the block, thus this confers strong adhesion between the wooden block and the tissue block.

## **Sectioning**

This is the stage where the tissue is cut into sections serially. The microtome machine is adjusted depending on one's choice. The microtome knife is set in place in order to attain correct cutting, section thickness are adjusted from 5-10 $\mu$ , the anti-roll plate is positioned in such that it is parallel with the edge of the knife. Allow the temperature in chamber to equilibrate by closing the cabinet for 22-3mins, cut the section slow and steady, while some harder tissues are best cut by fast stroke. With skill technique, the section will move smoothly underneath anti-roll plate.

## **Staining**

Staining is out of coloring or dying of a cut section of tissues; this increases its optical densities and renders it study with microscope easier. With help of stain, the physical features and relations of the tissue and their constituent cell can be study. Most cells have affinity for different dyes, thus no single stain will demonstrate all the tissue structures present. It is advice to carry out different staining methods in a particular tissue section to make diagnosis easier.

## Methods of staining

- a. De-waxing; this is the removal of paraffin wax, because wax is not permeable to stains. Wax are remove for 2-3mins by immersing the tissue slide in two (2) series of xylene . This is usually sufficient for sections up to ten microns thick. This is facilitated by warming the slide up to 60<sup>0c</sup> in the hot oven it begins to melt.
- b. Removal of xylene; xylene is not miscible with water and low grade alcohol; it therefore important remove it with absolute alcohol for 1-2mins in each of two series of absolute alcohol.
- c. Gradual hydration with lower grade alcohol; the sections are immersed for 1-2mins in 90% alc, and 7% alc. This is to avoid possibility of diffusion current bringing damage and detachment of the section.
- d. Hydration with water; the section are now rinsed with a distilled with or tap water, thus section are ready to stain.
- e. The section are now proceed to haematoxylin solution and allow to settle for about 25mins rinse in water and then;
- f. Differentiate with 1% for 3mins.
- g. Transfer the sections to eosin for about 15mins.
- h. Rinse with water and dehydrate with absolute alcohol and allow to dry

## **Mounting of a stained section**

Due to great difference in refractive index of glass slide, the tissue components and air, unmounted stain section will show very little details when examined under microscope. They have to be mounted in a transparent medium that has a refractive index close to that of glass slide, thus it also has to the tendency to protect the stained section from physical injuries. This is done by applying mounting solution called DPX on the glass slide and cover it with cover slip and then mount the slide on the stage for viewing in the microscope.

## **RADIOLOGY**

### **Principle**

Radiology is a medical specialty that uses imaging to diagnose and treat diseases seen within the body. The acquisition of medical images is carried out by the radiographer often known as radiologic technologist. Depending on the location, the diagnostic radiologist or reporting radiographer, then interprets or reads the images and produces a report of their findings and impression or diagnosis. This report is then transmitted to the clinician who requested the

imaging, either routinely or emergently. They are different type of imaging modalities used in radiology to image. This includes;

1. X-rays
2. Ultrasound
3. Computed tomography (CT)
4. Magnetic resonance imaging.
5. Nuclear imaging
6. Mammography
7. Angiography
8. Contrast study
9. Doppler sonography
10. Hysterosalpingography

## **X-rays**

### **Principle**

X-rays are type of electromagnetic radiation which travels in a straight line and cast objects in they paths. It is mostly used in medical field to check patient and also industry to check loop holes. In x-rays unit, it consists of the radiographer and the radiologist. The radiographer produces film while the radiologist interprets it. X-ray means an unknown ray.

## **Procedure**

1. The patient is laid on chair or on bed.
2. Depending on the plane of projection, the patient can be lay on supine position or in standing position.
3. The X-ray can be shoot in AP or PA; in AP the beam is shoot from anterior position and dictated at posterior position; while in PA, the beam is shoot from posterior position and dictated at anterior plane.
4. The dictator machine is place in anterior or posterior position depending on the plane of projection.
5. The film is then produce and interpreted by the radiologist
6. The report is finally sends to the doctor that requires it.

## **Generation of x-ray**

X-ray consists of two poles which are the cathode and the anode inside a vacuum tube which has a high voltage built inside it. The cathode is heated about  $2000^{\circ}\text{c}$  by a specific heating filament. Electrons are emitted by the cathode and accelerate by the electric field between the cathode and the anode and hit the anode with a considerable amount of energy, where they induce electromagnetic radiation called x-ray. These rays are richer in energy, the higher the applied voltage the higher the energy. The area where the electron hit the anode is called the focus. A lot of energy is generated along this process, the anode consist of heat resistance disk covered with tungsten in most cases. The disk rotates quickly to disperse the

heat along its circumference, thus forming a focal track. The vacuum tube is surrounded by oil inside a lead lined housing that features only one small opening for the radiation to escape. The generated radiation has a spectrum or spread of energies only a part of which can be used for imaging. It could be of low dose or high dose energy

### **Attenuation of x-rays**

X-rays are attenuated as they pass through the patient's body. Two processes play a role; absorption and scatter with lower energy radiation (corresponding to lower exposure voltage) absorption dominates. With high energy (corresponding to high exposure voltage) scatter is mainly responsible for attenuation. In this process, the radiation beam loses energy and is diverted in all directions. The scattered radiation increases with irradiated body volume.

### **Detection of x-rays**

A variety of detectors can make x-rays visible. The simplest is photographic film. Because of the high spatial resolution one can achieve, it is used in nondestructive testing of industrial materials such as pipeline, alloy, car wheel. To expose film alone an incredible dose of x-rays is necessary. Film is much more sensitive to light than x-rays, as light exposes film better, in diagnostic radiology, a combination use of film and intensifying



screens that are made up of rare earth materials such as gadolinium, barium, lanthanum are used as gamma screen.

## **Computed tomography (CT)**

### **Principle**

Computed tomography is one of the modalities used in radiology department to image the body system. It takes the body in slices; it makes use of high dose of voltage to produce a sophisticated 2dimensional and 3dimensional images which can be reconstructed or reformatted in with machine. It consists of two tubes which spin or revolve round the patient with high dose of energy which is 50 times more than that of the x-rays. Its advantage over other modalities is that it has a window for a particular tissue.

### **Procedure**

In computed tomography, the patient is laid on the spiral tray of CT, the x-ray tube continuously rotate around cranio-caudal axis of the patient. A beam of radiation passes through the body and hits a ring or moving ring segment of detectors. The incoming radiation is continuously registered; the signal is digitalized and fed into a data matrix taking into account the varying beam angulations. The data matrix can be transformed into output image.

## **Magnetic Resonance Tomography**

Nuclear magnetic resonance tomography is the most complex medical imaging technique use in radiology to image the anatomy and the physiological processes of the body in health and in disease. MRI uses strong magnetic field, radio waves, and field gradients to form images of the body. Certain atomic nuclei can absorb and emit radio frequency energy when place in an external magnetic field. Hydrogen atoms are most often use to generate a detectable radio frequency signal that is received by antennas in close proximity to the anatomy being examine. Hydrogen atom exist naturally in people and other biological tissues organisms in abundant, particularly in water and fat. Most MRI scanner essentially map the location of water and fat in the body. MRI has two sequences  $T_1$  and  $T_2$ . In  $T_1$  imaging, water appears black and in  $T_2$  water appears white. Fat appears white in both  $T_1$  and  $T_2$ . MRI does not emit any form of radiation.

### **Principle**

When the patient lies inside the strong magnet, the hydrogen atom in the patient body water is use to produce MRI image. Pulse of radio waves excites the nuclear spin energy transition, and magnetic field gradients localize the signal in space. By varying the parameters of the pulse sequence, different contrast can be generated between tissues based on the relaxation properties of hydrogen atom

## **Nuclear Medical Imaging Technique**

Nuclear medical imaging is one of the techniques used in radiology to image the body. Its working principle is based on the ability of the radioactive substance to emit radiations. Here, a radioactive element is injected into the body and imaged using a special gamma camera to detect the radiation emitted from the body. The image quality is always low and depends on the localization of the radioactive element used.

## **Mammography**

This is another special technique used in radiology to image the breast. It is a special type of x-rays called soft x-ray with low ionizing dose to detect cancer and tumor cells in the breast.

## **Angiography**

Angiography is one of the modalities used in radiology to image the blood vessels. In this technique, a radioactive element is injected into the blood stream and allows to localize in the cardiovascular system. A special x-ray called fluoroscopy is used to image it and the blood vessels can be examined and evaluated with the help of a fluoroscope.

## **ULTRASOUND**

An ultrasound scan is a medical test that uses high frequency sound waves to produce cross-sectional images of the body. The basic component of the US probe is the piezoelectric crystal. It uses no radiation. For this reason, it's the preferred method for viewing a developing foetus during pregnancy.

### ***PRINCIPLE***

In ultrasonography, the sound waves are generated artificially by means of piezoelectric crystals. When connected to an alternating current of certain frequency, these crystals vibrate and thus emit a sound wave of the same frequency, but if they are exposed to sound waves of a certain frequency, they will produce an alternating current of that frequency.

Excitation of this crystal by electrical signals causes it to emit ultra-high frequency sound wave; this is the piezoelectric effect. Sound waves are reflected back to the crystal by the various tissues of the body. These reflected sound waves (echo) act on the piezoelectric crystal in the ultrasound probe to produce an electric signal, again by the piezoelectric effect

An assortment of probes is available for imaging and biopsy guidance of various body cavities and organs including;

- Transvaginal US (TVUS): accurate assessment of gynaecological problems and of early pregnancy to about 12 weeks of gestation.
- Transrectal US (TRUS); guidance of prostate biopsy; staging of rectal cancer.
- Endoscopic US (EUS): assessment of the tumours of the upper gastrointestinal tract, pancreas.

- Transoesophageal aechoardiography (TOE): TOE removes the problem of overlying ribs and lung, which can obscure the heart and aorta when performing conventional echocardiography.

## PROCEDURE

Before an ultrasound scan: Depends on the area or organ that is being imaged.

- For abdominal examination, the sonographer may tell the patient to fast for 8-12 hours before the ultrasound. This is because undigested food can block the sound waves, making it difficult for the technician to get a clear picture.
- For examination of the gallbladder, liver, pancreas, or spleen, the patient may be told to eat a fat free food the evening before the scan and then to fast until the procedure is carried out. However, the patient can continue to drink water and take any medication as instructed
- For examination of the urinary system, the patient will be asked to drink lots of water and to hold his/her urine so that the bladder is full and better visualised.
- During an ultrasound scan: The patient changes his/her clothing into a hospital gown.
- The patient is told to lie down on a table with a section of his/her body exposed (the exposed part depends on the location of the organ that is to be imaged).
- The sonographer will apply the ultrasound jelly to the patient`s skin. This prevents friction so that the ultrasound transducer can be rubbed easily on the skin. The ultrasound jelly also helps to transmit the sound waves.

- The transducer is placed on the skin of the patient and constantly adjusted to produce images in different direction of the organ that is been imaged.
- Depending on the area being examined, a patient might need to change position so that the sonographer can have better access.
- After an Ultrasound scan: at the end of the scan, the gel will be cleaned off from the patient`s skin.



Ultrasound image showing a foetus in the womb

## SIGNIFICANCE

- Lack of ionizing radiation, a particular advantage in pregnancy and paediatrics.
- Via transvaginal ultra scan, it can be used to access gynaecological problems.
- An ultrasound is also a helpful way to guide surgeons` movements during certain medical procedures, such as biopsies and fine needle aspiration.
- Relatively low cost
- Portability of the equipment.
- **DISADVANTAGES AND LIMITATIONS OF ULTRA SCAN**

- Ultra scan is highly operator dependent: it relies on the operator to produce and interpret images at the time of examination.
- Ultra scan cannot penetrate gas or bone.
- Bowel gas can obscure structures deep in the abdomen, such as the pancreas or renal arteries.

## **CHAPTER 4**

### **CONCLUSION**

In conclusion, student industrial work experience is like a bridge that link up the theory class and the practical aspect of teaching. It is a light that cast away darkness before the students because it elucidate the practical ignorant in student thus given the student the chance to perform practical's that are relevant to their program ,thus enhancing and upgrading they intelligent quotient.

It prepares the student to be smart and to understand the jobs which there are like to meet at future and how to get use of machines and other working equipment that they may enhance the performance in a particular task. So industrial training is a key to success of every student as it taught more than theoretical class thus student industrial work experience should as a program should not to be separated from student.



## **RECOMMENDATIONS**

The government and industrial training fund should keep this program on and never to separate it from student because it is the principle key that guide and prepare the student for future development.

The federal government should fully sport the ITF and the student by paying the student and not only paying but regular payment in order to carry this program because most challenges that we encounter is lack of finance to feed ourselves and to transport ourselves to the place of work. This has been the worse situation because student will be late in the working office and more over they suffer from starvations. We therefore apologize and recommend that the government of this federation should put remedy into these situations.

## Reference

All pictures were taken from General Hospital Ikot Ekpene, Akwa Ibom State.