HEALTH TECH ACADEMY

Robotic-Assisted Surgery

Surgical Skills

Lesson Objectives:

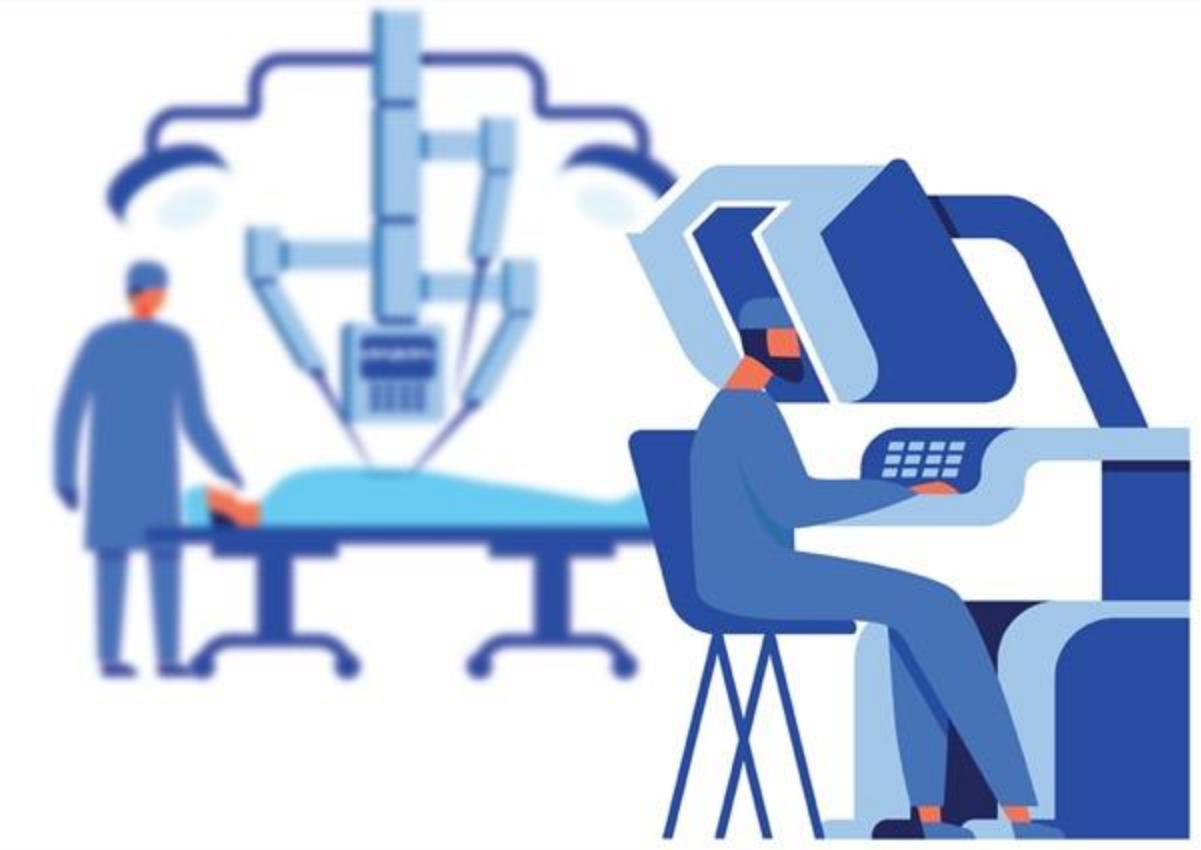
1. Describe the components of a robotic-assisted surgical system
2. Compare the features of robotic-assisted surgery with standard MIS
3. Describe the movements of wristed instruments
4. Differentiate between open and closed surgeon consoles
5. Describe the patient cart and its functions
6. Describe the features of robotic-assisted optics and vision system
7. Differentiate between the Veress needle technique and Hasson techniques for pneumoperitoneum
8. Discuss the importance of robotic system room layout
9. Discuss the role of the surgical technologist during robotic-assisted surgery
10. Discuss the importance of teamwork and communication during robotic-assisted surgery

What is Robotic-Assisted Surgery (RAS)?

- A subtype of computer-assisted surgical (CAS) systems
- RAS uses computer technology and software to control and manipulate surgical instruments.
- Newer systems combine robotic capabilities with other computer interfaces to plan and perform surgical procedures

Terminology

- **Articulation**
  - Joints
- **Degrees of freedom**
  - manipulator movement
- **Manipulators**
  - Robot arms
- **Resolution**
  - Distant distinguish b/t two points
- **Sensitivity**
  - Robot see in dim light

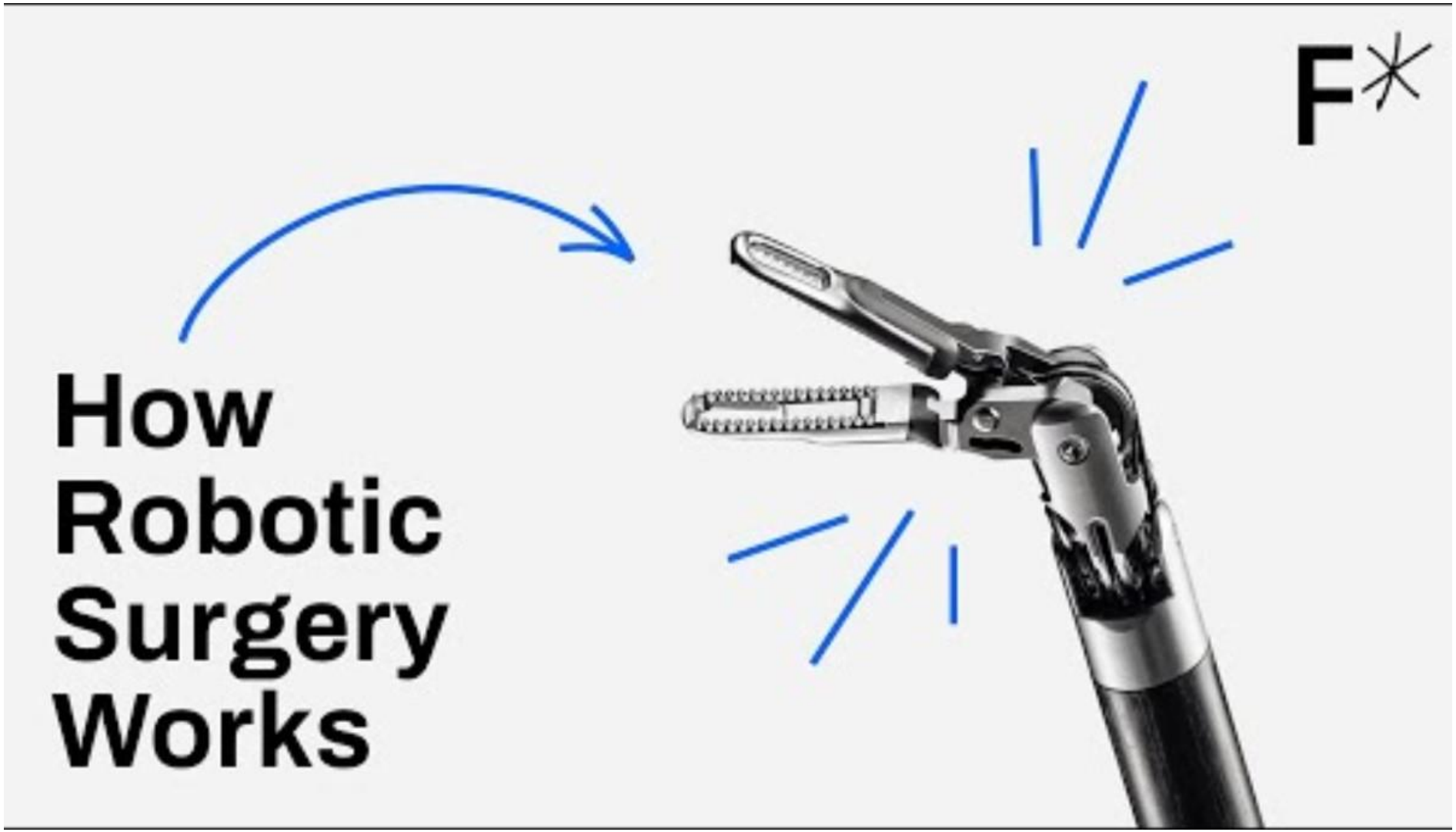


Features of Robotic Systems

- **Scaled movement**
  - Can scale surgeon's hand movements to varying ratios from 1:2 to 1:5
  - Enabling greater precision without demanding greater motor skills
- **Image registration**
  - Produces a blended image in three dimensions
  - Uses 3-D Coordinate system to guide surgeon about locations
- **Autonomy**
  - Can perform repetitive tasks
  - Actions are under direct control of surgeon
- **Similarities to minimally invasive surgery**

Watch the "Building Surgical Robots" Video for an Overview

Building Surgical Robots Video



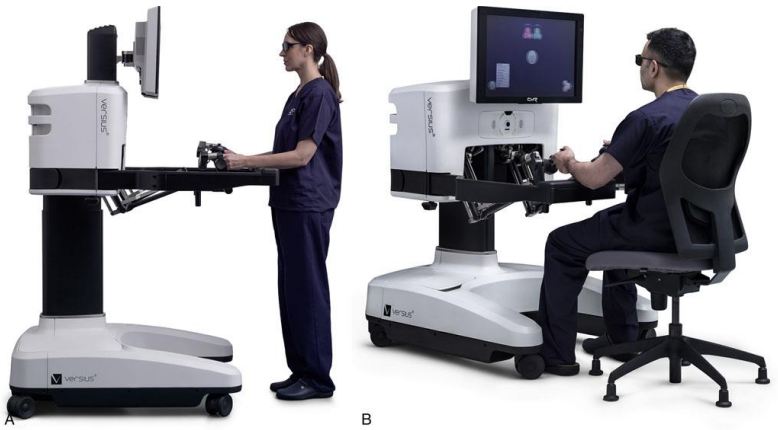
Building Surgical Robots Video

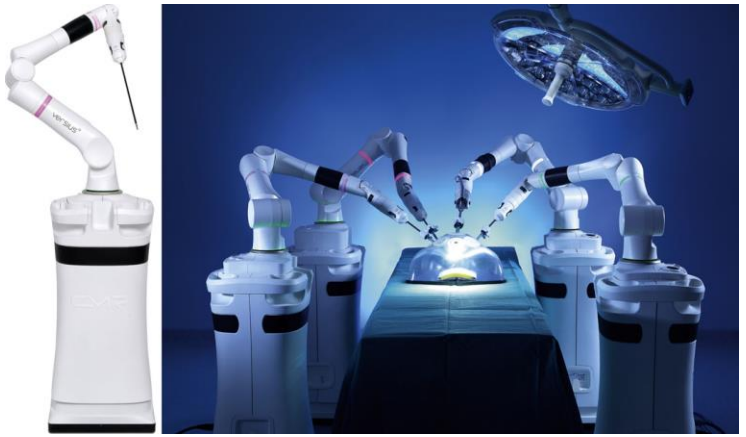
Summary of Video:

- 3D Vision for Surgeon – Can observe depth, not like 2D in MIS
- Hand Controls match finger movements to instruments
- Latency (Delay) must be in milliseconds

Robotic Technology

- **Components**
  - Surgeon console
  - Bedside unit and instrument arms (patient cart)
  - Equipment or vision tower
  - Optics (Scope/Camera)





Surgeon Console

- Design
- Display
- Hand controls
  - Instrument control
- Foot controls
  - Cautery, arm swapping, and more

DaVinci Surgeon Console by Intuitive

Bedside Unit

- Also called the *patient cart*
- Instrument arms attach to the bedside unit
- Features vary with each system

DaVinci Xi Patient Cart by Intuitive

Optics and Vision System

- Capable of 3-dimensional imaging
- Equipment or vision tower
- Energy modalities
  - Control for ESU and Ultrasonic dissectors
- System electronics
- Video controller
  - Scope/Camera input
- Touch screen

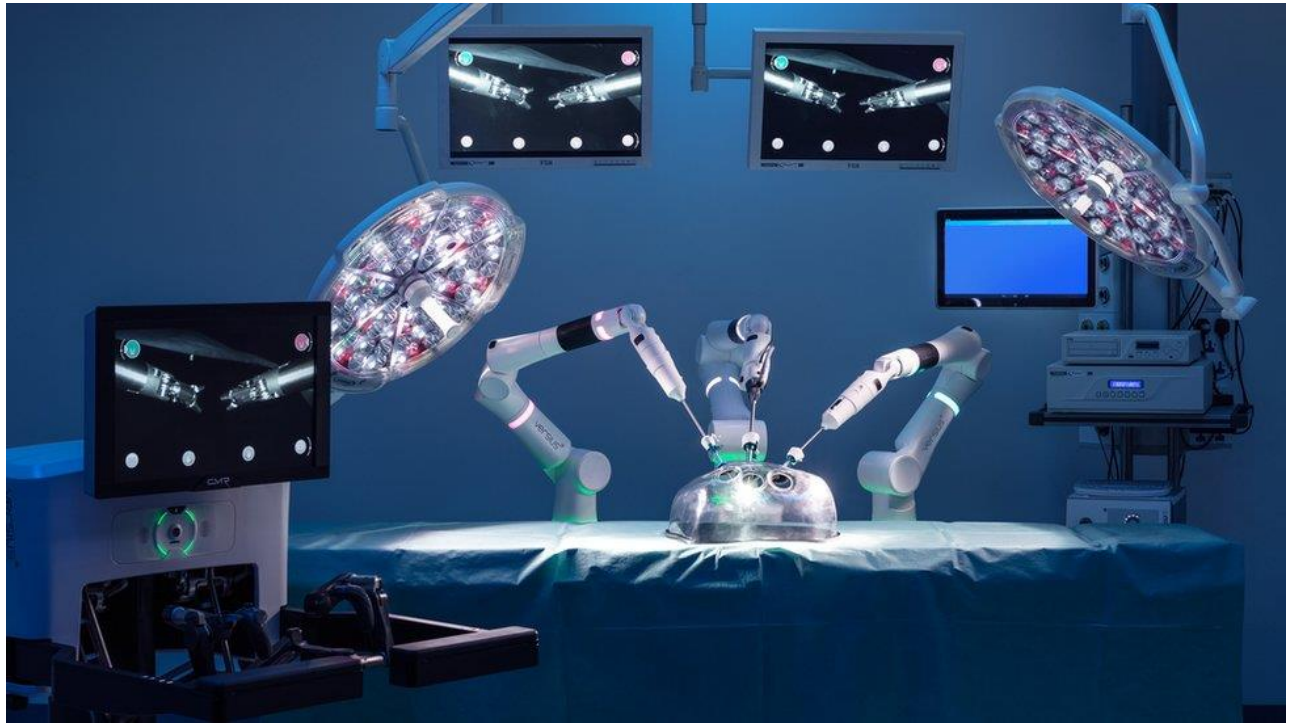
DaVinci Vision Cart by Intuitive

Classification of Robots

- Instrument design
- Types of instruments
- Reprocessing robotic instruments
- Haptic feedback
- Rigid endoscope
- Near-infrared imaging

- Reprocessing Instruments:
  - Life span – many instruments will have a set number of usages, as the internal structures will wear and tear
  - Online resource - know your system. Some can automatically send their data

Examples of Robotic and Computer Assisted Systems



- Versius (CMR Surgery)
- Da Vinci Systems (Intuitive, Inc.)
- Senhance (TransEnterix, Inc.)
- Joint Arthroplasty Systems
- Flex Robotic Drive and Monarch Platform (Medrobotics, Inc.)

Advantages and Disadvantages

Advantages

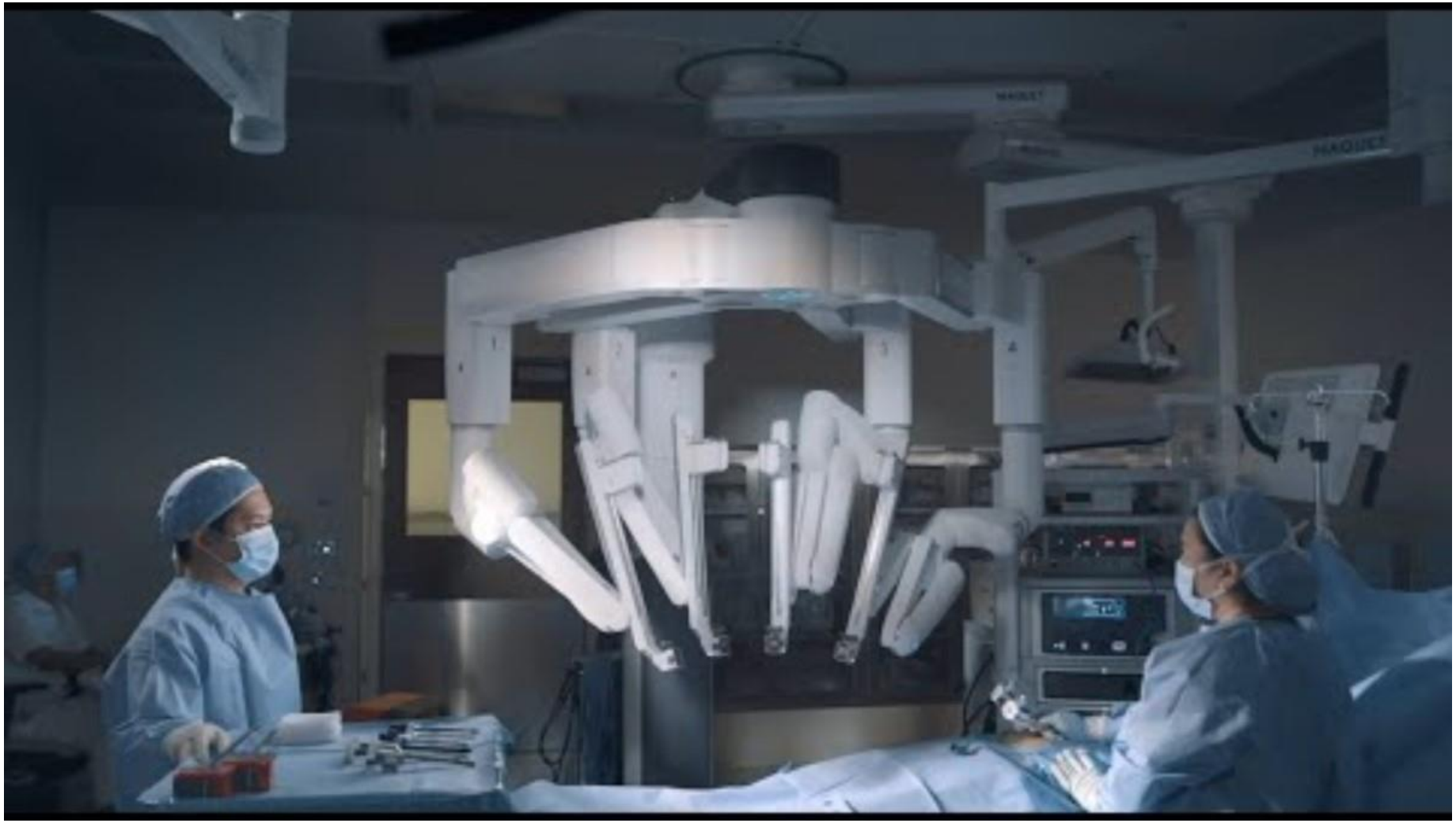
- Images are 3-dimensional
- Reduce tremor and movement scale
- Closely replicate human movement

Disadvantages

- Expensive and uses valuable resources
- Requires on-site coordinator
- Surgeons must receive training

Watch the "Robotic Surgery Advantages" Video for a Summary

Robotic Surgery Advantages Video



Robotic Surgery Advantages Video

- Summary of Video:
  - Can do movements and techniques not possible in open and MIS
  - Less traumatic to patient – surgical tremor, port trauma
  - Quicker recovery
  - Little pain, less blood loss
  - Complex surgery becomes easier
  - 3D imaging for Surgical team

Watch the Robotic Surgery Docking and Instrument Video

Robotic Surgery Docking and Instruments Video

Robotic Surgery Docking and Instruments Video

- Summary of Video:
  - Docking into Ports
  - Follow laser for target anatomy
  - Port and Instrument Clutches
  - Instrument Removal
  - Guided Instrument Insertion

Setup for Robotic Surgery

- **Room setup**
  - Optimizes safety and communication
  - Test the system – ensure fully operational
- **Equipment positioned as per guideline**
- **Sequence for robotic surgery**
  - Adjustment of components
  - Nonsterile connections are made
  - Sterile setup is completed
  - Procedure begins

Individual Roles in Robotic Surgery

- **Surgeon**
  - Will be in surgeon console for a portion of the procedure
- **Assistant surgeon**
  - May sit in a secondary surgeon console or assist at the field
- **Advance practice providers**
  - Will do table-side assistance
- **Circulating nurse**
  - Must have additional knowledge for setup, troubleshooting, robot movement/docking, video routing, and more
- **Robotics coordinator**
  - Resource for OR staff and Surgeons on system management/training

Emergencies During Robotic Surgery

- **Technical Problems**
  - Complex robotic systems may encounter malfunctions, risking loss of vision or instrument failure.
  - Technical issues may necessitate immediate attention or conversion to open surgery.
- **Surgical Problems**
  - Hemorrhage poses significant challenges due to limited visualization and tamponade capabilities.
  - Difficulty in locating bleeding sources increases the complexity of managing hemorrhage.
- **Problems Related to Anesthesia**
  - Pneumoperitoneum can lead to decreased lung capacity and upper body edema.
  - Large robotic systems may obstruct access to the patient's airway and emergency equipment.

Role of Surgical Technologists in RAS

Preoperative Preparation

- Collaborate with the circulating nurse to plan for the case.
- Ensure equipment readiness based on surgeon's preference card.
- Verify robotic equipment functionality and room layout.
- Set up sterile equipment and positioning of robotic instruments and ports.

Intraoperative Responsibilities

- Assist in placing endoscopes and instrument ports.
- Collaborate with the assistant surgeon in standard tasks.
- Perform specific RAS tasks like instrument swapping and troubleshooting.
- Maintain sterile field and prioritize patient safety.

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HEALTH TECH ACADEMY

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Lesson 21 is complete.