BACK TO FUNDAMENTALS IN COLONOSCOPY

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COLONSCOPY TIMELINE

- Introduced in 1969 with fiberscope
- Introduced as “coloscopy”
- Internal funding for development of the device
- Few months later, snare polypectomy introduced
- Video endoscopy – 1980s

Wolff, Am J Gastroenterol 1989; 84:1017-1025
INDICATIONS FOR COLONOSCOPY

- Evaluation of an abnormality on barium enema or other imaging study that is likely to be clinically significant, such as a filling defect or stricture
- Evaluation of unexplained GI bleeding
  - Hematochezia
  - Melena after an upper GI source has been excluded
  - Presence of fecal occult blood
- Unexplained iron deficiency anemia
- Screening and surveillance for colon neoplasia
  - Screening of asymptomatic, average-risk patients for colon neoplasia
  - Examination to evaluate the entire colon for synchronous cancer or neoplastic polyps in a patient with treatable cancer or neoplastic polyp
  - Colonoscopy to remove synchronous neoplastic lesion at or around the time of curative resection of cancer followed by colonoscopy at 1 year and if examination normal, then 3 years, and if normal, then 5 years thereafter to detect metachronous cancers
  - Surveillance of patients with neoplastic polyps
  - Surveillance of patients with a significant family history of colorectal neoplasia

For dysplasia and cancer surveillance in select patients with long-standing ulcerative or Crohn’s colitis
- Clinically significant diarrhea of unexplained origin
- Intraoperative identification of a lesion not apparent at surgery (e.g., polypectomy site, location of a bleeding site)
- Treatment of bleeding from such lesions as vascular malformation, ulceration, neoplasia, and polypectomy site
- Intraoperative evaluation of anastomotic reconstructions (e.g., anastomotic leak and patency, bleeding, pouch formation)
- As an adjunct to minimally invasive surgery for the treatment of diseases of the colon and rectum
- Management or evaluation of operative adverse events (e.g., dilation of anastomotic strictures)
- Foreign body removal
- Excision or ablation of lesions
- Decompression of acute megacolon or sigmoid volvulus
- Balloon dilation of stenotic lesions (e.g., anastomotic strictures)
- Palliative treatment of stenosing or bleeding neoplasms (e.g., laser, electocoagulation, stenting)
- Marking a neoplasm for localization


INDICATIONS FOR COLONOSCOPY (SUMMARY)

- Abnormal GI Tract Imaging
- Gastrointestinal Bleeding
- Colorectal Cancer Screening/Surveillance
- Surveillance In Ulcerative Colitis/Crohn’s Colitis
- Diarrhea Investigation
- Decompression of Colon
- Stenting of Stenotic Lesions

### QUALITY INDICATORS FOR COLONOSCOPY - PREPROCEDURE

- Frequency of endoscopy for an indication >98%
- Informed Consent completion >98%
- Frequency of preprocedure history and directed physical examination >98%
- Frequency for risk for adverse events is assessed and documented before sedation >98%
- Frequency for prophylactic antibiotics are administered >98%
- Frequency with which a sedation plan is documented >98%
- Frequency with management of antithrombotic therapy is formulated and documented N/A
- Frequency for team pause is conducted/documentied >98%
- Frequency for which endoscopy is performed by fully trained and credentialed individual to perform procedure >98%


### QUALITY INDICATORS PREPROCEDURE

- Informed Consent
- Antibiotics
- Adverse Events Assessment
- Time Out
- Antithrombotic Management

### DOCUMENTATION

QUALITY INDICATORS - INTRAPROCEDURE

Photodocumentation is performed N/A
Frequency for patient monitoring during sedation is performed and documented >98%
Frequency with which doses and routes of administration of all medications used during the procedure are documented >98%
Frequency with which use of reversal agents is documented >98%
Frequency with which procedure interruption and premature termination due to sedation-related issues is documented >98%


QUALITY INDICATORS - INTRAPROCEDURE

- Patient Monitoring
- Drugs
- Reversal Agents

DOCUMENTATION OF PATIENT STATUS

QUALITY INDICATORS - POSTPROCEDURE

- Frequency with which discharge from endoscopy according to predetermined discharge criteria is documented >98%
- Frequency with which patient instructions are provided >98%
- Frequency with which the plan for pathology follow-up is specified and documented >98%
- Frequency with which a complete procedure report is created >98%
- Frequency with which adverse events are documented >98%
- Frequency with which adverse events occur N/A
- Frequency with which postprocedure and late adverse events occur and are documented N/A
- Frequency with which patient satisfaction data are obtained N/A
- Frequency with which communication with referring provider is documented N/A

**COLON PREPS – WHY ARE THEY IMPORTANT?**

- Colorectal Cancer (CRC) - #2 Cause of Cancer-related deaths in US.
- Colonoscopy can prevent CRC by detection and removal of lesions before development into cancer
- Diagnostic evaluation of symptoms and secondary evaluation for other colorectal screening tests
- 20-25% of all colonoscopies have inadequate bowel preparations


**REASONS FOR POOR BOWEL PREPS**

- Compliance with preparation
- Patient medical conditions
- Costs of preparations
- Distance traveled for colonoscopy
- Extended wait times with scheduling
- Poor education for colon preps

Personal Practice Experience
EFFECT OF POOR BOWEL PREPS

- Lower Adenoma Detection Rates
- Longer Procedural Time
  - (prolonged sedation, increased use of sedatives)
- Lower Cecal Intubation Rates
- Increased electrocautery risks
- Shorter intervals need for examinations


BOWEL PREPS

- Efficacy versus Tolerability

“Consequently, the choice of a bowel cleansing regimen should be based on cleansing efficacy first and patient tolerability second. However, efficacy and tolerability are closely interrelated.”

INADEQUATE PREPARATIONS FOR POLYP/ADENOMA DETECTION AND FOLLOW-UP

- Prep quality assessment in the rectosigmoid colon
  - If inadequate for polyp detection greater than 5 mm, termination of procedure or reschedule after additional bowel cleansing strategies
  - Prospective Observational Study – 5832 patients
  - Polyp Detection
    - OR 1.73 95% CI [1.28, 2.36] Intm-quality vs low-quality
    - Polyps > 10 mm
      - OR 1.72 95% CI [1.11, 2.67] high-quality vs low-quality


PREP PREDICTOR SCORING

- 1331 colonoscopies in 4 European Centers
- Tricyclic Antidepressants 3
- ASA Risk Score ≥3 2
- Chronic Constipation
- Opioid Use
- Diabetes
- History of Surgery
- Hospitalized Patient
- History of Inadequate Preparation 1

- 14% of patients Score ≥3 = Inadequate Preparation
- 43% Sensitivity; 90% Specificity; 34% PPV, and 93% NPV

Dik, et al Gastrointestinal Endosc 2015
http://dx.doi.org/10.1016/j.gie.2014.09.066 [e-pub ahead of print]
REPEAT INTERVAL RECOMMENDATIONS

- Very variable among colonoscopists
- Tend to be shorter in duration with sub-optimal preparations

- 116 gastroenterologist survey
- Board Certification Review participants
- > 80% recommended F/U < 3 years for 1-2 small adenomas and suboptimal preparations


INADEQUATE PREPARATION
MULTI-SOCIETY GUIDELINES

- If colonoscopy is complete to cecum and preparation is inadequate,
- Examination should be repeated
- Interval: Within 1 year
- If advanced neoplasia is detected, shorter interval is needed.
- (Low-Quality Evidence)

ADEQUATE PREPARATION
MULTI-SOCIETY GUIDELINES

- Preparation is adequate and colonoscopy is completed
- Guideline recommendation for screening or surveillance
- (High-Quality Evidence)


PREP DOSING

- Split Dosing – Strongly Recommended – Elective Colonoscopy
- Same Day Regimen – Acceptable Alternative – Afternoon Colonoscopy

Rex, et al Am J Gastroenterol 2009;104:739-750
SPLIT DOSE PROBLEMS

- Anesthesia Input
  - Anesthesiology Guideline
    - Clear Liquids: 2 hours in healthy patients
    - Type of Liquid is more important than volume

- Patient Objections
  - Early Awakening
  - Extended travel following consumption

American Society of Anesthesiology. *Anesthesiology* 2011;114:495-511

TIMING TO PROCEDURE

- VA Study
  - 378 consecutive outpatient colonoscopy patient survey
  - 96% Men, Mean Age 62.2 years

- Excellent/Good Prep more likely encountered with a shorter interval from last preparation dose (P=.013) (< 14 hours)

- Fair/Poor/Inadequate found to have longer time interval from last dose (> 14 hours)

DIET – MULTI-SOCIETY GUIDELINES

- Clear Liquids – Traditional Approach

- Weak Recommendations – Full Liquid Diet or Low Residue

- Patients with motility issues preferentially consider clear liquids


PATIENT EDUCATION

- Oral and Written Patient Education Instructions

www.asge.org (Last Accessed 2/1/2015)
85% of colonoscopies should have an adequate preparation

Assessment of bowel prep after intra-procedural cleansing of residual liquid

Boston Bowel Prep assesses 3 areas of the colon

BOSTON BOWEL PREPARATION SCALE

- 0-Unprepared Colon Segment with Mucosa not seen because of solid stool that cannot be cleared
- 1-Portion of mucosa of the colon segment seen, but other areas of the colon segment are not well seen because of staining, residual stool, and/or opaque liquid
- 2-Minor amount of residual staining, small fragments of stool and/or opaque liquid, but mucosa of colon segment is seen well
- 3-Entire mucosa of colon segment seen well, with no residual staining, small fragments of stool, or opaque liquid

www.cori.org/bbps  Score ≥5 in 3 Segments = Adequate
BOSTON SCALE 2


BOSTON SCALE 3

FDA APPROVED BOWEL PREPS

POLYETHYLENE GLYCOL-ELS

- Polyethylene Glycol-Electrolyte Lavage Solution (PEG-ELS)
  - 4 Liters (Large or High Volume)
    - Colyte (Alaven Pharmaceuticals, Marietta, GA)
    - Gavilytely (Gavis Pharmaceuticals, Somerset, NJ)
    - Golytely (Braintree Laboratories, Braintree, MA)
    - Nulytely (Braintree Laboratories) – No Sulfate
  - 2 Liters plus Adjunct (Low Volume)
    - 2-L PEG-ELS with Bisacodyl – Halflytely (Braintree Laboratories) - Not Available
    - 2-L PEG-ELS with Ascorbic Acid – Moviprep (Salix Pharmaceuticals, Raleigh, NC)
PEG-ELS SOLUTIONS

- Iso-Osmotic
- Minimal effects on vital signs, electrolytes, weight, blood counts
- Few case reports of adverse events
- May be preferable in patients with
  - Renal Insufficiency
  - Congestive Heart Failure
  - Advanced Liver Disease


FDA APPROVED PREPARATIONS
LOW VOLUME

- Oral Sulfate Solution OSS
  - SUPREP (Braintree Laboratories)

- Sodium picosulfate/magnesium citrate
  - Prepopik (Ferring Pharmaceuticals, Inc, Parsippany, NJ)

- Combination PEG-ELS and OSS
  - Suclear (Braintree Laboratories)
FDA APPROVED PREPARATIONS

- Sodium Phosphate Solution (Withdrawn from OTC in December, 2008)
- Fleet Phospho-Soda (C.B. Fleet Co, Lynchburg, VA)
- Fleet EZ-Prep (C. B. Fleet Co.)

- Sodium Phosphate prescription tablet – Box Warning about risk of acute phosphate nephropathy
  - OsmoPrep; (Salix Pharmaceuticals, Raleigh, NC)


META-ANALYSIS – VOLUME – PEG-ELS

- 28 trials w/ PEG-ELS (21 trials w/ bowel-cleanliness outcomes)

- High-Volume (HV) ≥ 3 L with Low-Volume (LV) <3L

- 7208 ITT patients (3450 HV vs. 3752 LV)

- No significant difference in Volumes

- (OR, 1.03; 95% CI, 0.80-1.32)

META-ANALYSIS – SPLIT PREP – PEG-ELS

- PEG-ELS Split Dose (8 trials – 1990 ITT patients)
- 2 L + 2L (846) vs. Nonsplit 1144
- Six trials able to be analyzed
- PEG-ELS Split Dose Increased cleanliness
- (OR 4.38; 95% CI, 1.88-10.21)


META-ANALYSIS – ORAL SULFATE SOLUTION (OSS)

- 923 ITT patients
- 462 OSS vs 461 PEG patients
- No increase in bowel cleanliness
- (OR 1.12; 95% CI, 0.77-1.62)

META-ANALYSIS – SODIUM PICOSULFATE (PICO)

- 11 trials comparing PICO vs PEG-ELS (10 analyzable trials)
- 3097 ITT patients (1385 PICO vs 1715 PEG-ELS)
- PICO showed no significant increase in efficacy versus PEG-ELS
  (OR, 0.92, 95% CI, 0.63-1.36)

- 8 trials comparing PICO vs. NaP (3 analyzable trials)
- 1792 ITT patients (966 PICO, 826 NaP)
- PICO not superior to NaP
  (OR, 0.60; 95% CI, 0.22-1.65)


SODIUM PHOSPHATE PREPS

- NaP-induced nephropathy risk - Rare
- Female Sex
- Prior Renal Insufficiency
- Inadequate Hydration
- Shorter Interval between doses
- Hypertension
- Older Age
- Diuretics, NSAIDS, Renin-Angiotensin Inhibitors

META ANALYSIS – SODIUM PHOSPHATE

- 48 trials NaP vs. Peg-ELS (11368 ITT patients) – 33 analyzable trials
- 5529 PEG vs 5839 NaP patients
- NaP did not have an increase in bowel cleanliness
  - (OR, 1.02; 95% CI, 0.77-1.36)
- Willingness to repeat NaP was increased
  - (OR, 2.61; 95% CI, 1.48-4.59)


OTC NON-FDA APPROVED PREPARATIONS

- PEG-3350
- PEG-3350 with Sports Drink
- Magnesium Citrate
- Senna
- Bisacodyl
PEG-3350

- Hyponatremia has been reported (No Safety Outcomes Data)
- Adjuncts often used
- Tolerability comparable to 4 L PEG-ELS
- Meta-Analysis Favors 4 L PEG-ELS compared to PEG-3350 (Sports Drink)
- OR 3.40; 95% CI, 2.28-5.06

Enestvedt, et al Clinical Gastroenterology and Hepatology 2012;10:1225-1231
Schoenfeld, Clinical Gastroenterology and Hepatology 2013;11:582-583

MAGNESIUM CITRATE

- Magnesium Citrate (300 mL x 3) vs NaP (45 mL x 2)
- Good to Excellent Quality for Magnesium Citrate
- 94% Right Colon
- 97% Left Colon
- (P <.001)
- Avoid in Chronic Kidney Disease

OTHERS

- High Dose Senna (24 tablets – 12 mg)
- Effective as 4 L PEG-ELS
- Bisacodyl 30-40 mg
- Lower Rates of Satisfactory Bowel Cleansing


BOWEL PREPARATION IN SPECIFIC POPULATIONS

- Elderly
  - Retrospective Study 50,660 patient > 65 y/o
  - No Difference PEG-ELS or PICO in serious events (28/1000)
- Children/Adolescents
  - Usually tolerated
- IBD Patients
  - NaP preps may induce a mucosal change
  - Limit usage

Ho, et al Can J Gastroenterol 2012;26:436-440
BOWEL PREPARATIONS IN SPECIFIC POPULATIONS

- Constipated/Opioid Patients/Prior Colon Resection
  - Additional bowel purgatives

- History of Spinal Cord Injury
  - May require additional bowel purgatives


PREGNANT PATIENTS

- Generally avoid colonoscopy during pregnancy
- PEG-ELS and NaP are Category C medications
- Delay endoscopy until 2nd trimester
- Tap Water enemas for flexible sigmoidoscopy patients

Mahadevan and Kane Gastroenterology 2006;131:278-282
BARIATRIC PATIENTS

- Low Volume Prep
- Restrictive Procedures
- Avoid high sugar drinks
- Liquid Foods
- Risk of dumping syndrome – Restrictive Surgeries

Heber et al J Clin Endocrinol Metab 2010;95:4823-4843

SALVAGE OPTIONS

- 23% chance of failure rate on second colonoscopy - 6990 colonoscopies/4.4% Initial Failure (retrospective study);
  - Risk: CCB
- 50% chance brown stool/solids predicts poor prep at presentation
- Large Volume Enemas/Oral Preparation are option
- Through-the-scope enema
  - Phosphate Enema or Bisacodyl Enemas through scope into right colon; repeat colon same day in 21 patients
  - 500 ml PEG Solution at Hepatic Flexure – 96% Success
- Same-day or next day colonoscopy (Repeat Prep)

Sohn and Weinstein Dis Colon Rectum 2008:51:462-466
RIGHT SIDED FLAT LESION; PREVIOUS COLONOSCOPY 2 YEARS AGO
### 2012 MULTISOCIETY GUIDELINES

- **Low Risk Adenoma**
  - 1-2 tubular adenomas < 10 mm

- **High Risk Adenoma**
  - Tubular adenoma ≥10 mm, 3 or more adenomas, adenoma with villous histology, or High Grade Dysplasia

- **Advanced Neoplasia**
  - Adenoma ≥10 mm, villous histology, or HGD

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### US MULTI-SOCIETY TASK FORCE ON COLORECTAL CANCER 2012

<table>
<thead>
<tr>
<th>Findings</th>
<th>Recommended Surveillance Interval (y)</th>
<th>Quality of Evidence for Recommendation</th>
<th>New Evidence Stronger than 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Polyps</td>
<td>10</td>
<td>Moderate</td>
<td>Yes</td>
</tr>
<tr>
<td>Small (&lt;10 mm hyperplastic polyps in rectum or sigmoid colon)</td>
<td>10</td>
<td>Moderate</td>
<td>No</td>
</tr>
<tr>
<td>1-2 small (&lt;10 mm) tubular adenomas</td>
<td>5-10</td>
<td>Moderate</td>
<td>Yes</td>
</tr>
<tr>
<td>3-10 tubular adenomas</td>
<td>3</td>
<td>Moderate</td>
<td>Yes</td>
</tr>
<tr>
<td>&gt; 10 adenomas</td>
<td>&lt; 3</td>
<td>Moderate</td>
<td>No</td>
</tr>
<tr>
<td>1 or more tubular adenoma ≥ 10 mm</td>
<td>3</td>
<td>High</td>
<td>Yes</td>
</tr>
<tr>
<td>1 or more villous adenomas</td>
<td>3</td>
<td>Moderate</td>
<td>Yes</td>
</tr>
<tr>
<td>Adenoma with High Grade Dysplasia (HGD)</td>
<td>3</td>
<td>Moderate</td>
<td>No</td>
</tr>
</tbody>
</table>

US MULTI-SOCIETY TASK FORCE ON COLORECTAL CANCER (SERRATED LESIONS) 2012

<table>
<thead>
<tr>
<th>Findings</th>
<th>Recommended Surveillance Interval (y)</th>
<th>Quality of Evidence for Recommendation</th>
<th>New evidence stronger than 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sessile Serrated Polyp(s) &lt; 10 mm with no dysplasia</td>
<td>5</td>
<td>Low</td>
<td>NA</td>
</tr>
<tr>
<td>Sessile Serrated Polyp(s) ≥ 10 mm</td>
<td>3</td>
<td>Low</td>
<td>NA</td>
</tr>
<tr>
<td>Sessile Serrated Polyp with Dysplasia</td>
<td>3</td>
<td>Low</td>
<td>NA</td>
</tr>
<tr>
<td>Traditional Serrated Adenoma</td>
<td>3</td>
<td>Low</td>
<td>NA</td>
</tr>
<tr>
<td>Serrated Polyposis Syndrome</td>
<td>1</td>
<td>Moderate</td>
<td>NA</td>
</tr>
</tbody>
</table>


BASELINE COLONOSCOPY

- Surveillance intervals for polyps also depend on the previous colonoscopy and the most recent colonoscopy
- Low Risk Adenoma at Baseline Colonoscopy
- No Adenomas at Recent Colonoscopy (5 years)
- Surveillance Examination should be at 10 years
- High Risk Adenoma at Baseline
- No Adenomas at Recent Colonoscopy (5 years)
- Surveillance Examination should be at 5 years

POSITIVE FOBT TEST AFTER COLONOSCOPY

- FOBT testing should not be planned
- Interval FIT may lead to cancer diagnosis before subsequent colonoscopy in 1 study (Methodology problems)
- No data to support routine early examination
- No higher than expected risk of cancer or advanced adenoma
- Clinician’s judgment to repeat colonoscopy considering prior colonoscopy findings and prep quality

Lieberman, et al Gastroenterology 2012;143:844-857

OTHER FACTORS

- Minor Rectal Bleeding, Diarrhea, Constipation with 3-5 after initial colonoscopy? Clinical judgment
- Lifestyle Risk Factors – NSAIDS? – No change in surveillance intervals

Lieberman, et al Gastroenterology 2012;143:844-857
As technology and pharmaceuticals have improved, quality initiatives have been introduced to colonoscopy.

Endoscopists should be methodical in colon cancer screening. We seek out cancer everyday with a systematic/scientific approach.

A thorough understanding of colon preps and systematic approach will assist in colon polyp detection.

Surveillance of colon polyps depends on accurate interpretation of findings in the colon.