Learning Objectives

Upon completion of this course, you will be able to:

• Name the major parts and functions of endoscopes
• Review key steps in point of use preparation, transport, reprocessing and storage to prevent endoscope damage

Current Trends in Endoscopy

• U.S. endoscope market valued at $2 billion
• Technology advances in diagnostics
• Advanced visualization for complex procedures
• Improved diagnostic and therapeutic capabilities

High Dollar Investment

<table>
<thead>
<tr>
<th>Endoscope</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Duodenoscope</td>
<td>$40,000</td>
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<tr>
<td>Gastroscope</td>
<td>$25,000</td>
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<tr>
<td>Colonoscope</td>
<td>$35,000</td>
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<tr>
<td>EUS Endoscopes</td>
<td>$30,000 - $50,000</td>
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Types of Flexible Endoscopes

- Fiberscope
- Videoscope
Flexible Endoscope Characteristics

- Delicate, complex, expensive
- Multiple internal channels of different sizes
- Lens system for image
- Light guide tube for illumination
- Insufflation component
- Suction & irrigation systems
- Accessory channels for e.g., biopsy forceps, biopsy needles etc.
- Monitors connected through cable system to carry signals

Flexible Endoscope Basic Anatomy

- Distal tip
- Biopsy port
- Suction and Air/Water channel ports
- Directional lever

Flexible Endoscope Anatomy

- Mechanical system
  - Control body, insertion and light guide tubes, bending section
- Video Image System
  - Fiberoptic cable, video electronics, connector, water resistant caps
- Channels
  - Suction/biopsy, air/water, irrigation, water-jet, elevator wire
- Accessories
  - Valves, suction, air/water, biopsy port
  - Biopsy forceps, snares, guide wires, irrigators, dilators

Mechanical System – Control Body

- Coiled wires connect to directional knobs
- Work together to angulate and move bending section
- Angulation wires coated with lubricant
- Fluid invasion causes lubricant to harden resulting in stiffness and grinding sound

Mechanical System - Control Knobs & Switches

- Inspect for cracks, leaks
- Move to maximum angles
- Moves smoothly
- Depress switches during leak test
- Lubricate periodically per Manufacturer’s Instructions for Use (IFUs)

Video Image System

- Chip located in distal tip
- Image bundle with video camera unit
- Video lens system reduces and focuses image onto electronic chip
- Signals transmitted to electrical connector/processor
- Image viewed on video screen
Mechanical System – Insertion Tube

- Portion inserted into patient
- Markings act as reference points
- Bending section covers end of insertion tube
- Working component

Mechanical System - Bending Section

- Flexible component for positioning
- Contains channels, lens, CCD chip

Distal Tip

- Connects control body to light guide connector
- Houses wiring, tubing, fiber bundle, channels
- Provides power & light

Mechanical System – Light Guide Tube

Light Guide Connector

Video Connector

- Touch Pins
- Screws
- Leak Tester Port

Fluid Resistant Caps

- O-Ring
- Contact Pins
- Screws
**Fluid Resistant Soaking Caps**

- Remove from endoscope
- Manually clean
- Reprocess according to manufacturer’s instructions
- Store unattached with endoscope
- Reusable vs. Disposable

**Channels/Ports**

- Biopsy Port
- Air/Water Port
- Suction Port

**Valves/Buttons**

- Follow manufacturer’s instructions
- Manually clean
- HLD/Sterilize per Manufacturer’s written instructions for use IFUs
- Reusable vs. Disposable

**Accessories**

- Follow manufacturer’s instructions
- Manually clean
- HLD/Sterilize per Manufacturer’s written instructions for use IFUs
- Reusable vs. Disposable

**Illumination - Fiberscope**

- Fiber bundle carries light
- Image viewed directly through eyepiece
- Broken fibers diminish light
- New fiber bundle = total repair

**Reprocessing**

- Pre-Cleaning/Containment/Transport
- Leak Testing
- Manual Cleaning
- Disinfection/Sterilization
- Drying
- Storage
Pre-Cleaning at the Point of Use

- Don appropriate PPE
- Wipe surfaces with lint-free cloth/sponge with cleaning solution
- Suction through suction/biopsy channel
- Flush air/water channels (use cleaning adapter if applicable)
- Flush auxiliary water or elevator channels (if applicable)
- Ensure channels are not blocked
- Place distal end in solution & suction until clear
- Detach from light source/suction pump
- Attach fluid resistant cap (if applicable)

Containment

- Closed/covered container
- Mark with biohazard label
- Appropriate Size DO NOT over coil
- Separate from Accessories e.g., forceps/wires/needles etc.

Transport

- As soon as possible
- Delays may result in
  - Biofilm formation
  - Manufacturer recommended longer soak/cleaning time
  - Device damage

Proper Handling

- Insertion tube coiled loosely
- Support control body, light guide
- Components separated
- No accessories

Leak Testing

- Check leak tester for functionality
- Performed prior to cleaning
- Pressurize prior to immersion in water
- Follow device manufacturer’s instructions

Air Pressurization

- Air Around Internal Components
Leak Testing

- Clear, fresh water
- No suds
- Allow time
- Turn knobs
- Procedure for failed leak test
- Decompress prior to disconnecting

Indications of a Leak

- Control Body
- Biopsy Channel

Cleaning Methods

- Follow manufacturer IFUs
  - Manual
  - Mechanical
  - Combination of both
  - Physical removal of debris
  - Wiping, brushing, flushing
  - Should not damage endoscope
  - Safe for the worker performing the task

Manual Cleaning

- Follow Manufacturer’s written instructions for use IFUs
- Know endoscope anatomy including channels
- **DO NOT SKIP STEPS**
- AER cleaning phase DOES NOT replace manual cleaning
- Allow enough time to process per Manufacturer’s IFUs

Sinks

- Minimum 2 sinks
  - **First sink**: Leak Test & Manual Clean
  - **Second sink**: Rinsing
  - Sink Measurements
    - Size 18” x 30”
    - From Floor 36”
    - Depth 8 – 10”

Cleaning Chemistry

- Fresh solution every time
- **READ THE LABEL!**
- Follow manufacturer IFUs
- Neutral pH
- Compatible with endoscopes
- Dilute correctly
- Verify, measure & document water temperature (if applicable)
- Mark water line on sink
- Recommended soak time
Brushes

- Know the Anatomy
  - Ensure all channels are brushed
- Reusable vs. Disposable
- Clean after each use
- Replace when worn
- Correct type of brush
- Correct size

Channel Irrigators

- Use appropriate, manufacturer recommended cleaning accessories

Elevator Guide Wire Auxiliary Water Channels

Rinsing

- Water Quality
  - Utility - tap
  - Critical - treated
- Clean, fresh, warm water every time
- Thorough rinsing
  - Immersed in water
  - Flush all instrument channels
- Rinse to irrigate the challenging design features
- Remove soil and cleaning chemistry

Mechanical Flushing

- Flushes internal channels during cleaning & rinsing
- Consistent process
- Follow manufacturer’s written instructions for use
- IFUs for cleaning/disinfection of tubing & unit

Mechanical Cleaning

- Automated Endoscope Reprocessor AER
  - Wash phase during cycle
  - Augments manual cleaning for consistent outcome
  - Manufacturer recommended Pre-cleaning steps MUST be followed
- Follow AER manufacturer instructions for use IFUs
- IFUs may be in conflict
Scope Damage

- Normal Wear & Tear: 70%
- Within Our Control: 30%

Process Flow/Risk Assessment

Areas Most Vulnerable

- Distal tip - houses CCD, light guide lens, air water nozzle
  - Avoid striking or dropping
  - Place tip down carefully, gently, avoid stacking
- Electronics and optics
  - Keep fluid from internal workings
  - No impact or trauma
- Channels
  - Smaller have more kinks and curves
  - More difficult to clean

Challenges

- Shorter procedures
- Appropriate point of use care & handling
- Short turnover times
- Inadequate inventory
- Rushing, skipping steps during processing
- Cutting corners to please internal customers
- Lack of training, experience, expertise
- Lacking of competency assessment
- Not following manufacturer’s written instructions for use
- Number of people handling and reprocessing

Contributing Factors for Damage

- Improper care and handling at point of use
- Incorrect transporting
- Improper cleaning chemistries
- Inappropriate use of HLD/Sterilization Chemistries
- Inappropriate rinsing & drying
- Not following manufacturer’s written instructions for use
- Inadequate training
- Lack of competency assessment

Poor Handling Practices
Common Damage

• Fluid invasion
  - Failed leak tests
• Broken fibers, cracked lenses
• Punctures in internal lumens

• Mishandling/misuse
  - During procedures
  - Transport
  - Cleaning, disinfection/sterilization
  - Storage

Examples of Damage

The “pretzel” syndrome
• Excessive coiling, twisting
• Not following natural curvature of endoscope

• Crushing injuries
• Buckling
• Chemical Reaction
• Tears
• Cracks

Outer Rubber Sheath

Strain Relief Boot

• Separation
• Twists
• Buckles
• Dent
• Irregularities

Chemical Reaction

• Blistering
  • Improperly diluted & use of cleaning chemistries
  • Inadequate rinsing
  • Reaction between cleaning chemistries/HLD

Inappropriate Cleaning Chemistry & Inadequate Rinsing
Transport Damage Risk

- Excessive coiling
- Devices not safely secured
- Transported with accessories/sharps
- Twists, bends in bag

Fluid Invasion

- Frequent repair – over half of total repair costs
- Requires immediate identification and repair
- If undetected = greater damage
  - Image stains
  - Foggy images
  - Transmission of infection
  - Fluid, biologic materials, biofilm collect

Non-Organic Soils

- Simethicone
  - Form of silicone (anti-gas)
  - Injected w/syringe through Water or Water Auxiliary Channel
- Lubricants
  - Should be water soluble
  - No petroleum or silicone based

Inspection

- External damage
- Discoloration
- Tears
- Cracks
- Blistering

Disinfection vs. Sterilization

- Critical vs. semi-critical
- Sterilization preferred
- Follow manufacturer’s guidelines
- Individual facility policy

High Level Disinfection Manual

- Follow manufacturer’s written instructions for use IFUs
- Manual soaking
  - Submerge completely
  - Flush all channels
- Adequate rinsing
  - Aldehydes
  - Oxidative Chemistries
- Clean area
- Test Strips
- QA
- Frequency
High Level Disinfection - Automated

- Follow manufacturer’s written instructions for use IFUs
- Careful placement in Reprocessor
- Use validated adapters per manufacturer recommendation

- Clean area
- Test Strips
- QA
- Frequency

Drying

- After cleaning prior to HLD
  - Lint-free cloth
  - Reduces dilution of HLD
- After manual soaking & rinsing
  - 70 – 80% isopropyl alcohol
  - Follow manufacturer’s written instructions for use IFUs
  - Quantity
  - Method
  - Flush with instrument forced air
  - Follow endoscope manufacturer’s written instructions for use IFUs for psi

Storage

- Follow Manufacturer’s instructions for use IFUs e.g.,
  - Hang vertical
  - Attaching venting cap
- Detach removable accessories
  - Keep with endoscope
- Angulate in free position
- Remove water resistant cap
- Hang freely
- NO suitcases

- Well ventilated cabinet
- Hepa Filters
- Tubing to purge with air
- Distal tip not touching bottom of cabinet
- Label endoscopes
- Date of processing
- Person processing
- Date of HLD

Incorrect Storage

Storage Time

Endoscope Shelf Life prior to reprocessing:

- AAMI ST 91: based on risk assessment
- AORN: based on risk assessment
- SGNA: up to 7 days
- CDC: based on risk assessment

Preventative Maintenance for all Endoscopes

- Check for signs of wear and tear
- Ensure scope is intact after repairs
- Prevent damage
- Trained and qualified staff
- Competencies
Action Plan

• Obtain, read and implement endoscope manufacturer’s instructions for use
• Train and educate staff on correct care & handling of flexible endoscopes
• Audit processes to ensure proper processing of flexible endoscopes
• Assess staff competency on a routine and as needed basis

References


References, continued


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