Learning Objectives
Upon completion of this course, you will be able to:
• Discuss current healthcare trends in endoscopy
• Compare and contrast flexible and rigid endoscopes
• 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

Flexible Endoscope
Suction and Air/water channel ports
Distal tip
Biopsy port
Directional Lever
Camera – approximately $15,000

Small Flexible Endoscope – approximately $22,000

Robotic Scopes – approximately $18,000

Flexible and Rigid Endoscope Characteristics

- Delicate, complex, expensive
- Require special care and handling
- Access internal structures/cavities
- Lens system for image
- Fiberoptic cable for light
- Internal lumens and channels
- Insufflation component
- Suction and irrigation systems
- Monitors connected through cable system to carry signals

Types of Flexible Endoscopes

- Fiberscope
- Videoscope

Flexible Endoscopes

- Complex devices
  - Mechanical, electrical, plumbing systems working in unison
- Advanced visualization
- Delicate design
- Unique components
- Constant changing technology means:
  - New endoscopes
  - New design features
  - New challenges

Flexible Endoscope Anatomy

- Mechanical system
  - Control body, insertion and light guide tubes, bending section
- Image
  - 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

Effects on Repair Costs

- Level of care and handling
- Short turnover times
- Inadequate inventory
- Rush, skip steps during processing
- Cutting corners to please internal customers
- Lack of training/experience/expertise
- Poorly managed internal procedures and training
- Number of people handling and reprocessing
Mechanical System

- Control mechanism, insertion tube, bending section
- Coiled wires connect to directional knobs
- Work together to angulate and move bending section

Mechanical System, continued

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

Bending Section

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

Mechanical System

- Light guide tube
- Connects control body to light guide connector
- Houses wiring, tubing, fiber bundle, channels
- Incorporates connections
  - suction, air/water bottle
  - light fiber bundle
  - electrical contacts
- ETO venting valve (fiberscopes)
- Electrical connector (video scopes)

Illumination - Fiberscope

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

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
Types of Rigid Endoscopes

- Arthroscopes
- Laparoscopes
- Cystoscopes
- Bronchoscopes
- Sinuscopes
- Hysteroscopes
- Ureteroscopes
- Esophagoscopes

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Scope Damage

• 30% scope damage = normal wear and tear
• 70% scope damage = within our control

Contributing Factors Towards Repair Costs

• Improper care and handling
• Expedited room turnovers
• Insufficient inventory
• Pressure to quickly reprocess devices; skipped steps
• Inadequate training/diminished competency

Effects on Repair Costs

• Routine use
• Fluid invasion
  − Failed leak tests
• Mishandling/misuse
  − During procedures
  − Transport
  − Cleaning, disinfection/sterilization
  − Storage
• Broken fibers, cracked lenses
• Bent rods
• Punctures in internal lumens

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Proper Handling

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

Poor Handling Practices
Poor Handling Practices, continued

Poor Practices

- Avoid the “pretzel” syndrome
  - Excessive coiling, twisting
  - Not following natural curvature of endoscope
- Crushing injuries
- Stacking
- Buckling

Endoscope Damage

- 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 kinds and curves
    - More difficult to clean

Correct Handling Practices

- Protect eyepiece and body
- Avoid damage to lens

Endoscope Damage

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Endoscope Damage

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### Pre-Cleaning at the Point of Use
- Keep devices free of soil and blood during use
  - Reduce microorganisms
  - Reduce potential for environmental contamination
- Wipe surfaces with gauze/non-lint sponges
- Flush lumens and cannulas with water
- Separate endoscope from other instruments
  - Avoid damage
- Prepare for transport

### Containment and Transport
- Closed/covered container
- Mark with biohazard label
- Regular scheduled pick-up
- Avoid high traffic areas

### Repair Issues Related to Transport
- Excessive coiling
- Devices not safely secured
- Transported with accessories/sharps
- Twists, bends in bag

### Leak Testing
- Check leak tester for functionality
- Preformed prior to cleaning
- Pressurize prior to immersion in water
- Follow device manufacturer’s instructions

### Air Pressurization
- Air Around Internal Components
Indications of a Leak

- Control body
- Channels

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

Cleaning

- Multi-step process
- 2 sinks of adequate size for flexible endoscopes
  - First sink: soak/wash with cleaning solution to remove soil
  - Second sink: rinse
  - Third sink: for treated water rinse
- Work flow dirty to clean

Cleaning Methods

- Follow manufacturer IFUs
  - Manual
  - Mechanical
  - Combination of both
  - Mechanical friction
- Physically remove debris
  - Wiping, brushing, spraying, flushing lumens
- Should not damage endoscope
- Safe for the worker performing the task

Manual Cleaning

- Non-lint cloths
- Identify models and channels
- ALL channels accessed
- Channel irrigators used
- Brush inventory
  - Correct brush sizes for channels
  - Varying diameters and lengths
  - Single use are disposable!
  - Disinfect reusable brushes
- Flush channels to remove loosened soil

Appropriate Cleaning Chemistry

- Fresh solution
- READ THE LABEL!
- Follow manufacturer IFUs
- Neutral pH
- Compatible with endoscopes
- Dilute correctly
- Check water temperature
- Mark water line on sink
- Soak time
**Mechanical Cleaning Options**

- Flushes internal channels
- Consistent process

**Manual Cleaning: Rinse in Second Sink**

- Clean, fresh, warm water
- Thorough rinsing
- Immersed in water
- Flush all instrument channels
- Rinse to irrigate the challenging design features
- Remove soil and cleaning chemistry

**Manual Cleaning: Third Sink with treated water for rinsing**

**Inappropriate Cleaning Chemistry and Inadequate Rinsing**

**Mechanical Cleaning**

**Ultrasonic Cleaning**

- Utilized for fine cleaning of rigid devices
- Gross debris removed
- Effective cleaning chemistry
- Cavitation process
  - Sonic energy created bubbles
  - Unstable bubbles implode
  - Dislodges soil from surfaces
- Degas prior to use
- Change solution regularly
- No optical devices, mixed metals
Mechanical Cleaning
Automated Endoscope Reprocessor

- Wash phase during cycle
- Augments manual cleaning for consistent outcome
- Cleaning chemistry labeled for endoscopes
- FDA cleared wash phase with minimal pre-cleaning
  - Pre-cleaning steps MUST be followed
- Follow endoscope manufacturer instructions
- Follow AER manufacturer instructions
- IFUs may be in conflict

Endoscope Accessories

- Reusable accessories, valves, tubing processed per manufacturer instructions
- Disassembled and cleaned
- Inspect for integrity
- AER manufacturer validates processing

Inspection

- Examine line of shaft
- External damage
- Check vision

Disinfection vs. Sterilization

- Endoscope’s intended use
- Critical, semi-critical
- Sterilization preferred
  - Vaporized Hydrogen Peroxide
  - Hydrogen Peroxide gas plasma
  - Liquid chemical sterilization
- Follow manufacturer’s guidelines
- Individual facility policy

High Level Disinfection

- Follow manufacturer’s instructions
- Manual soaking and adequate rinsing
- Automated Endoscope Reprocessor
  - Careful placement in Reprocessor
  - Use validated adapters as needed

Storage

- Remove residual water
- Purge all channels with alcohol and (compressed) air
- Detach removable parts, valves, biopsy caps
- Angulation locks in free position
- Variable stiffness knob in neutral position
- Detach water resistant cap
- Well-ventilated cabinet
- Hang freely
- Distal tip not touching bottom of cabinet
- Processed scopes labeled as ‘patient ready’
Incorrect Storage

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
- Scope intact after repairs
- Prevent damage
- Trained and qualified staff

Action Plan

- Continuing education to staff on proper care, handling and maintenance of all scopes
- Refer to scope manufacturer’s instructions for proper use and handling

References


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Summary

Now that you have completed this course, you can:

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