SSG
Sir Sayajirao General Hospital

SIR SAYAJIRAO GENERAL HOSPITAL

INTERNSHIP REPORT

On

BIOMEDICAL ENGINEERING

By

DIRGHAU PATEL

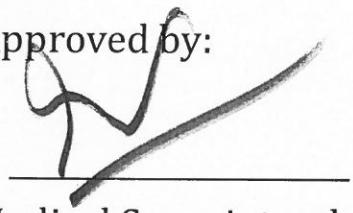
Duration: 05 June'18- 25 June'18

Submission Date: June 13, 2018

Approval of the Internship Report

I, hereby declare that this Internship Report is submitted to the complete fulfillment of the internship program conducted from 05 June, 2018 to 25 June, 2018. Any part of this report has not been reported or copied from any report of the hospital or others.

Approved by:



Medical Superintendent

Acknowledgment

The special thanks goes to my helpful supervisor **Mr. Hardik Patel**, Biomedical Engineer at SSG Hospital, Vadodara. The supervision and support that he gave me truly helped the progression and smoothness of the internship program. The co-operation is much indeed appreciated. I express my sincere thanks to **Mrs. Jagruti Choudhary**, Medical officer and **Mr. Rajeev Deveshwar**, Medical Superintendent SSG Hospital, Vadodara.

- Dirghau Patel

Executive Summary

This report is about to explain what I did and learned during my internship period. As the main purpose of internship is to learn by working in practical environment and to apply the knowledge acquired during the studies in areal world scenario in order to tackle the problems using the knowledge and skill learned during the academic process.

I have discussed about every major aspect of the hospital, which I observed and perceived during my internship program.

This report is divided in to six sections. Section one will discuss about the background of Sir Sayajirao General Hospital. Section two is about the overall internship experience of biomedical engineering. Section three consists of the overview of the Biomedical Equipments I repaired and came across throughout the internship program. Section four is the overall benefits I gained during the internship program. Section five is the work flow of the hospital through a biomedical engineer's prespective. The last section is about the conclusion.

The most important in an internship program is that the student should spend their time in a true manner and with the spirit to learn practical orientation of theoretical study framework. This report is about my internship that I have undergone Sir Sayajirao General Hospital from June 5, 2018 to June 25, 2018. During my internship I am able to learn practical skills and get good working experience.

1. Basic Information of SSG Hospital

Sir Sayajirao General Hospital (S.S.G.H) Vadodara was started in 1865 as the 56 bedded Countess of Dufferin Hospital. This was then taken over by the Government of Gujarat in 1907 and renamed the S.S.G Hospital after the erstwhile ruler of Vadodara, Maharaja Sayajirao II. S.S.G Hospital is designed in the Indo-Saracen style. It is the largest referral hospital in Central Gujarat.

It forms the teaching hospital component of Medical College Baroda. It also houses the Government College of Physiotherapy and Government Nursing College. It caters to the primary, secondary and tertiary health care needs of the people of central Gujarat and adjoining states of Madhya Pradesh and Rajasthan. It also participates in various community outreach and national health programs.

It has 1250 teaching beds across several clinical specialties and subspecialties, with an annual average outdoor attendance of about 9 Lakh patients, an average annual indoor admission of 67,000 patients and a bed occupancy rate of 90%. It also offers select high-end surgeries such as Oncosurgeries, endo-urologic surgeries, laparoscopic surgery and plastic surgery. S.S.G Hospital offers a 24-hour emergency service and receives around 290 emergencies each day. Its various laboratories run approximately 2000 tests daily and the department of Radio diagnosis has a daily load of 600 radiological tests per day. The Medical Nursing Home on the campus is a 22 bedded facility for patients requesting private rooms.

Funded by the Department of Health and Family Welfare Government of Gujarat, it renders yeomen service - practically free of cost - to the underprivileged sections of the society and the

common man. The Rogi Kalyan Samiti of the Hospital which generates funds from various sources funds the management of people below poverty line and tribal patients free of cost.

Statistical Data on Number of Surgeries (2017)

Month	Major	Minor	Total
January	1499	4931	6430
February	1409	4466	5875
March	1243	5308	6551
April	1124	5162	6286
May	1251	5399	6650
June	1177	5359	6536
July	1126	5392	6518
August	1158	6237	7395
September	1216	5995	7211
October	1134	5866	7200
TOTAL	**12337**	**54115**	**66452**

Statistical Data on OPD, Admissions, Discharge, Deaths: (2017)

Month	OPD	IPD	Discharge	Deaths
January	76193	5169	4229	229
February	72118	4490	3583	169
March	80692	4649	3734	171
April	70124	4361	3413	173
May	78443	5018	4121	191
June	72891	4759	3851	242
July	81986	4989	4099	235
August	87553	5510	4953	283
September	79205	6579	4978	427
October	79469	6493	4777	342
TOTAL	**702481**	**52017**	**41738**	**2462**

Statistical Data on Deliveries and LSCS: (2017)

Month	Deliveries	LSCS
January	541	160
February	424	142
March	439	141
April	470	182
May	592	216
June	526	207
July	513	166
August	730	238
September	753	234
October	776	269

TOTAL	5764	1955

SSG HOSPITAL VADODARA DISTRIBUTION OF BEDS (TEACHING BEDS)

Sr. No.	Name of Specialty	No. of Teaching beds
1	General Medicine	240
2	Pediatrics	120
3	Tuberculosis & Respiratory Disease	60
4	Dermatology, Venerology & Leprosy	30
5	Psychiatry	40
6	General Surgery	300
7	Orthopedics	170
8	Ophthalmology	60
9	Otorhinolaryngology	40
10	Obstetrics and Gynecology	190
	Total	**1250**

2. The Overall Internship Experience

Nothing is a waste of time if you use the experience wisely.

-Augste Rodin

I got very familiar with my collegues and staff on the first day itself. The first 3 days I spent getting familiar with with the location of different departments in the hospital, their repective HOD's and learning the overall work culture and enviornment of the hospital.

After that I started to go out on calls accompyning Mr. Jaimin and Mr. Narendra who were great as companions. For the first time in my entire life, I visited different OT's of different departments, understood the work flow of how the biomedical engineering department in a hospital operates, and repaired biomedical equipments of various shapes and sizes.

I would also tend to emergency calls with my collegues and working under such circumstances taught me to remain calm under tremendous pressure, always have a presence of mind in no matter whatever task you are doing and to always give a little extra effort everytime.

All in all, I would like to conclude by saying that this intership program not only helped me in exceeding my academic and practical standards, it also provided me an extraordinary experience.

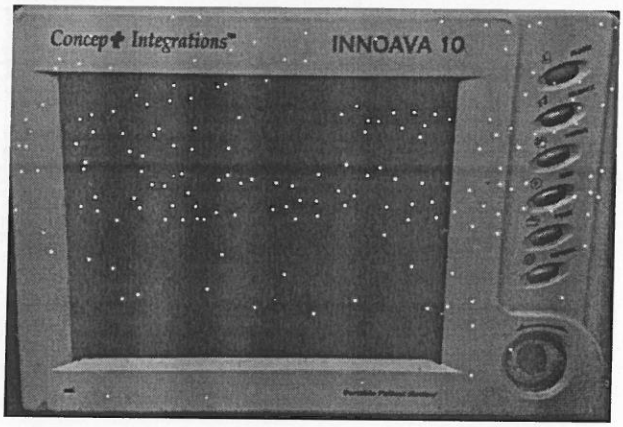
3. Biomedical Equipments Overview

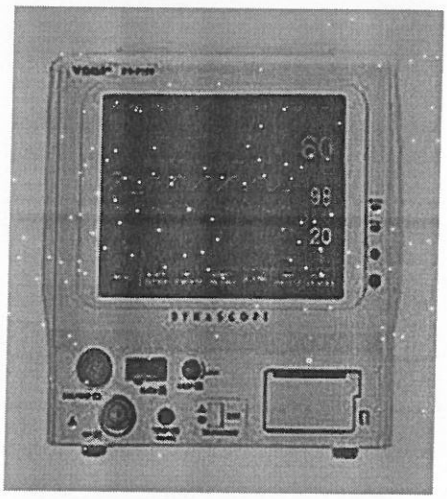
Success is the sum of small efforts, repeated day in and day out.

-R. Colier

This is an overview of all the biomedical equipments I repaired and came across during the internship program at SSG Hospital, Vadodara.

1. Patient Bedside Monitor





- Manufactured by Concept integrations.
- Costs of 75000 INR.
- Displays Blood Pressure (BP), ECG (Ecocardiograph), SpO_2 and body temprature.
- Monitoring of vital parameters can include several of the ones mentioned above, and most commonly include at least blood pressure and heart rate, and preferably also pulse oximetry and respiratory rate. Multimodal monitors that simultaneously measure and display the relevant vital parameters are commonly integrated into the bedside monitors in critical care units, and the anesthetic machines in operating rooms. These allow for continuous monitoring of a patient, with medical staff being continuously informed of the changes in general condition of a patient. Some monitors can

even warn of pending fatal cardiac conditions before visible signs are noticeable to clinical staff, such as atrial fibrillation or premature PVC.

⑩ Components

Sensor

Sensors of medical monitors include biosensors and mechanical sensors.

Translating component

The translating component of medical monitors is responsible for converting the signals from the sensors to a format that can be shown on the display device or transferred to an external display or recording device.

Display device

Physiological data are displayed continuously on a CRT, LED or LCD screen as data channels along the time axis, They may be accompanied by numerical readouts of computed parameters on the original data, such as maximum, minimum and average values, pulse and respiratory frequencies, and so on.

Besides the tracings of physiological parameters along time (X axis), digital medical displays have automated numeric readouts of the peak and/or average parameters displayed on the screen.

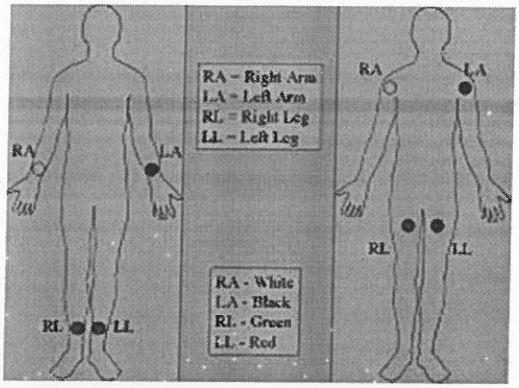
Modern medical display devices commonly use digital signal processing (DSP), which has the advantages of miniaturization, portability, and multi-parameter displays that can track many different vital signs at once.

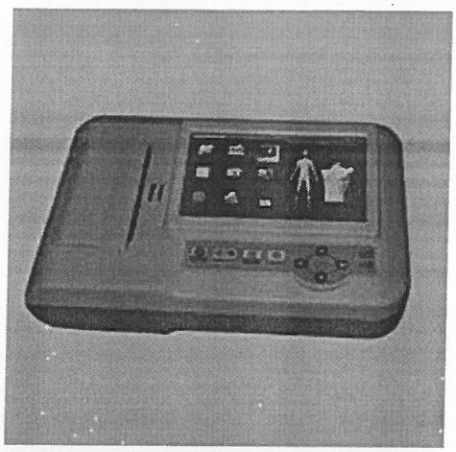
Old analog patient displays, in contrast, were based on oscilloscopes, and had one channel only, usually reserved for electrocardiographic monitoring (ECG). Therefore, medical monitors tended to be highly specialized. One monitor would track a patient's blood pressure, while another would measure pulse oximetry, another the ECG. Later analog models had a second or third channel displayed in the same screen, usually to monitor respiration movements and blood pressure. These machines were widely used and saved many lives, but they had several restrictions, including sensitivity to electrical interference, base level fluctuations and absence of numeric readouts and alarm.

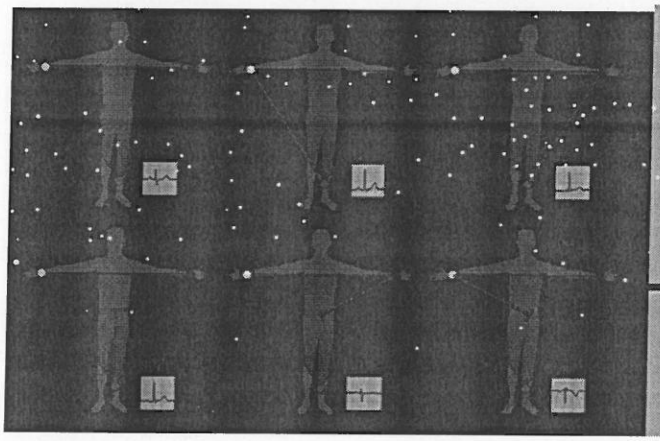
⑩ Other components

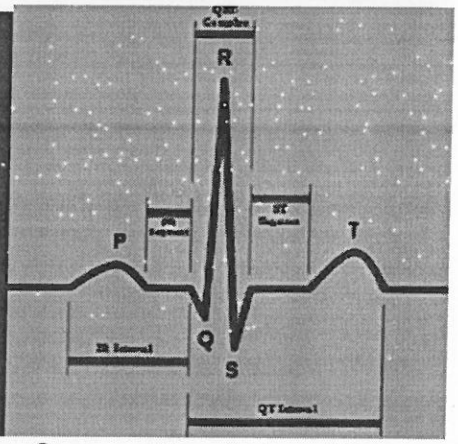
A medical monitor can also have the function to produce an alarm (such as using audible signals) to alert the staff when certain criteria are set, such as when some parameter exceeds of falls the level limits.

2. ECG (Electrocardiography)









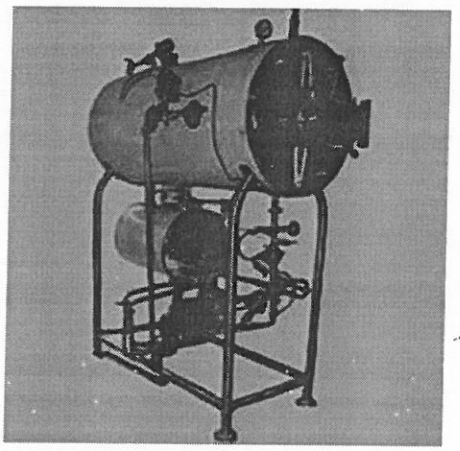
- Manufactured by BPL.
- Costs 30000 INR.
- Displays only ECG.

· Electrocardiography is the process of recording the electrical activity of the heart over a period of time using electrodes placed on the skin. These electrodes detect the tiny electrical changes on the skin that arise from the heart muscle's electrophysiologic pattern of depolarizing and repolarizing during each heartbeat. It is very commonly performed to detect any cardiac problems.

- In a conventional 12-lead ECG, ten electrodes are placed on the patient's limbs and on the surface of the chest.

- The overall magnitude of the heart's electrical potential is then measured from twelve different angles ("leads") and is recorded over a period of time (usually ten seconds).
- In this way, the overall magnitude and direction of the heart's electrical depolarization is captured at each moment throughout the cardiac cycle.
- The graph of voltage versus time produced by this noninvasive medical procedure is called an electrocardiogram.
- During each heartbeat, a healthy heart has an orderly progression of depolarization that starts with pacemaker cells in the sinoatrial node, spreads out through the atrium, passes through the atrioventricular node down into the bundle of His and into the Purkinje fibers, spreading down and to the left throughout the ventricles. This orderly pattern of depolarization gives rise to the characteristic ECG tracing.
- To the trained clinician, an ECG conveys a large amount of information about the structure of the heart and the function of its electrical conduction system.
- Among other things, an ECG can be used to measure the rate and rhythm of heartbeats, the size and position of the heart chambers, the presence of any damage to the heart's muscle cells or conduction system, the effects of cardiac drugs, and the function of implanted pacemakers.

3. Autoclave

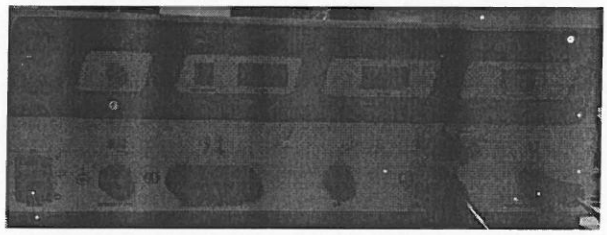


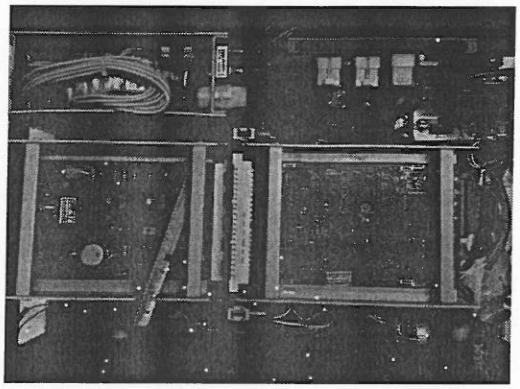
- A medical autoclave is a device that uses steam to sterilize equipment and other objects. This means that all bacteria, viruses, fungi, and spores are inactivated. However, prions, such as those associated with Creutzfeldt–Jakob disease, and some toxins released by certain bacteria, such as Cereulide, may not be destroyed by autoclaving at the typical 134 °C for three minutes or 121 °C for 15 minutes. Although a wide range of archaea species, including

Geogemma barosii, can survive and even reproduce at temperatures above 121 °C, no archaea are known to be infectious or otherwise pose a health risk to humans; in fact, their biochemistry is so vastly different from our own and their multiplication rate is so slow that microbiologists need not worry about them.

- Autoclaves are found in many medical settings, laboratories, and other places that need to ensure the sterility of an object. Many procedures today employ single-use items rather than sterilizable, reusable items. This first happened with hypodermic needles, but today many surgical instruments (such as forceps, needle holders, and scalpel handles) are commonly single-use rather than reusable items. Autoclaves are of particular importance in poorer countries due to the much greater amount of equipment that is re-used. Providing stove-top or solar autoclaves to rural medical centers has been the subject of several proposed medical aid missions.
- Because damp heat is used, heat-labile products (such as some plastics) cannot be sterilized this way or they will melt. Paper and other products that may be damaged by steam must also be sterilized another way. In all autoclaves, items should always be separated to allow the steam to penetrate the load evenly.
- Autoclaving is often used to sterilize medical waste prior to disposal in the standard municipal solid waste stream. This application has become more common as an alternative to incineration due to environmental and health concerns raised because of the combustion by-products emitted by incinerators, especially from the small units which were commonly operated at individual hospitals. Incineration or a similar thermal oxidation process is still generally mandated for pathological waste and other very toxic and/or infectious medical waste.
- In dentistry, autoclaves provide sterilization of dental instruments according to health technical memorandum 01-05 (HTM01-05). According to HTM01-05, instruments can be kept, once sterilized using a vacuum autoclave for up to 12 months using sealed pouches.
- In most of the industrialized world medical-grade autoclaves are regulated medical devices. Many medical-grade autoclaves are therefore limited to running regulator-approved cycles. Because they are optimized for continuous hospital use, they favor rectangular designs, require demanding maintenance regimens, and are costly to operate. (A properly calibrated medical-grade autoclave uses thousands of gallons of water each day, independent of task, with correspondingly high electric power consumption.)

4. Cautery





- Manufactured by Jhonson and Jhonson.

- Electrocauterization is the process of destroying tissue (or cutting through soft tissue) using heat conduction from a metal probe heated by electric current. The procedure stops bleeding from small vessels (larger vessels being ligated). Electrocautery applies high frequency alternating current by a unipolar or bipolar method. It can be a continuous waveform to cut tissue, or intermittent to coagulate tissue.

Unipolar

- In unipolar cauterization, the physician contacts the tissue with a single small electrode. The circuit's exit point is a large surface area, such as the buttocks, to prevent electrical burns.
- The amount of heat generated depends on size of contact area, power setting or frequency of current, duration of application, and waveform.
- Constant waveform generates more heat than intermittent. Frequency used in cutting the tissue is higher than in coagulation mode.

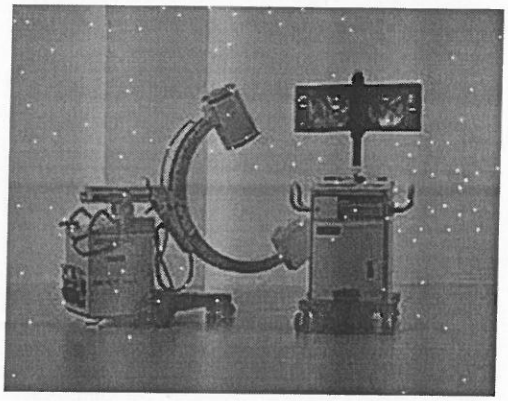
Bipolar

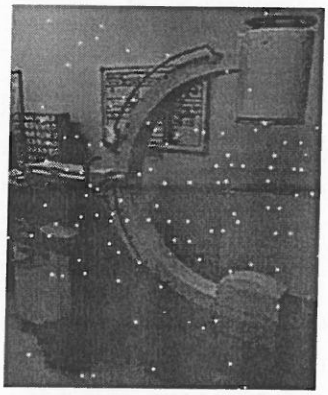
- Bipolar electrocautery passes the current between two tips of a forceps-like tool. It has the advantage of not disturbing other electrical body rhythms

(such as the heart) and also coagulates tissue by pressure. Lateral thermal injury is greater in unipolar than bipolar devices.

- Electrocauterization is preferable to chemical cauterization, because chemicals can leach into neighbouring tissue and cauterize outside of intended boundaries.
- Concern has also been raised regarding toxicity of the surgical smoke electrocautery produces. This contains chemicals that, through inhalation, may harm patients or medical staff.

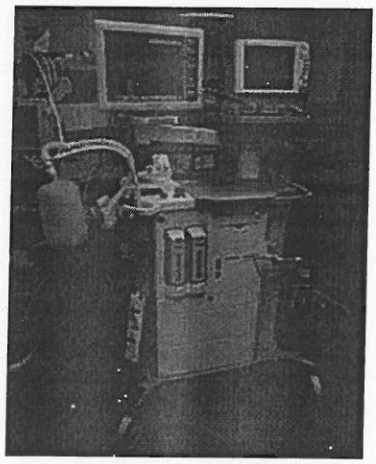
5. IITV (Image Intensified Television)





- An x-ray image intensifier (XRII) is an image intensifier that converts x-rays into visible light at higher intensity than mere fluorescent screens do. Such intensifiers are used in x-ray imaging systems (such as fluoroscopes) to allow low-intensity x-rays to be converted to a conveniently bright visible light output.
- The device contains a low absorbency/scatter input window, typically aluminum, input fluorescent screen, photocathode, electron optics, output fluorescent screen and output window. These parts are all mounted in a high vacuum environment within glass or more recently, metal/ceramic.
- By its intensifying effect, It allows the viewer to more easily see the structure of the object being imaged than fluorescent screens alone, whose images are dim. The X-ray II requires lower absorbed doses due to more efficient conversion of x-ray quanta to visible light. This device was originally introduced in 1948.

6. Anesthesia Machine



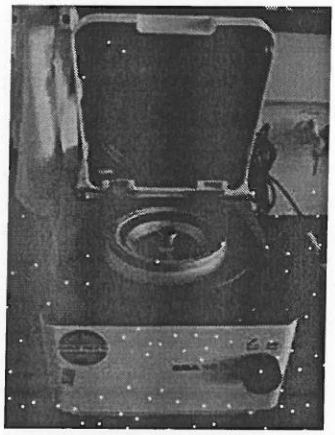
- Anesthesia carts are hospital devices used to store tools that are necessary for aid during procedures that require administration of anesthesia. Anesthesia refers to the use of drugs to subdue a patient's mind and prevent him or her from feeling any pain during a surgical operation. It is very important for anesthesia tools to be well organized and maintained so that patients receive proper anesthesia care. To ensure that patients remain unconscious and pain-free throughout the procedure, anesthesia supply carts can help to keep all the necessary anesthesia tools easily at hand.

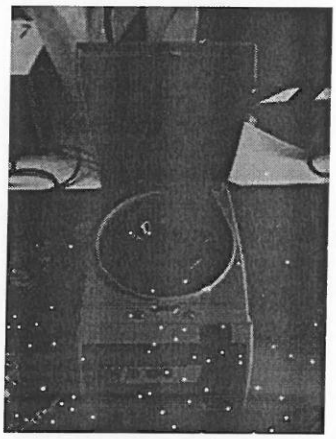
- These carts allow anesthesiologists easy access to all anesthesia tools, in one simple, portable location. Anesthesiologists are able to present or take away their medical tools quickly and easily whenever they are needed. Sometimes, patients must be rapidly taken out of the anesthetized state and this may not be possible or as easy if anesthesiology carts are not utilized. The design of Anesthesia supply carts allows for easy transportation between rooms and could potentially be used in multiple operating rooms. Medical personnel save time and energy by not having to seek out and gather anesthesia tools.

- Many optimized features are available for anesthesiology carts. To keep anesthesia tools safe and in the hands of authorized users, locking drawers are a useful option. These same anesthesiology supplies cart drawers glide smoothly on rolling sliders to prevent displacement or wobbling. Built-in stabilizing bases increase anesthesia storage cart stability and prevent tipping during transport. Easy-grip push handles and smooth-rolling and locking casters provide for maximum anesthesiologist cart maneuverability. Anesthesiology carts are available in many different sizes and colors to

accommodate specific facility needs. Colors are often used by facilities to coordinate which cart belongs in which room in the hospital or medical center.

7. Centrifuge



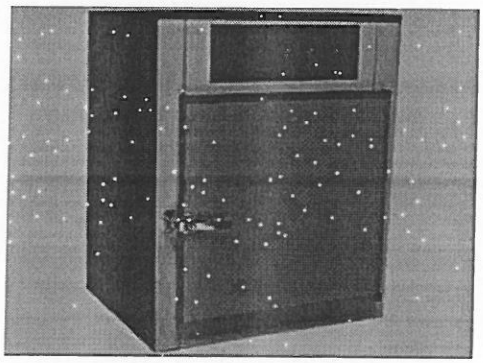


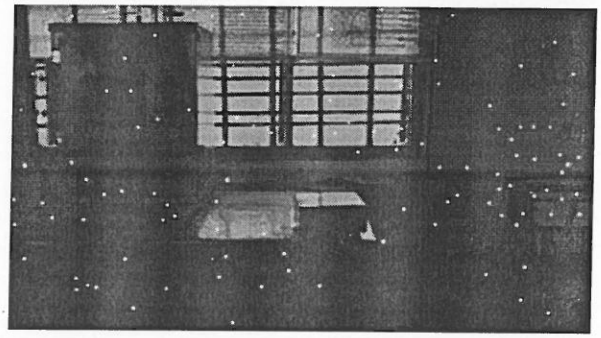
- A centrifuge is a piece of equipment that puts an object in rotation around a fixed axis (spins it in a circle), applying a force perpendicular to the axis of spin (outward) that can be very strong. The centrifuge works using the sedimentation principle, where the centrifugal acceleration causes denser substances and particles to move outward in the radial direction. At the same time, objects that are less dense are displaced and move to the center. In a laboratory centrifuge that uses sample tubes, the radial acceleration causes denser particles to settle to the bottom of the tube, while low-density substances rise to the top.

- A wide variety of laboratory-scale centrifuges are used in chemistry, biology, biochemistry and clinical medicine for isolating and separating suspensions and immiscible liquids. They vary widely in speed, capacity, temperature control, and other characteristics. Laboratory centrifuges often can accept a range of different fixed-angle and swinging bucket rotors able to carry different numbers of centrifuge tubes and rated for specific maximum speeds. Controls vary from simple electrical timers to programmable models able to control acceleration and deceleration rates, running speeds, and temperature regimes. Ultracentrifuges spin the rotors under vacuum, eliminating air resistance and enabling exact temperature control. Zonal rotors and continuous flow systems are capable of handing bulk and larger sample volumes, respectively, in a laboratory-scale instrument. Another application in laboratories is blood separation. Blood separates into cells and

proteins (RBC, WBC, platelets, etc.) and serum. DNA preparation is another common application for pharmacogenetics and clinical diagnosis. DNA samples are purified and the DNA is prepped for separation by adding buffers and then centrifuging it for a certain amount of time. The blood waste is then removed and another buffer is added and spun inside the centrifuge again. Once the blood waste is removed and another buffer is added the pellet can be suspended and cooled. Proteins can then be removed and the entire thing can be centrifuged again and the DNA can be isolated completely.

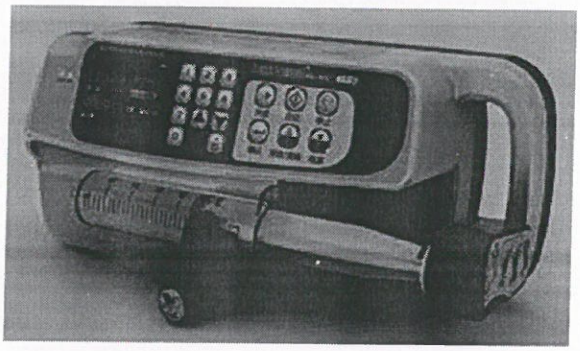
8. Hot Air Oven





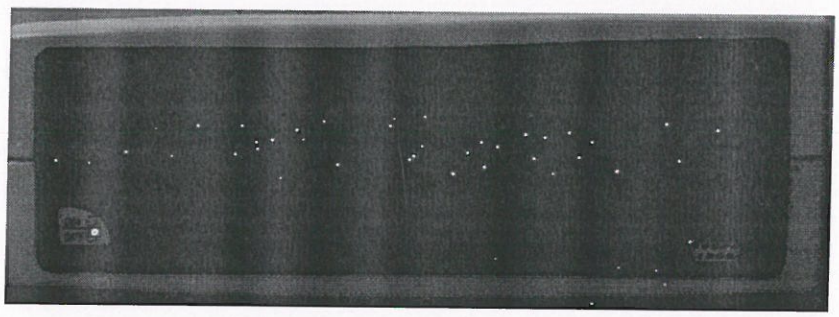
- Hot air ovens are electrical devices which use dry heat to sterilize. They were originally developed by Pasteur. Generally, they can be operated from 50 to 300 °C, using a thermostat to control the temperature. Their double walled insulation keeps the heat in and conserves energy, the inner layer being a poor conductor and outer layer being metallic. There is also an air filled space in between to aid insulation. An air circulating fan helps in uniform distribution of the heat. These are fitted with the adjustable wire mesh plated trays or aluminium trays and may have an on/off rocker switch, as well as indicators and controls for temperature and holding time. The capacities of these ovens vary. Power supply needs vary from country to country, depending on the voltage and frequency (hertz) used. Temperature sensitive tapes or biological indicators using bacterial spores can be used as controls, to test for the efficacy of the device during use.

9. Infusion Pump



- An infusion pump infuses fluids, medication or nutrients into a patient's circulatory system. It is generally used intravenously, although subcutaneous, arterial and epidural infusions are occasionally used.
- Infusion pumps can administer fluids in ways that would be impractically expensive or unreliable if performed manually by nursing staff. For example, they can administer as little as 0.1 mL per hour injections (too small for a drip), injections every minute, injections with repeated boluses requested by the patient, up to maximum number per hour (e.g. in patient-controlled analgesia), or fluids whose volumes vary by the time of day.
- Because they can also produce quite high but controlled pressures, they can inject controlled amounts of fluids subcutaneously (beneath the skin), or epidurally (just within the surface of the central nervous system – a very popular local spinal anesthesia for childbirth).

10. Pulse Oximeter

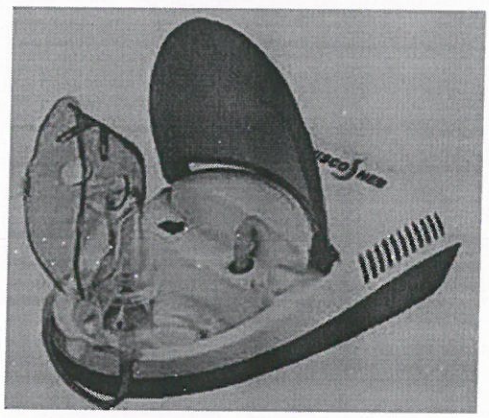


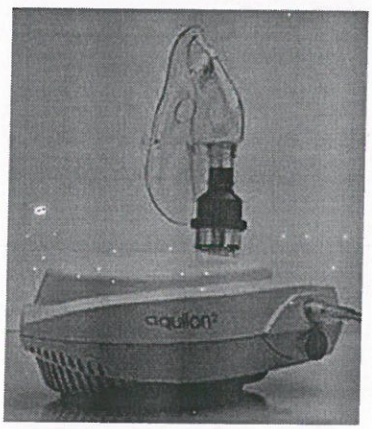
- Pulse oximeter is a noninvasive method for monitoring a person's oxygen saturation. Though its reading of SpO2 (peripheral oxygen saturation) is not

always identical to the more desirable reading of SaO2 (arterial oxygen saturation) from arterial blood gas analysis, the two are correlated well enough that the safe, convenient, noninvasive, inexpensive pulse oximetry method is valuable for measuring oxygen saturation in clinical use.

- In its most common (transmissive) application mode, a sensor device is placed on a thin part of the patient's body, usually a fingertip or earlobe, or in the case of an infant, across a foot. The device passes two wavelengths of light through the body part to a photodetector. It measures the changing absorbance at each of the wavelengths, allowing it to determine the absorbances due to the pulsing arterial bloodalone, excluding venous blood, skin, bone, muscle, fat, and (in most cases) nail polish.
- Less commonly, reflectance pulse oximetry is used as an alternative to transmissive pulse oximetery described above. This method does not require a thin section of the person's body and is therefore well suited to a universal application such as the feet, forehead, and chest, but it also has some limitations. Vasodilation and pooling of venous blood in the head due to compromised venous return to the heart can cause a combination of arterial and venous pulsations in the forehead region and lead to spurious SpO2 results. Such conditions occur while undergoing anesthesia with endotracheal intubation and mechanical ventilation or in patients in the Trendelenburg position.

11. Nebulizer



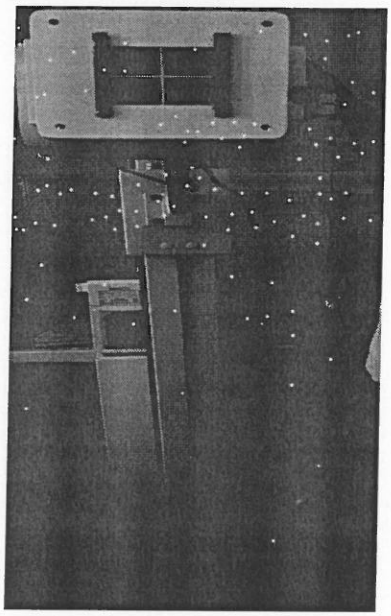


- In medicine, a nebulizer or nebuliser is a drug delivery device used to administer medication in the form of a mist inhaled into the lungs. Nebulizers

are commonly used for the treatment of cystic fibrosis, asthma, COPD and other respiratory diseasesor disorders.

- Analytical nebulizers are another form of nebulizer and are used primarily in laboratory settings for elemental analysis.
- Nebulizers use oxygen, compressed air or ultrasonic power to break up solutions and suspensions into small aerosol droplets that can be directly inhaled from the mouthpiece of the device. An aerosol is a mixture of gas and solid or liquid particles.

12. Portable X-Ray Machine

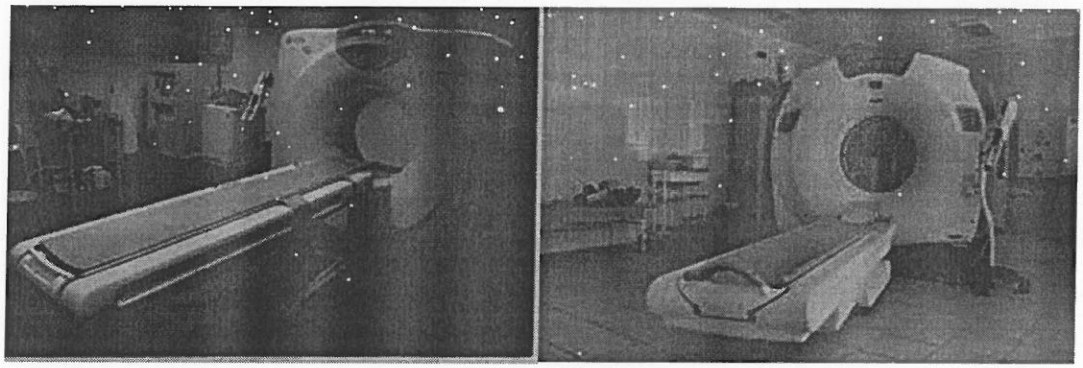


- An X-ray machine is a device that produces X-rays. Together with an X-ray detector, it is commonly used in a variety of applications including medicine, fluorescence, electronic assembly inspection, and measurement of material thickness in manufacturing operations. In medical applications, X-ray generators are used by radiographers to acquire x-ray images of the internal structures (e.g., bones) of living organisms, and also in sterilization.
- An X-ray generator generally contains an X-ray tube to produce the X-rays. Possibly, radioisotopes can also be used to generate X-rays.
- An X-ray tube is a simple vacuum tube that contains a cathode, which directs a stream of electrons into a vacuum, and an anode, which collects the electrons and is made of tungsten to evacuate the heat generated by the

collision. When the electrons collide with the target, about 1% of the resulting energy is emitted as X-rays, with the remaining 99% released as heat. Due to the high energy of the electrons that reach relativistic speeds the target is usually made of tungsten even if other material can be used.

- An X-ray generator also needs to contain a cooling system to cool the anode; many X-ray generators use water or oil recirculating systems.
- In medical imaging applications, an x-ray machine has a control console that is used by a radiologic technologist to select x-ray attributes suitable for the specific exam, a power supply that creates and produces the desired kVp (peak kilo voltage), mA (milliamperes, sometimes referred to as mAs which is actually mA multiplied by the desired exposure length) for the x-ray tube, and the x-ray tube itself.

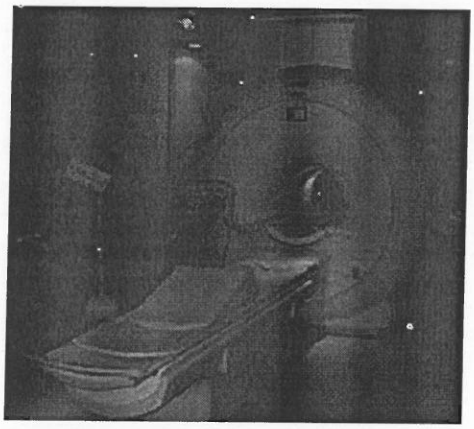
13. CT Scan

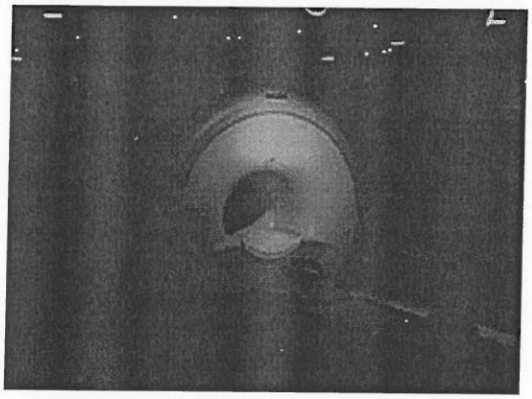


- A CT scan, also known as computed tomography scan, makes use of computer-processed combinations of many X-ray measurements taken from different angles to produce cross-sectional (tomographic) images (virtual "slices") of specific areas of a scanned object, allowing the user to see inside the object without cutting. Other terms include computed axial tomography (CAT scan) and computer aided tomography.
- Digital geometry processing is used to further generate a three-dimensional volume of the inside of the object from a large series of two-dimensional radiographic images taken around a single axis of rotation. Medical imaging is the most common application of X-ray CT. Its cross-sectional images are used for diagnostic and therapeutic purposes in various medical disciplines. The rest of this article discusses medical-imaging X-ray CT; industrial applications of X-ray CT are discussed at industrial computed tomography scanning.

- The term "computed tomography" (CT) is often used to refer to X-ray CT, because it is the most commonly known form. But, many other types of CT exist, such as positron emission tomography (PET) and single-photon emission computed tomography (SPECT). X-ray tomography, a predecessor of CT, is one form of radiography, along with many other forms of tomographic and non-tomographic radiography.
- CT produces data that can be manipulated in order to demonstrate various bodily structures based on their ability to absorb the X-ray beam. Although, historically, the images generated were in the axial or transverse plane, perpendicular to the long axis of the body, modern scanners allow this volume of data to be reformatted in various planes or even as volumetric (3D) representations of structures. Although most common in medicine, CT is also used in other fields, such as nondestructive materials testing. Another example is archaeological uses such as imaging the contents of sarcophagi. Individuals responsible for performing CT exams are called radiographers or radiologic technologists.

14. MRI Machine





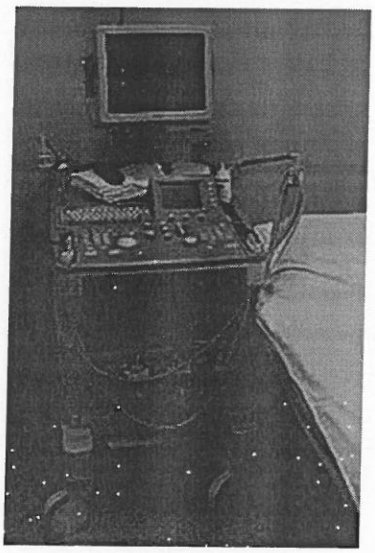
- Magnetic resonance imaging (MRI) is a medical imaging technique used in radiology to form pictures of the anatomy and the physiological processes of the body in both health and disease. MRI scanners use strong magnetic fields, electric field gradients, and radio waves to generate images of the organs in the body. MRI does not involve X-rays or the use of ionizing radiation, which distinguishes it from CT or CAT scans. Magnetic resonance imaging is a medical application of nuclear magnetic resonance (NMR). NMR can also be used for *imaging* in other NMR applications such as NMR spectroscopy.

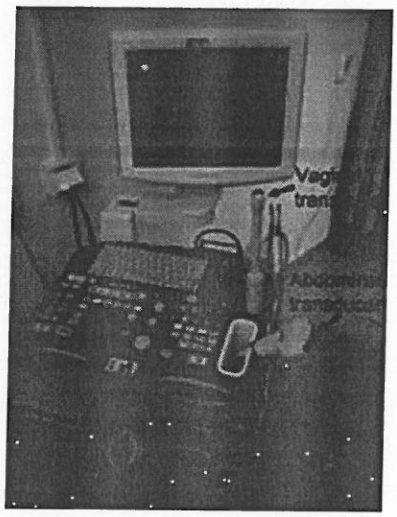
- While the hazards of X-rays are now well-controlled in most medical contexts, MRI may still be seen as a better choice than a CT scan. MRI is widely used in hospitals and clinics for medical diagnosis, staging of disease and follow-up without exposing the body to radiation. However, MRI may often yield different diagnostic information compared with CT. There may be risks and discomfort associated with MRI scans. Compared with CT scans, MRI scans typically take longer and are louder, and they usually need the subject to enter a narrow, confining tube. In addition, people with some medical implants or other non-removable metal inside the body may be unable to undergo an MRI examination safely.

- MRI was originally called 'NMRI' (nuclear magnetic resonance imaging) and is a form of NMR, though the use of 'nuclear' in the acronym was dropped to avoid negative associations with the word. Certain atomic nuclei are able to absorb and emit radio frequencyenergy when placed in an external magnetic field. In clinical and research MRI, hydrogen atoms are most often used to generate a detectable radio-frequency signal that is received by antennas in close proximity to the anatomy being examined. Hydrogen atoms are naturally abundant in people and other biological organisms, particularly in water and fat. For this reason, most MRI scans essentially map the location of water and fat in the body. Pulses of radio waves excite the nuclear spin energy transition, and magnetic field gradients localize the signal in space. By varying the parameters of the pulse sequence, different contrasts may be generated between tissues based on the relaxation properties of the hydrogen atoms therein.

- Since its development in the 1970s and 1980s, MRI has proven to be a highly versatile imaging technique. While MRI is most prominently used in diagnostic medicine and biomedical research, it also may be used to form images of non-living objects. MRI scans are capable of producing a variety of chemical and physical data, in addition to detailed spatial images. The sustained increase in demand for MRI within health systems has led to concerns about cost effectiveness and overdiagnosis.

15. Medical Ultrasound





Medical ultrasound (also known as diagnostic sonography or ultrasonography) is a diagnostic imaging technique based on the application of ultrasound. It is used to see internal body structures such as tendons, muscles, joints, blood vessels, and internal organs. Its aim is often to find a source of a disease or to exclude any pathology. The practice of examining pregnant women using ultrasound is called obstetric ultrasound, and is widely used.

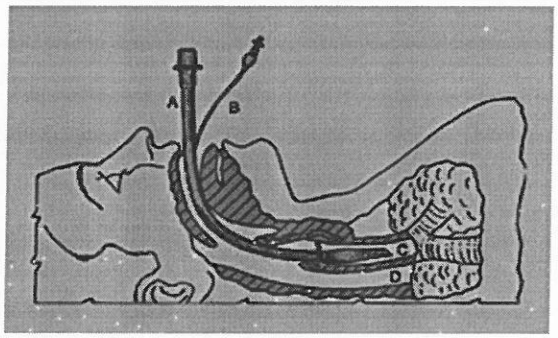
Ultrasound is sound waves with frequencies which are higher than those audible to humans (>20,000 Hz). Ultrasonic images, also known as sonograms, are made by sending pulses of ultrasound into tissue using a probe. The sound echoes off the tissue; with different tissues reflecting varying degrees of sound. These echoes are recorded and displayed as an image to the operator.

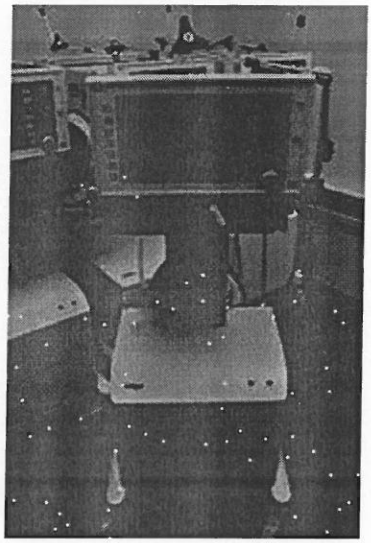
Many different types of images can be formed using sonographic instruments. The most well-known type is a B-mode image, which displays the acoustic impedance of a two-dimensional cross-section of tissue. Other types of image can display blood flow, motion of tissue over time, the location of blood, the presence of specific molecules, the stiffness of tissue, or the anatomy of a three-dimensional region.

Compared to other prominent methods of medical imaging, ultrasound has several advantages. It provides images in real-time, it is portable and can be brought to the bedside, it is substantially lower in cost, and it does not use harmful ionizing radiation. Drawbacks of ultrasonography include various limits on its field of view, such as the need for patient cooperation, dependence on physique, difficulty imaging

structures behind bone and air, and the necessity of a skilled operator, usually a trained professional.

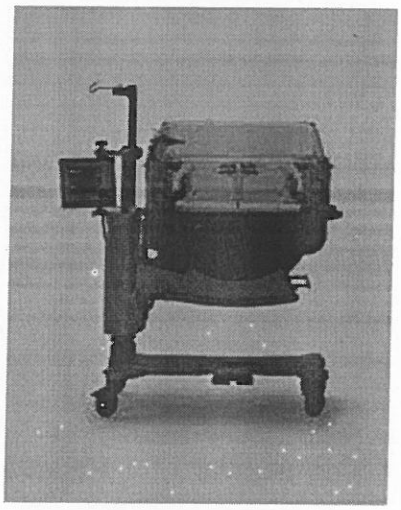
16. Medical Ventilator

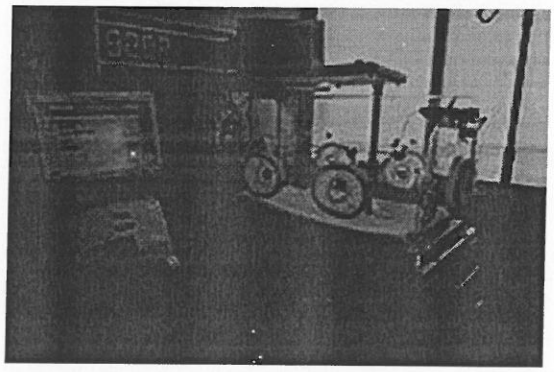




- A medical ventilator (or simply ventilator in context) is a mechanical ventilator, a machine designed to move breathable air into and out of the lungs, to provide breathing for a patient who is physically unable to breathe, or breathing insufficiently.
- While modern ventilators are computerized machines, patients can be ventilated with a simple, hand-operated bag valve mask.
- Ventilators are chiefly used in intensive care medicine, home care, and emergency medicine (as standalone units) and in anesthesia (as a component of an anesthesia machine).
- Medical ventilators are sometimes colloquially called "respirators", a term stemming from commonly used devices in the 1950s (particularly the "Bird Respirator"). However, in modern hospital and medical terminology, these machines are never referred to as respirators, and use of "respirator" in this context is now a deprecated anachronism signaling technical unfamiliarity. In the present-day medical field, the word "respirator" refers to a protective face mask.

17. Infant Incubator





- An incubator is an apparatus used to maintain environmental conditions suitable for a neonate (newborn baby). It is used in preterm births or for some ill full-term babies.

⓾ There is additional equipment used to evaluate and treat sick neonates. These include:

(a) Blood pressure monitor: The blood pressure monitor is a machine that's connected to a small cuff which wrapped around the arm or leg of the patient. This cuff automatically takes the blood pressure and displays the data for review by providers.

(b) Oxygen hood: This is a clear box that fits over the baby's head and supplies oxygen. This is used for babies who can still breathe but need some respiratory support.

(c) Ventilator: This is a breathing machine that delivers air to the lungs. Babies who are severely ill will receive this intervention. Typically, the ventilator takes the role of the lungs while treatment is administered to improve lung and circulatory function.

Possible functions of a neonatal incubator are:

- Oxygenation, through oxygen supplementation by head hood or nasal cannula, or even continuous positive airway pressure (CPAP) or mechanical ventilation. Infant respiratory distress syndrome is the leading cause of death in preterm infants, and the main treatments are CPAP, in addition to administering pulmonary surfactant and stabilizing the blood sugar, blood salts, and blood pressure.

4. The Overall Benefits I gained From the Internship

One thing I have learned in a long life: that all our science, measured against reality, is primitive and childlike—and yet is the most precious thing we have.

—ALBERT EINSTEIN

Introduction

Internship is the beginning of the road that will take me to the point I want to be at after my graduation. Internship is a practice I need to perform, because it prepares me for the life that I aim at.

4.1 Practical Skill

The Internship will have the opportunity to connect classroom theory with current industry challenges, and have exposure to the latest technologies. Opportunities to converse and interact with a large pool of talented experienced department members will provide a deeper insight to the overall operation, as well as provide a valuable pool of resources to assist in completion of internship program. This internship program was exactly what I needed to nurture the lack of practical skills I had. I would acquire practical experience to complement the theoretical content of my studies.

4.2 Interpersonal Communication Skills

During my internship period the Interpersonal skills, which are the life skills I use every day to communicate and interact with other people, individually and in groups are good for me. Not only how I communicate with others, but also I got confidence and my ability to listen and understand. Problem solving, decision making and personal stress management are also considered interpersonal skills. Through this internship, I found that I matured and I gained manynew perspectives, such as problem solving skill, diversity, effective communication, teamwork and service recovery, attention to detail, time management, personal empowerment, self-confidence, responsibility and cultural sensitivity. My supervisor was so kind to answer with patience and teach me much that made this internship so enjoyable. I had gotten a wonderful internship that spent such a happy moment with all of them. Though, still have so much to learn, I think this challenge was what should be included in my career. This helped much on my future planning.

4.3 Team Playing Skills

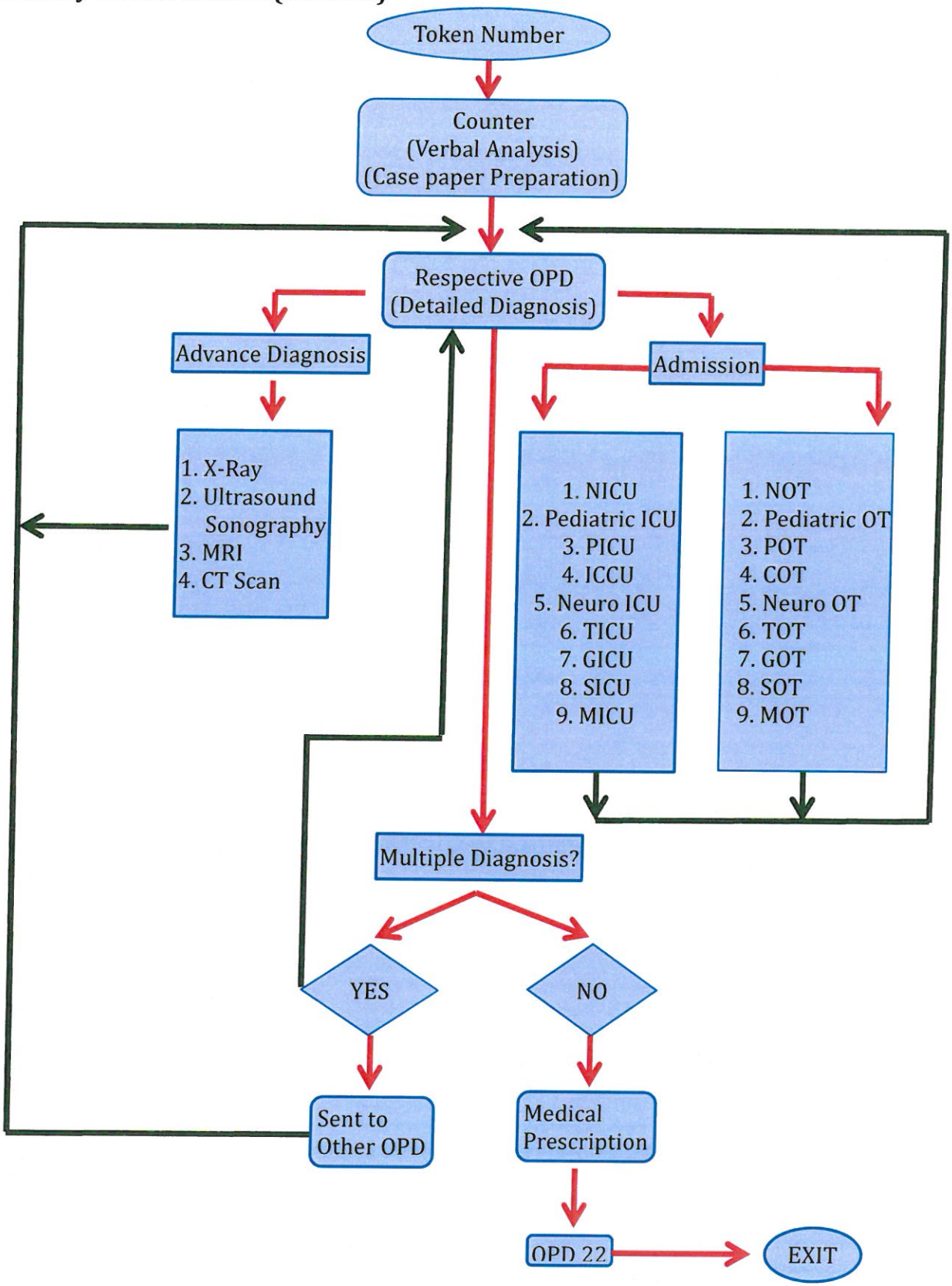
In the section of the hospital I had been working, most of the time I had work with my collegues, while I gained in terms of improving my team playing skill during my internship period.

4.4 Leadership Skills

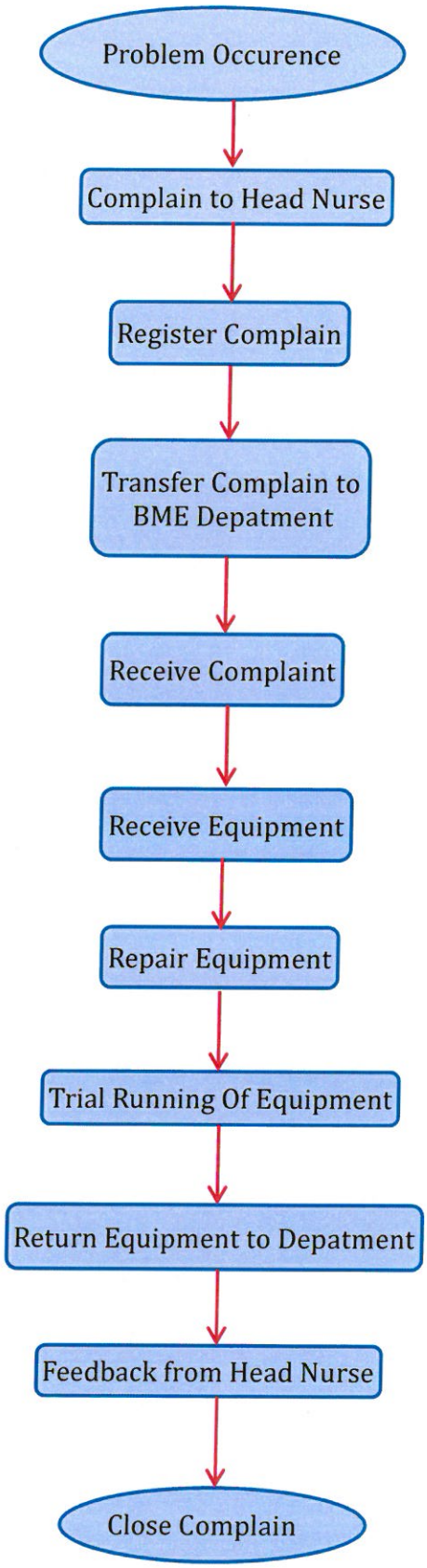
Leadership skills are the tool, behaviors, and capabilities that a person needs in order to besuccessful at motivating and directing others. Yet true leadership skills involve something more; the ability to help people grow in their own abilities. It can be said that the most successful leaders are those that drive other to active their own success. I gained leadership skills from my supervisor during the internship period which included managing time, motivating individuals,giving feedback and building teams.

5. Work Flow:

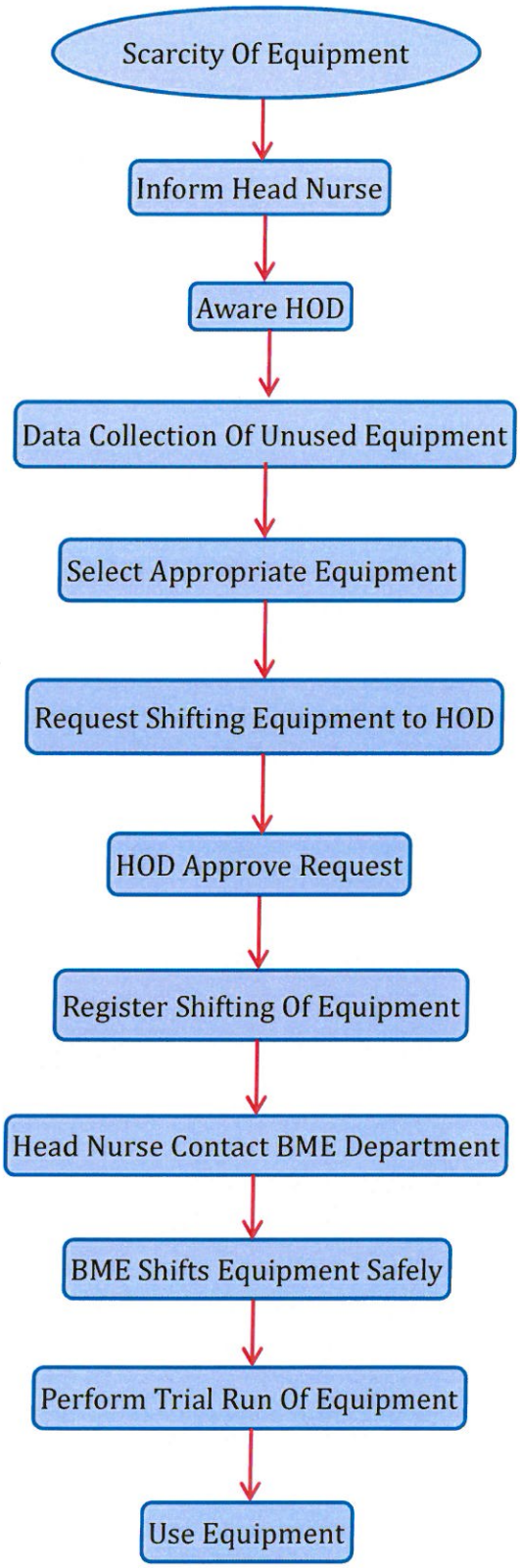
5.1 Entry of New Patient (General)



5.2 Repair of Faulty Equipment



5.3 Flow Diagram of Equipment Shifting



6. Conclusion

After going through the whole period of internship as an intern I've observed so many professional activities and learnt as well. This internship was very fruitful to me because I had to cover many different departments. I also learnt new concepts and new ways of working.

During this internship period I acquired practical experience to complement the theoretical content of my study. To conclude, I think that this internship was very beneficial to me as I learnt a lot, and it made me discover what actually works in real world.