



Biomedical Instrumentation And Rural Healthcare

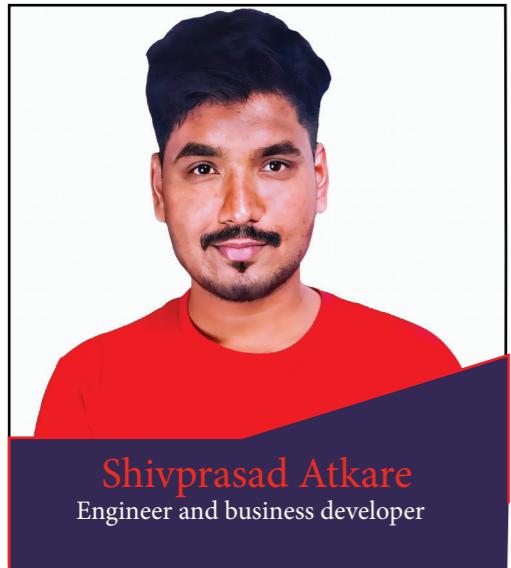
Shivprasad Shahaji Atkare
20210901065

Internship From
18 December 2024 To
13 May 2025

At,
Yashodhara Super Speciality Hospital
Solapur.

PERSONAL INFORMATION

INTERNSHIP OVERVIEW



Who Am I ?

I, Shivprasad Atkare, am a final-year B.Tech Biomedical Engineering student at DY Patil International University, Pune, and a passionate biomedical engineer, analyst, and aspiring business developer. During my internship at Yashodhara Hospital under the guidance of Mr. Mohan Jadhav, I gained hands-on experience in biomedical instrumentation, NABH audits, and management practices. My college mentor, Dr. Parth Sarthi Sen Gupta, supported me throughout this journey. I explored the electronics of biomedical devices and how hospitals operate. This experience highlighted the challenges of expensive healthcare technology and poor accessibility in rural India, motivating me to pursue affordable, high-quality biomedical solutions.

YSSH

Yashodhara Super Speciality Hospital, located in Solapur, Maharashtra, is dedicated to delivering the highest quality and affordable treatments to its patients. The hospital ensures a pleasant and stress-free atmosphere, with a strong focus on hygiene and sanitation. Patients are cared for by highly experienced surgeons and specialists who provide personalized and attentive treatment. With rich knowledge and extensive experience, Yashodhara Super Speciality Hospital offers exceptional healthcare services while maintaining an unwavering commitment to medical ethics.



INTERNSHIP CERTIFICATE



REF: YSSH/ADM/HR/TC/663

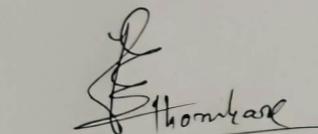
Date: 31st May, 2025TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Shivprasad Shahaji Atkare** has successfully completed Five-month internship training in the **Biomedical Department** from **18/12/2024 to 18/05/2025** at **Yashodhara Super Speciality Hospital, Solapur**.

During the training period his code and conduct were good.

We wish him all the best for his better future.

For Yashodhara Super Speciality Hospital, Solapur.



Sanjay Thombare
HR Head – Unit I & II

Unit 2 - Yashodhara Super Speciality Hospital
S.No.- 102, Plot No. H-1, Near Market Yard, Solapur - Hyderabad Road, Old Vidi Gharkul, Solapur - 413 005, Maharashtra
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My internship experience focused on hands-on work with hospital equipment, auditing for standards, and understanding the challenges of healthcare accessibility in rural India, inspiring me to develop affordable biomedical solutions for equitable healthcare.

During my internship at Yashodhara Super Speciality Hospital, I focused on understanding the technical and operational aspects of hospital equipment, along with gaining insights into the broader challenges of the healthcare sector. My primary responsibilities involved the maintenance and repair of various biomedical devices, ensuring their proper functioning and reliability. I was actively involved in preparing breakdown reports, which helped identify recurring issues and guided preventive measures. Additionally, I participated in NABH audits, gaining practical knowledge about healthcare standards and protocols that are crucial for quality patient care.

Beyond technical work, I studied the significant impact of expensive healthcare technology on poor and rural populations in India. This experience revealed the urgent need for affordable solutions that can bridge the accessibility gap and improve healthcare delivery in underserved regions.

Reflecting on these insights, I aim to contribute to the development of cost-effective biomedical technologies and innovative business models. My goal is to create sustainable and accessible healthcare solutions that ensure equitable healthcare for all, regardless of economic status or geography.



Objectives



To gain hands-on experience in maintaining and repairing biomedical equipment.

To understand the operational challenges faced by hospitals in ensuring equipment functionality.

To learn about NABH audit procedures and their importance in healthcare quality.

To analyze the impact of expensive healthcare equipment on rural and economically weaker populations.

To explore innovative and cost-effective solutions that improve healthcare accessibility.

Work Experience

AREA OF WORK



Biomedical science



NABH Audit



Rural Healthcare

Biomedical science



Biomedical engineering is a field that combines biology, medicine, and engineering to create tools and devices that improve healthcare. This includes designing things like medical equipment, artificial organs, and prosthetics, as well as developing new diagnostic and treatment methods.

Biology



Medicine



Electronics

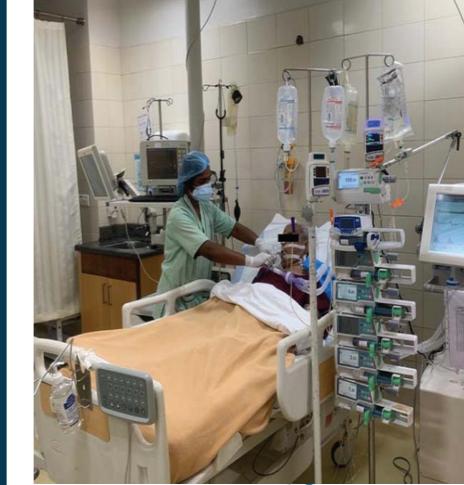


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Biomedical machines rely on various electronic components for functionality. These include microcontrollers, LEDs, transistors, ICs, Op Amps, capacitors, inductors, resistors, batteries, connectors, and power converters.



In a hospital, biomedical engineers ensure medical equipment functions safely and effectively. They handle the full lifecycle of equipment, from purchasing and installation to maintenance, repair, and training staff. Their work is crucial for accurate diagnoses, effective treatments, and overall patient care.



ICU

Intensive Care Unit – a special department in a hospital that provides intensive treatment and monitoring for patients with severe or life-threatening illnesses or injuries.



Operating Theatre

a room in a hospital where surgical operations are performed (also called Operating Room (OR) in American English).



Intensive Care Unit

ICU

Role of Biomedical Engineer in ICU



Maintenance & Calibration

Regularly inspect, maintain, and calibrate ICU equipment like ventilators, infusion pumps, monitors, etc., to ensure accurate performance.



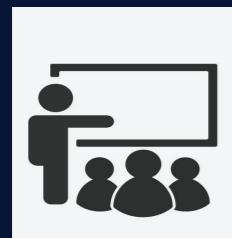
Troubleshooting & Repairs

Quickly fix any technical issues that arise with ICU equipment to minimize patient risk.



Equipment Selection & Installation

Advise on the best equipment for ICU needs and oversee its installation and integration.



Training

Train healthcare staff on how to use equipment safely and effectively.



Compliance & Safety

Ensure that equipment meets all safety standards and regulatory guidelines.



Innovation & Optimization

Collaborate with clinicians to improve existing equipment or develop new devices to better meet ICU needs.

Common Equipment in ICU



Multipara Monitor

Track vital signs: heart rate, blood pressure, oxygen saturation, temperature, and ECG.



Ventilator

Provide respiratory support for patients who can't breathe on their own.



Syringe Pumps

Deliver precise doses of medication or fluids.



Defibrillators

Restore normal heart rhythm in emergencies.



Suction Machines

Remove secretions from the airway to keep it clear.



Blood Gas Analyzer

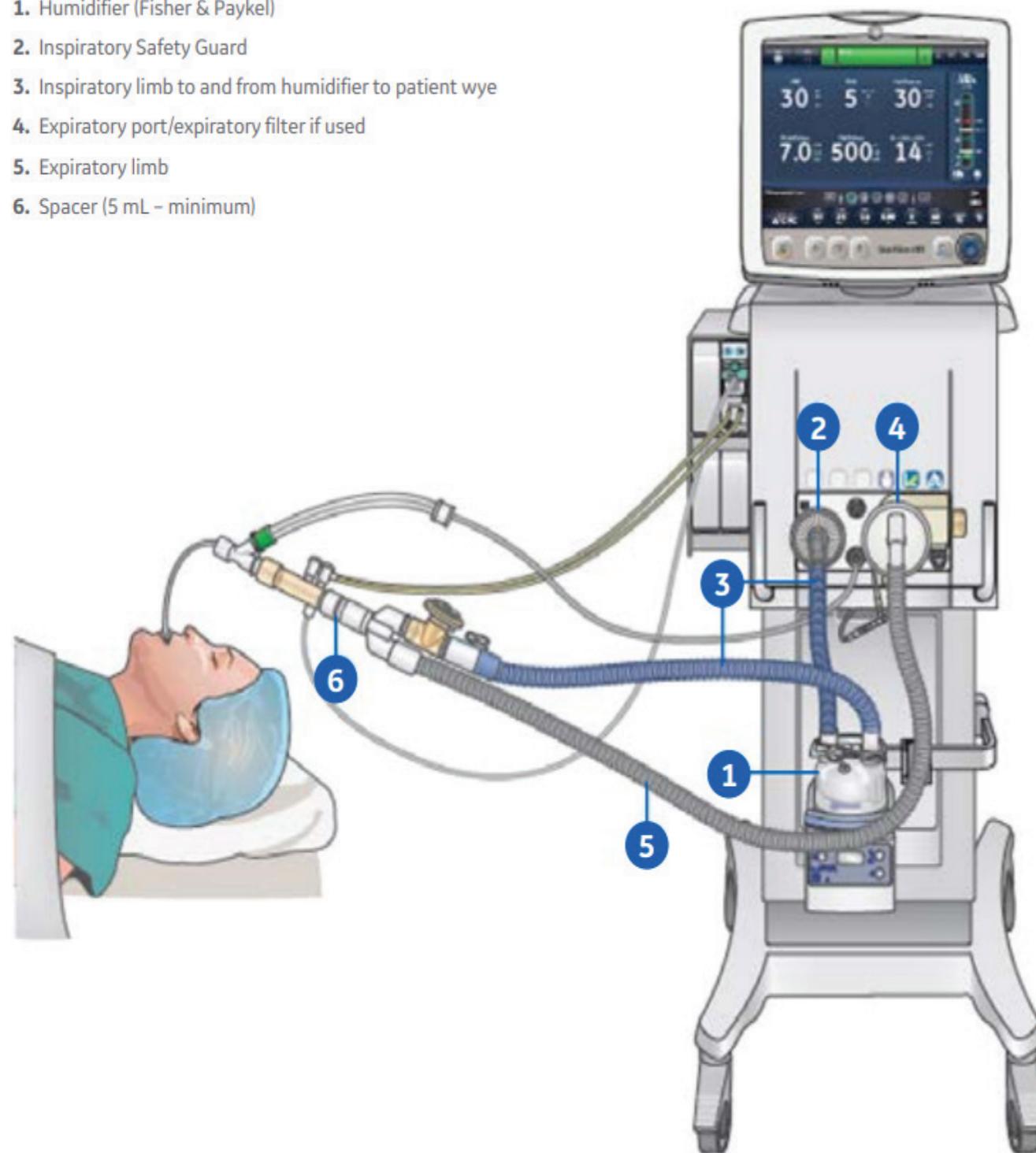
Quickly analyze blood samples for pH, oxygen, carbon dioxide, and electrolytes.

Ventilator

A ventilator is a medical device that supports or takes over breathing by moving air in and out of the lungs for patients who are unable to breathe adequately on their own.

Patient Circuit Connection with Humidifier Components

1. Humidifier (Fisher & Paykel)
2. Inspiratory Safety Guard
3. Inspiratory limb to and from humidifier to patient wye
4. Expiratory port/expiratory filter if used
5. Expiratory limb
6. Spacer (5 mL - minimum)



1. Control Panel :

The interface where healthcare providers set and monitor ventilation settings (like tidal volume, respiratory rate, and oxygen concentration).

2. Gas Delivery System :

Mixes and delivers medical gases (air and oxygen) to the patient.

3. Inspiratory and Expiratory Valves :

Control the flow of air into and out of the patient's lungs.

4. Humidifier :

Adds moisture to the gas to prevent drying out the airway and lungs.

5. Breathing Circuit / Tubing :

Connects the ventilator to the patient, delivering air and removing exhaled gases.

6. Filters :

Remove bacteria and other contaminants to ensure clean airflow.

7. Pressure Sensors and Flow Sensors :

Monitor the amount of pressure and air delivered to the lungs.

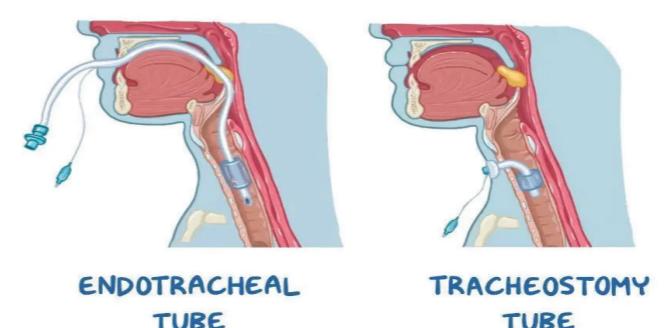
8. Alarms and Indicators :

Provide visual and audio alerts for unsafe conditions (like high pressure, disconnection, or apnea).

MECHANICAL VENTILATION

* MOVE AIR IN and OUT of LUNGS of CLIENTS WHO CAN'T BREATHE on THEIR OWN

INVASIVE



NONINVASIVE



* CPAP: SAME AMOUNT OF PRESSURE

* BIPAP: DIFFERENT PRESSURES

Operation theatre OT

Role of Biomedical Engineer in OT



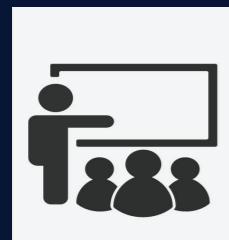
Maintenance & Calibration
Regularly inspect, maintain, and calibrate OT equipment like Anesthesia Machine, Surgical Lights, monitors, Endoscopes & Laparoscopes etc., to ensure accurate performance.



Troubleshooting & Repairs
Quickly fix any technical issues that arise with OT equipment to minimize patient risk.



Equipment Selection & Installation
Advise on the best equipment for OT needs and oversee its installation and integration.



Training
Train healthcare staff on how to use equipment safely and effectively.



Compliance & Safety
Ensure that equipment meets all safety standards and regulatory guidelines.



Innovation & Optimization
Collaborate with clinicians to improve existing equipment or develop new devices to better meet OT and sterilization needs.



Multipara Monitor

Track vital signs: heart rate, blood pressure, oxygen saturation, temperature, and ECG.



Anesthesia machine

Delivers gases and anesthesia drugs safely.



Electrosurgical Unit (ESU)

a surgical instrument that uses high-frequency electrical currents to cut, coagulate, and destroy tissue



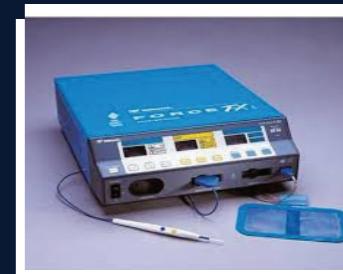
Defibrillators

Restore normal heart rhythm in emergencies.



Endoscopes & Laparoscope

Enable minimally invasive surgery.



Cautery Machines

Electrocauteration (or electrocautery) is often used during surgery to remove unwanted or harmful tissue. I

Endoscopy And Laparoscopy



Endoscopy

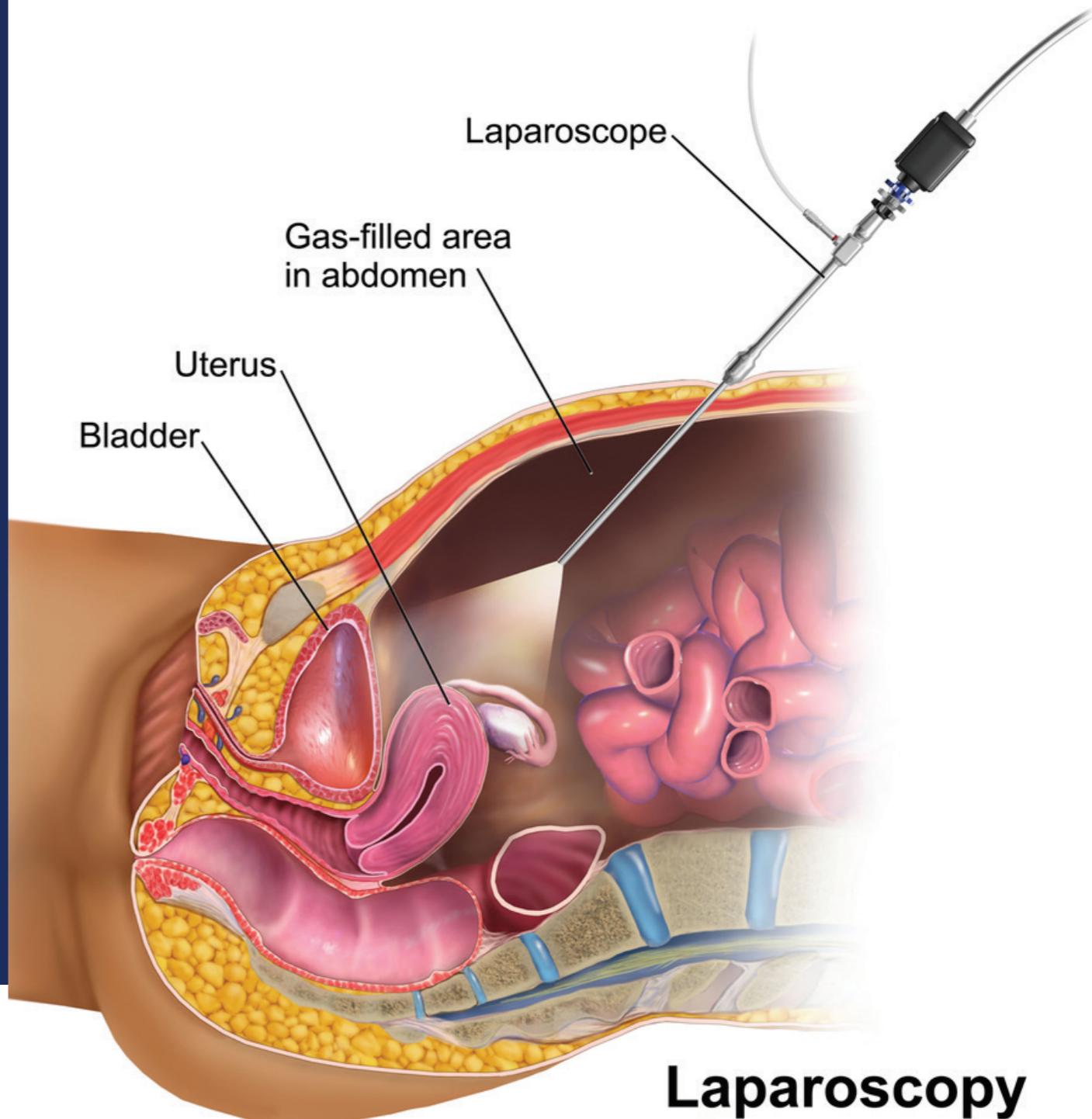
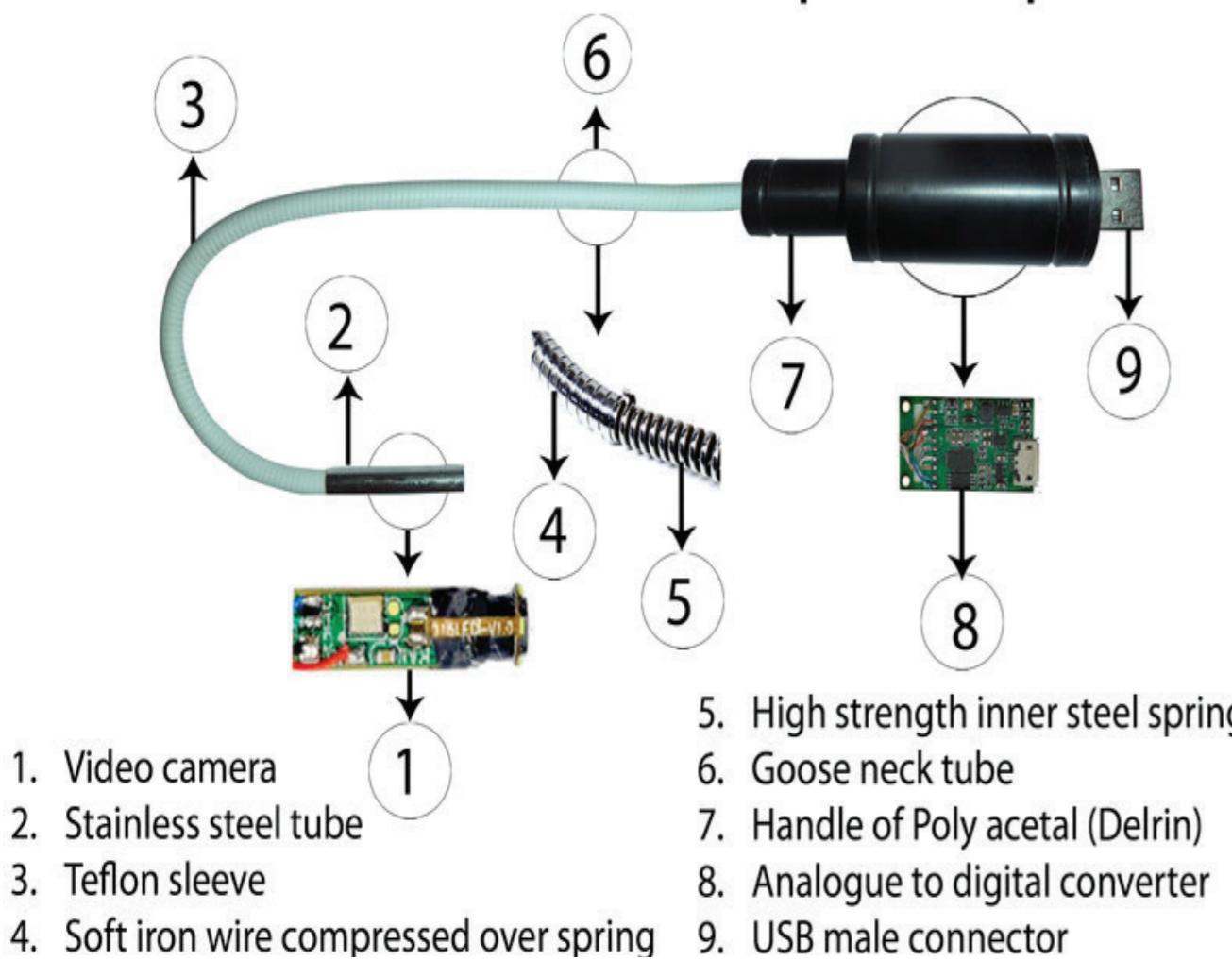
Endoscopy is a procedure where a flexible tube with a camera (endoscope) is inserted into the body to examine the interior of organs or cavities.



Laparoscopy:

Laparoscopy is a minimally invasive surgical procedure where a laparoscope (a thin, lighted tube with a camera) is inserted through small incisions in the abdomen to perform surgery or examine organs.

Flexible Video Laparoscope



This series of images illustrates laparoscopy, a minimally invasive surgical procedure used to visualize and operate on abdominal organs. The surgeon makes small incisions in the abdominal wall and inserts a laparoscope (a thin, lighted tube with a camera) to see inside the body. The gas-filled area in the abdomen (created by pumping in carbon dioxide) helps create space for better visibility and easier manipulation of organs. The images show key structures like the uterus and bladder, as well as the intestines and surrounding tissues. This technique reduces recovery time, causes less pain, and has a lower risk of infection compared to open surgery.

About NABH

National Accreditation Board for Hospitals and Healthcare Providers (NABH) is a constituent board of Quality Council of India (QCI), set up to establish and operate accreditation program for healthcare organizations. **NABH has been established with the objective of enhancing health system & promoting continuous quality improvement and patient safety.**

The board while being supported by all stakeholders, including industry, consumers, government, has fully functional autonomy in its operation.

Equipment Maintenance Records

Biomedical engineers ensure that all hospital equipment is well-maintained, with detailed preventive maintenance (PM) and corrective maintenance (CM) records.

For NABH audits, they provide these records as proof that equipment is reliable, reducing risks of malfunction or patient harm.

Example: Maintenance logbooks for patient monitors, anesthesia machines.

Asset Management

Biomedical engineers maintain a detailed inventory of all medical equipment, including tagging, labeling, and asset tracking (asset number, department, date of purchase, etc.).

They ensure this data is easily retrievable and regularly updated for audits.

Example: Asset register in Excel or specialized software.

Calibration & Certification

They verify that equipment is regularly calibrated (adjusted for accuracy) and certified by authorized agencies (like NABL-accredited labs).

This ensures that diagnostic and therapeutic devices are providing accurate and safe performance, as required by NABH standards.

Example: Annual calibration of infusion pumps and ventilators.

Policy Implementation

They help draft and enforce biomedical equipment management policies in line with NABH's quality standards.

Policies cover equipment procurement, lifecycle management, disposal, and emergency management.

Benefits of NABH for Patients

Patient Centred



Patient Satisfaction



Patient Safety



High-Quality Care

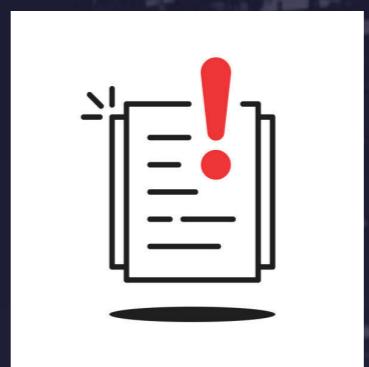


Protected Rights

only for study

Skills & Knowledge

Maintain and troubleshoot medical devices



How to keep various records and reports .



Team management and Leadership coach



Time Management



Application Specialist



Calibration

Challenges

In Indian Healthcare



Lack of Awareness and Training

Medical staff in some facilities may not be fully trained in the safe and effective use of biomedical equipment.

Biomedical engineers and application specialists can help by conducting training—but limited staffing and resources make this difficult.

Regulatory and Compliance Issues

Many healthcare facilities struggle to meet national (NABH, ISO) or international standards for equipment safety and quality.

Biomedical engineers often find it challenging to implement strict protocols in hospitals that lack funding or leadership support.

Cost Constraints

Hospitals often prioritize cost-cutting over purchasing advanced medical technology, leading to use of outdated or second-hand equipment.

Biomedical engineers face the challenge of maintaining these old devices and ensuring they still meet safety standards.

Public-Private Divide

Public hospitals face budget constraints, while private hospitals can afford better equipment—but this creates unequal access.

Conclusion

During my time at Yashodhara Hospital, Solapur, I gained valuable practical experience in maintaining, calibrating, and troubleshooting essential biomedical equipment.

Working closely with doctors, nurses, and fellow biomedical engineers, I learned the importance of safety, compliance, and patient care in a real-world hospital environment.

I also had the opportunity to understand the challenges of a busy healthcare setup, from managing device breakdowns to ensuring seamless operation of the OT and ICU equipment. This experience has given me the confidence and skills to support medical teams and ensure that patients receive the best possible care.

Let's build a healthier India together! By working hand in hand—healthcare professionals, biomedical engineers, policymakers, and everyday citizens—we can bridge gaps in care, bring advanced medical technology to every corner of the country, and ensure that no one is left behind. With dedication and teamwork, we can transform India's healthcare system into a model of excellence, safety, and compassion. The journey begins with small steps, but the impact will last for generations.