



## LECTURE 6: SCOPE CHOICE, STIFFNESS AND BOWEL PREPARATION

### Participant Handout

#### Colonoscopy Without Pain | MEA Physician Symposium

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Speaker: Dr. Faiz Ibrahim

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### LEARNING OBJECTIVES

By the end of this lecture, you will be able to:

1. Select appropriate colonoscope type for specific clinical scenarios
2. Understand variable stiffness function and optimal deployment
3. Match bowel preparation agent to patient characteristics
4. Recognize impact of preparation quality on outcomes
5. Manage inadequate preparation scenarios
6. Optimize equipment and prep selection for painless procedures

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### COLONOSCOPE SELECTION: SCOPE TYPES

#### Standard Adult Colonoscope

##### Specifications:

- Diameter: 13-14 mm
- Length: 160-180 cm
- Flexibility: Fixed (no stiffness adjustment)
- Tip deflection:  $\pm 180^\circ$  (full deflection range)
- Working channels: Single instrument channel

##### Advantages:

- Familiar to most endoscopists
- Full therapeutic capability (biopsy, polypectomy, dilation)
- Proven reliability in routine cases
- Appropriate for 80% of patients

##### Limitations:

- Higher loop risk in redundant colon
- Longer insertion time in difficult anatomy
- Cannot be adjusted for specific anatomical challenges

**Indications:** Routine screening, suspected polyps/cancer, therapeutic procedures planned.



## Variable-Stiffness Colonoscope

**Design:** Manual control lever changes shaft rigidity from flexible (pediatric-like) to rigid (standard-like).

### Specifications:

- Same diameter/length as standard
- Flexible mode: Navigates tight angles like pediatric scope
- Stiff mode: Prevents looping like rigid scope
- Can toggle between modes during procedure

### Advantages:

- **Reduced insertion time:** 6.5 min (VS) vs 10.5 min (standard) — 38% faster
- **Reduced patient pain:** Median score 7 (VS) vs 24 (standard)
- **Lower loop rates:** Stiffness prevents re-looping after passing difficult zone
- **Improved intubation:** 92% success in previously failed cases

### Limitations:

- More expensive than standard scope
- Requires operator training
- Learning curve: 20-30 procedures to master
- Should NOT use stiffness if loop already forming (risk of perforation)

### Deployment Strategy:

1. **Start flexible** — Navigate difficult sigmoid/angles with pediatric-like properties
2. **Activate stiffness** — Once past sigmoid, activate to prevent re-looping
3. **Toggle as needed** — Return to flexible if encountering new angles
4. **Deactivate** — Back to flexible in right colon if needed for specific viewing angles

**Success Rate:** 85-90% in difficult cases; reduces need for scope changes by 50%.

## Pediatric Colonoscope

### Specifications:

- Diameter: 12 mm (smaller than adult)
- Length: 140-160 cm
- Flexibility: Greater than standard adult scope
- Tip deflection:  $\pm 180^\circ$

### Advantages:

- Better navigation of tortuous colon (fixed angles)
- Successfully completes 90% of failed standard scope attempts
- Less traumatic in angulated anatomy



- Good for benign strictures

**Limitations:**

- Shorter length (may not reach cecum in long colons)
- Reduced field of view
- Less maneuverable in some situations
- Therapeutics more difficult than standard scope

**Indications:**

- Failed insertion with standard scope after 15+ minutes
- Tortuous or angulated colon (known from imaging or prior procedure)
- Benign strictures
- Post-surgical altered anatomy

**Crossover Strategy:** If unsuccessful with standard scope at 15 minutes, switching to pediatric scope succeeds in 90% of non-obstructed cases.

**Ultrathin Colonoscope**

**Specifications:**

- Diameter: 7-8 mm (very small)
- Length: 160-180 cm
- Flexibility: Extreme maneuverability
- Limited: Some have only up/down tip deflection

**Advantages:**

- Extreme flexibility navigates severe strictures/tortuosity
- Rarely fails in navigable anatomy
- Diagnostic capability reasonable despite small size

**Limitations:**

- Small working channel limits therapeutics
- Learning curve steep (30+ cases recommended)
- Limited field of view
- More fragile than standard scopes

**Indications:**

- Failed pediatric scope attempt
- Severe strictures not passable with pediatric scope
- Unusual anatomical configurations
- Salvage technique for failed multiple attempts

**Role:** Tertiary option; used when standard and pediatric fail.



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## VARIABLE STIFFNESS: MECHANICS AND DEPLOYMENT

### How Variable Stiffness Works

**Mechanism:** Control lever on handle changes internal shaft rigidity via adjustable backbone structure.

**Flexible Mode:** Shaft behaves like pediatric scope — can navigate tight angles and curves without trauma.

**Stiff Mode:** Shaft becomes rigid — resists bending and prevents loop formation within colon (scope stays straight).

### Optimal Deployment Protocol

#### Phase 1: Sigmoid Navigation (Flexible Mode)

- Start with stiffness OFF
- Enter rectum and navigate sigmoid with flexibility
- If loop begins to form, withdraw and straighten
- Once sigmoid entered and straightened, prepare for stiffness mode

#### Phase 2: Splenic Flexure Passage (Toggle Mode)

- At splenic flexure, may need flexibility
- Use flexible mode to navigate the 90° turn
- Once past flexure and entering transverse, activate stiffness

#### Phase 3: Transverse Advancement (Stiff Mode)

- Activate stiffness to prevent transverse looping
- Stiffness prevents re-loop formation
- Maintains straight path through transverse
- Reduces insertion time significantly

#### Phase 4: Right Colon (Flexible Again)

- At hepatic flexure, deactivate stiffness for navigation
- Return to flexible mode through ascending colon
- Flexibility allows better maneuverability in right colon
- Prepare stiffness deactivation before hepatic flexure

#### Phase 5: Cecum (Variable)

- May need flexibility or stiffness depending on approach
- Retroflexion may be easier with flexible mode
- Toggle as needed for optimal visualization

**Critical Safety Rule:** Never activate stiffness if loop already formed. This can increase intramural tension and perforation risk. Always straighten loop first, THEN activate stiffness.



## Effectiveness Data

- **Insertion time reduction:** 38% faster (6.5 vs 10.5 minutes)
- **Pain reduction:** 71% lower pain scores
- **Loop prevention:** Stiffness prevents 70% of re-loops
- **Abdominal pressure need:** Reduces external compression requirement from 50% to 8% of cases
- **Overall success:** 92% success in previously failed cases

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## BOWEL PREPARATION: AGENTS AND REGIMENS

### Preparation Agents

#### Polyethylene Glycol (PEG) with Electrolytes

- Volume: 4 L (high-volume) or 2 L (low-volume formulations)
- Mechanism: Osmotic, non-absorbed polymer
- Efficacy: Excellent (BBPS 5.0 median)
- Tolerance: Moderate (59% report no/ slight discomfort)
- Compliance: 81% complete full volume
- Cost: Moderate

#### Sodium Picosulfate/Magnesium Citrate (SPMC)

- Volume: Low-volume (total fluid ~4 L with clear liquids)
- Mechanism: Stimulant + osmotic
- Efficacy: Excellent (BBPS 5.0 median — equal to PEG)
- Tolerance: Superior (72.6% report no/ slight discomfort)
- Compliance: Superior (94.2% complete regimen)
- Polyp detection: Higher (34.3% vs 23.3% with PEG)
- Cost: Less expensive than PEG

### Key Comparison:

Feature	PEG	SPMC
Cleansing efficacy	Excellent	Excellent (equal)
Patient tolerance	Moderate	Superior ✓
Compliance	81%	94% ✓
Polyp detection	23.3%	34.3% ✓
Cost	Higher	Lower ✓

**Recommendation:** SPMC preferred due to superior tolerance, compliance, and detection rates.



### **Split-Dose Regimen (CRITICAL)**

**Concept:** Divide prep into two doses — most on day before, remainder morning of procedure.

#### **Impact:**

- 6.6× increased odds of adequate cleansing vs single-dose
- Better cecal intubation rates
- Higher polyp detection
- Should be standard approach

#### **Example SPMC Split-Dose:**

- Day before (1800h): First sachet + 2 L clear liquids
- Morning of procedure (0600h): Second sachet + 2 L clear liquids
- Procedure time: 1000h

#### **Example PEG Split-Dose:**

- Day before (1800h): 2 L PEG + 1 L clear liquids
- Morning of procedure (0600h): 1 L PEG + 1 L clear liquids
- Procedure time: 1000h

**Bottom Line:** Split-dose is evidence standard; should be used for virtually all patients.

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## **BOWEL PREPARATION QUALITY: MEASUREMENT AND IMPACT**

### **Boston Bowel Prep Scale (BBPS)**

#### **Scoring System:**

Each colon segment (right, transverse, left) scored 0-3:

- **0:** Unprepared segment with stool/blood obscuring view
- **1:** Some stool/debris; some visualization possible
- **2:** Minor stool/debris; good visualization
- **3:** Excellent — no stool/debris; complete visualization

**Total Score:** Sum of three segments (0-9)

- **Overall score  $\leq 5$ :** Inadequate (repeat needed)
- **Overall score 6-7:** Good preparation
- **Overall score  $\geq 8$ :** Excellent preparation

**Minimum acceptable:** Score  $\geq 2$  for each individual segment. If ANY segment  $< 2$ , repeat colonoscopy recommended.

#### **Surprising Finding: "Excellent" Not Always Best**

**Unexpected Data:** Studies show adenoma detection rate (ADR) highest in GOOD (6-7) range, NOT in excellent (8-9) range.



### Possible Explanations:

- Excellent prep requires extensive suctioning/flushing during withdrawal
- This time spent on cleaning reduces inspection time
- Good preparation provides balance: adequate visualization without excessive cleaning time
- Patients with excellent prep may have different adenoma burden

**Clinical Implication:** Target "good" (6-7) preparation, not necessarily "excellent."

### Preparation Quality Checklist

#### Factors Associated with Inadequate Prep:

- Single-dose regimen (vs split-dose)
- Patient non-compliance with volume intake
- Poor bowel function (constipation history)
- Inpatient status
- Use of picosulfate alone (without adjuvants)

#### Patient Factors for Counseling:

- Explain importance of split-dose timing
- Emphasize completing full fluid volume
- Advise clear liquids only (no solid foods after start)
- Note common side effects (mild nausea, bloating) are expected
- Stress compliance improves outcome

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## MANAGING INADEQUATE PREPARATION

### Scenario: Inadequate Prep at Insertion

#### Recognition:

- Cannot visualize cecum due to stool/debris
- Excessive suctioning needed
- Insertion progressively more difficult
- Visibility poor across multiple segments

#### Immediate Decision:

- Attempt gentle flushing/suctioning first (5 min maximum)
- If not significantly improved → **Abandon procedure**
- Schedule repeat colonoscopy with reinforced prep instructions

#### Why Abandon:

- Proceeding with poor prep wastes time



- Miss rate unacceptably high (adenoma miss >20%)
- Insertion more traumatic
- Patient discomfort higher
- Better to repeat with proper prep

**Documentation:**

- Note specific prep quality (BBPS scores)
- Describe segments that were poorly visualized
- Recommend repeat procedure
- Provide reinforced prep instructions

**Repeat Instruction Emphasis:**

- Confirm split-dose timing (most important factor)
- Confirm clear liquids only
- Confirm full volume completion
- Consider different prep agent if non-compliance suspected

**Scenario: Adequate Early, Poor Late Prep (Right Colon)**

**Recognition:**

- Sigmoid/transverse well-visualized
- Right colon visualization deteriorates
- Stool/debris accumulation in cecum/ascending

**Management:**

- Increase suctioning in right colon
- Spend more withdrawal time there
- Multiple position changes to mobilize debris
- May need focused flushing in cecum

**Document:** Note location-specific prep issue; may not need full repeat if left/transverse adequate.

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**CLINICAL PEARLS**

1. **Variable stiffness transforms technique** — 38% faster insertion, 71% less pain, 92% success in previously failed cases
2. **Deploy stiffness strategically** — Flexible for navigation, stiff for prevention; never force stiffness with active loop
3. **Split-dose is game-changer** — 6.6× better odds of adequate prep; should be standard for all patients
4. **SPMC > PEG** — Superior tolerance, compliance, and polyp detection; not inherently inferior cleansing
5. **Good prep suffices** — Don't chase "excellent"; BBPS 6-7 provides optimal balance of visualization and detection



6. **Right colon suffers in poor prep** — Focus suctioning/flushing efforts on right colon; may be most affected segment
7. **Abandon early if needed** — Poor prep + difficult insertion = poor outcomes; repeat is better than persisting
8. **Patient counseling critical** — Emphasize split-dose timing and full volume; compliance determines success
9. **Scope selection matches anatomy** — Pediatric scope is workhorse for failed cases; ultrathin is salvage option
10. **Preparation quality documented** — Record BBPS scores; track prep quality as quality metric alongside ADR

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#### KEY TAKEAWAYS

- **Scope selection** — Standard for routine cases; variable-stiffness for difficult anatomy; pediatric for failed cases; ultrathin for salvage
- **Variable stiffness strategy** — Flexible for navigation → stiff for prevention → flexible for right colon; toggle as needed
- **Split-dose regimen standard** — 6.6x improved odds; use for virtually all patients
- **SPMC preferred agent** — Equal efficacy to PEG; superior tolerance and compliance; higher detection rates
- **Target good (6-7), not excellent** — BBPS scoring: adequate visualization without excessive cleaning time
- **Inadequate prep → abandon** — Don't force poor prep; repeat with better instructions
- **Right colon focus** — Highest miss risk; requires extended withdrawal time and focused suctioning
- **Document prep quality** — Record BBPS; track as quality metric
- **Patient education matters** — Split-dose timing and volume completion determine compliance and success

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