

Andrew Gentry

Gastroenterology



7-10

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**"I don't want to be one of them.
It's too hard to spell."**

Disclosures

- Andrew Gentry MD, Pfizer, research on C Diff vaccination and oral stool transplant delivery system
- Hoffman Reactor

Clostridium Difficile History

- In early 2000's increased incidence of severe C difficile
- Common strain in all cases
 - Toxinotype III, restriction endonuclease analysis group BI
 - Pulsed field gel electrophoresis as North American pulsed field type NAP1
 - Polymerase chain reaction as type 027
 - OR - BI/NAP1/027
- Single hospital outbreak 2003-2005 in United Kingdom
 - 334 infections
 - 38 deaths
- Biggest difference between these isolates and old strains
 - Fluoroquinolone resistance

IDSA Guidelines March 2017

- Metronidazole taken off as primary treatment
- Cascade testing

Review of *Clostridium difficile*

- What is *C. difficile*?
 - *C. difficile* is a spore-forming, gram-positive anaerobic bacillus that produces two exotoxins: toxin A and toxin B.
 - It accounts for 15-25 percent of all episodes of antibiotic-associated diarrhea

THE IMPACT OF *C. difficile* Infection (CDI)

CDI IS SERIOUS, DEADLY,
AND EXPENSIVE



29,000
US deaths/year
within 30 days of diagnosis

CDI adds up to:
12 days in
the hospital
and
\$27,160
per case
in direct
costs



1 in 5 (83,000)
recurrences
within 2 months

MORE THAN 1/3 OF CDI CASES
ARE NOT ASSOCIATED WITH
INPATIENT STAY

65%
at least
one overnight,
INPATIENT
hospital stay



29%
OUTPATIENT
healthcare
exposures
including
doctor and
dentist offices

6%
NOT HEALTHCARE-
ASSOCIATED

EVERYONE CAN HELP REDUCE THE RISK OF CDI

For more information, visit <http://bit.ly/reduce-CDI>

PATIENTS

- Use antibiotics only when necessary
- Don't demand antibiotics for viral infections like colds or flu

Antibiotics are the single most important risk factor for CDI and should be used only when necessary

- Wash your hands thoroughly after using the bathroom

HEALTHCARE PROFESSIONALS

- Prescribe antibiotics carefully — change the prescription if needed once you get culture results
- Order a *C. difficile* test when appropriate
- Promptly identify and isolate infected patients
- Use gloves, wash your hands frequently, and practice good patient contact precautions

HEALTHCARE ENVIRONMENTS

- Thoroughly clean using an EPA-approved, spore-killing disinfectant
- Notify other facilities when transferring patients with CDI



National
Foundation for
Infectious
Diseases

nfid.org/cdifficile

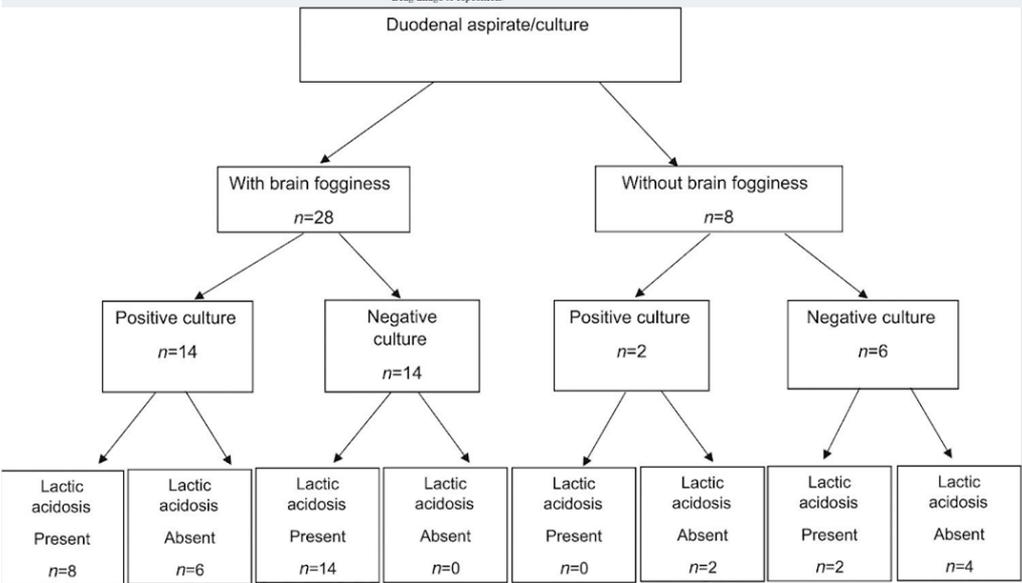
Use of probiotics

- Theoretical benefit of preventing CDI, limited clinical data
- No recommendation for or against use in 2017 CDI Guidelines
- Recently a meta-analysis including >6000 hospitalized patients concluded that administration of probiotics closer to the first dose of antibiotic reduces the risk of CDI by >50% in hospitalized adults
 - Multiple probiotic products used, no correlation with particular probiotic species/strength/formulation
- More studies warranted
- Adverse effects of probiotics: minimal

Side Track - Risk of Probiotics: D-Lactic Acidosis

- D-Lactate Acidosis
 - Evaluation of bloating patient with and without brain fogginess

3 months of >=2: mental confusion, cloudiness, impaired judgment, poor short term memory and diffiuculty with concentration



Based on Sensitivity of Testing

- Step one - does the patient have diarrhea
 - 3 unformed stools in one day
 - Without use of laxatives
 - Without use of contrast for imaging studies
- I would say 50% of our studies get rejected for being solid

- Diarrhea is definitely in the eye of the beholder

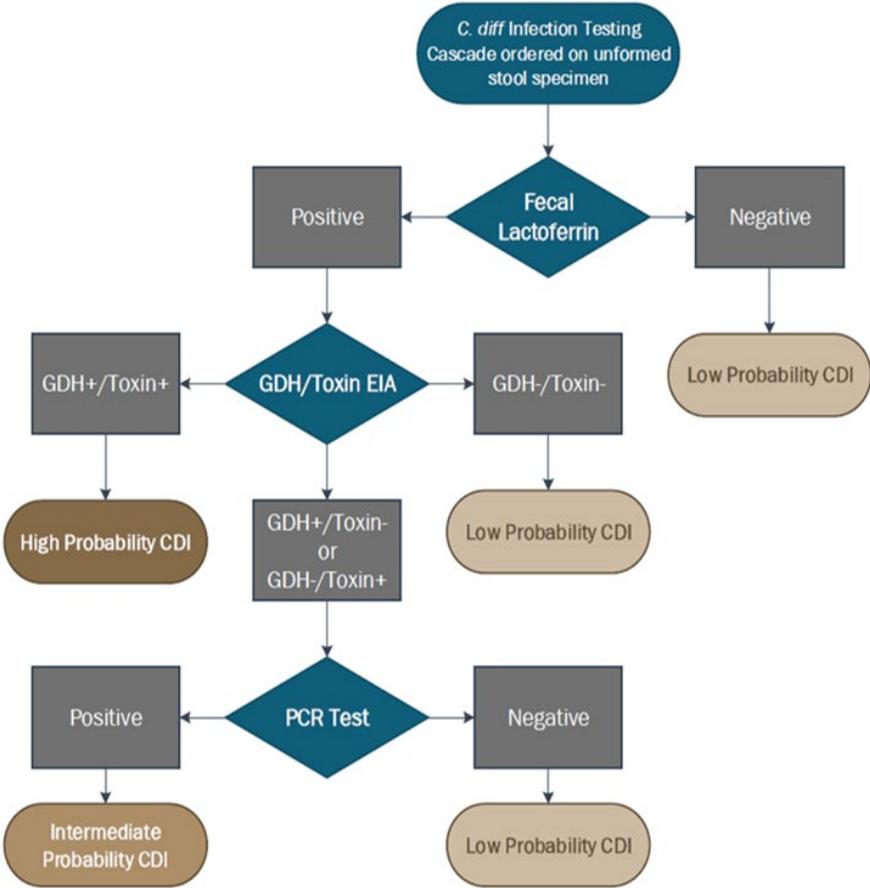
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Test	Sensitivity	Specificity	Substance Detected
Toxigenic culture	High	Low ^a	<i>Clostridium difficile</i> vegetative cells or spores
Nucleic acid amplification tests	High	Low/moderate	<i>C. difficile</i> nucleic acid (toxin genes)
Glutamate dehydrogenase	High	Low ^a	<i>C. difficile</i> common antigen
Cell culture cytotoxicity neutralization assay	High	High	Free toxins
Toxin A and B enzyme immunoassays	Low	Moderate	Free toxins

^aMust be combined with a toxin test.

- **Test for the organism or its major toxin A and B**
 - Toxigenic culture - culture for organism ---- takes several days
 - Cell Cytotoxicity neutralization assay - detects toxin directly
 - Glutamate dehydrogenase immunoassays -
 - Detects metabolic enzyme for both toxic and non toxic forms
 - Nucleic acid amplification test (NAAT) - FDA approval in 2009 -

Cascade Testing



DNA Testing

🚫 COMPREHENSIVE ENTERIC PATHOGEN PANEL, NAD

Status: Final result Visible to patient: No (Inaccessible in My Sanford Chart)

	Ref Range & Units	1yr ago
Campylobacter	Not Detected	Not Detected
Clostridium difficile Toxin A/B Gene	Not Detected	Detected !!
Plesiomonas shigelloides	Not Detected	Not Detected
Salmonella	Not Detected	Not Detected
Vibrio	Not Detected	Not Detected
Vibrio cholerae	Not Detected	Not Detected
Yersinia enterocolitica	Not Detected	Not Detected
Enteraggregative E. Coli (EAEC)	Not Detected	Not Detected
Enteropathogenic E. Coli (EPEC)	Not Detected	Not Detected
Enterotoxigenic E. Coli (ETEC) LT/ST	Not Detected	Not Detected
Shiga-like Toxin-Producing E. coli (STEC) STX1/STX2	Not Detected	Not Detected
Shigella/Enteroinvasive E. Coli (EIEC)	Not Detected	Not Detected
Cryptosporidium	Not Detected	Not Detected
Cyclospora cayetanensis	Not Detected	Not Detected
Entamoeba Histolytica	Not Detected	Not Detected
Giardia lamblia	Not Detected	Not Detected
Adenovirus F 40/41	Not Detected	Not Detected
Astrovirus	Not Detected	Not Detected
Norovirus GI/GII	Not Detected	Not Detected
Rotavirus A	Not Detected	Not Detected
Sapovirus (I, II, IV and V)	Not Detected	Not Detected

Resulting Agency

[BZN](#)

Narrative

This test was performed by multiplexed nested PCR and melting curve analysis on the FilmArray instrum
US Food and Drug Administration (FDA).

Testing Result

⚠️ CLOSTRIDIUM DIFFICILE INFECTION TESTING CASCADE

Status: Final result Visible to patient: No (Inaccessible in My Sanford Chart)

📄 Newer results are available. Click to view them now.

	Ref Range & Units	11mo ago
CDI Interpretation	Low Probability of CDI	High Probability of CDI !
Fecal Lactoferrin	Negative	Positive
Clostridium difficile Antigen	Not Detected	Detected
Clostridium difficile A/B Toxin	Not Detected	Detected
Resulting Agency		BZN

Narrative

Clostridium difficile infections are a clinical diagnosis and no laboratory test can definitively diagnose CDI. medication history must be evaluated, when deciding on diagnosis and treatment of CDIs. Consultation with an in: advised prior to beginning treatment for CDI.

Specimen Collected: 04/17/18 00:35

Last Resulted: 04/17/18 02:37

Adult Treatment Guidelines

Type	Clinical Data	Recommended Treatment
Mild to Moderate CDI	<ul style="list-style-type: none"> • WBC \leq 15,000 cells/mL • Serum creatinine $<$ 1.5 mg/dl 	<ul style="list-style-type: none"> • Vancomycin 125mg 4x per day by mouth for 10 days • Fidaxomicin 200mg BID by mouth for 10 days • If the above are unavailable: Metronidazole 500mg 3x per day by mouth for 10 days
Severe CDI	<ul style="list-style-type: none"> • WBC \geq 15,000 cells/mL • Serum creatinine $>$ 1.5 mg/dl 	<ul style="list-style-type: none"> • Vancomycin 125mg 4x per day by mouth for 10 days • Fidaxomicin 200mg BID by mouth for 10 days
Fulminant CDI	<ul style="list-style-type: none"> • Hypotension or shock • Ileus Megacolon 	<ul style="list-style-type: none"> • Vancomycin 500 mg 4x per day by mouth or NG tube. If ileus, consider rectal instillation of Vancomycin. Plus metronidazole 500 mg IV every 8 hours
First Recurrence		<ul style="list-style-type: none"> • If metronidazole was used for initial episode - vancomycin 125mg 4x per day by mouth for 10 days • If a standard regimen of vancomycin was used for initial episode: <ul style="list-style-type: none"> ○ Prolonged taper and pulsed vancomycin regimen (e.g. 125mg 4x a day for 10-14 days, BID x 1 week, daily x 1 week, every 2 to 3 days for 2-8 weeks), OR ○ Fidaxomicin 200mg BID by mouth for 10 days
Second Recurrence	<ul style="list-style-type: none"> • Consult gastroenterology or infectious disease for treatment recommendations. 	

Bezlotoximab (Zinplava®)

- Indication: *C. difficile* infection, adjunctive therapy
 - To reduce recurrence of *Clostridium difficile* infection (CDI) in patients ≥18 years of age who ARE receiving antibacterial drug treatment AND are at a high risk for CDI recurrence
- Human IgG1 monoclonal antibody which binds to *C. difficile* toxin B and neutralizes it to prevent its toxic effects; it does not bind to toxin A
- Dosing: 10 mg/kg IV as a single dose anytime during antibacterial treatment for *C. difficile*
 - Heart failure exacerbation (13%), infusion related reactions (10%), nausea (7%)
- Toxin B is more virulent than toxin A

Patient Case

- 56 yo female no significant past medical history
- Surgical history Lap Chole uncomplicated in 2016
- Non specific abdominal pain early 2017 treated with prednisone and PPI
- Diverticulitis treated as outpatient end of Oct 2017

Continued

- C diff – 1 Nov by PCR
- Treated with Cipro Flagyl over concerns of continued diverticulitis
- Continued diarrhea
- C diff – 29 Dec by PCR with elevated Calprotectin
- Treated with vancomycin QID and told she had Ulcerative Colitis
- Continued diarrhea

Stool transplant

- Seen in GI clinic
- C diff by PCR again positive (prior to new guidelines)
- Treated with fidaxomicin (Dificid®) with some improvement but continued Diarrhea
- Stool transplant March 2018
- Normal colon but continued diarrhea life limiting

- 8 week follow up – “Doing Great”

Stool transplant

Essentially cured of diarrhea

Pictures of our stool transplant patients



Sedation

- “Optimal sedation allows the patient the greatest degree of comfort while preserving the greatest degree of safety.”

This has included patient satisfaction.

Sedation Types

	<i>Minimal Sedation Anxiolysis</i>	<i>Moderate Sedation/ Analgesia ("Conscious Sedation")</i>	<i>Deep Sedation/ Analgesia</i>	<i>General Anesthesia</i>
<i>Responsiveness</i>	Normal response to verbal stimulation	Purposeful** response to verbal or tactile stimulation	Purposeful** response following repeated or painful stimulation	Unarousable even with painful stimulus
<i>Airway</i>	Unaffected	No intervention required	Intervention may be required	Intervention often required
<i>Spontaneous Ventilation</i>	Unaffected	Adequate	May be inadequate	Frequently inadequate
<i>Cardiovascular Function</i>	Unaffected	Usually maintained	Usually maintained	May be impaired

Propofol

- Onset
 - < 1 minutes
- Duration
 - 4 to 8 minutes
 - No significant effect with liver renal failure
- Issues
 - Avoided in patients with egg soy and sulfite allergies
 - Recovery time 12 minutes verse usual 93 minutes

Risks of Anesthesia Services

- Over 3 million colonoscopies between 2008-11
 - 34.4% were with anesthesia services
 - 13% increase in risk of any complication
 - Perforation 1.07
 - Bleeding 1.28
 - Abdominal pain 1.07
 - Stroke 1.04
 - Complications from anesthesia 1.15

Propofol Safety

- 2009 study endoscopy safety, endoscopist directed
 - Review of over 600,000 endoscopist directed propofol sedation
 - No safety difference than anesthesia directed propofol sedation

Death of Michael Jackson

- June 25, 2009



2010 CMS New Guidelines

“An example of deep sedation would be a screening colonoscopy when there is a decision to use propofol, so as to decrease movement and improve visualization for this type of invasive procedure. Because of the potential for the inadvertent progression to general anesthesia in certain procedures, it is necessary that the administration of deep sedation/analgesia be delivered or supervised by a practitioner as specified in 42 CFR 482.52(a).”

42 CFR 482.52(a) is instruction for scope of care of anesthesia services.

2018 PAC Summary Data

Select a Cycle: 2018

Total Receipts	\$4,528,927
Total Spent	\$4,365,879
Begin Cash on Hand	\$434,621
End Cash on Hand	\$597,670
Debts	\$0
Independent Expenditures	\$53,000
Date of last report	December 31, 2018

2018 PAC Contribution Data

Contributions from this PAC to federal candidates (list recipients) (45% to Democrats, 55% to Republicans)	\$1,613,700
Contributions to this PAC from individual donors of \$200 or more (list donors)	\$3,563,255

Official PAC Name:
AMERICAN SOCIETY OF ANESTHESIOLOGISTS POLITICAL ACTION COMMITTEE (ASA PAC)
Location: SCHAUMBURG, IL 60173
Industry: Health Professionals; Other physician specialists
Treasurer: LISA STEININGER
FEC Committee ID: C00255752
(Look up actual documents filed at the FEC)

*Based on data released by the FEC on March 06, 2019 except for independent

2018 PAC Summary Data

Select a Cycle: 2018

Total Receipts	\$275,604
Total Spent	\$215,474
Begin Cash on Hand	\$103,938
End Cash on Hand	\$164,068
Debts	\$0
Date of last report	December 31, 2018

2018 PAC Contribution Data

Contributions from this PAC to federal candidates (list recipients) (59% to Democrats, 41% to Republicans)	\$201,500
Contributions to this PAC from individual donors of \$200 or more (list donors)	\$215,246

Official PAC Name:
AMERICAN COLLEGE OF PHYSICIAN SERVICES INC PAC; AKA ACP SERVICES PAC
Location: WASHINGTON, DC 20001
Industry: Health Professionals; Other physician specialists
Treasurer: TRACHTMAN, RICHARD ESQ
FEC Committee ID: C00403881
(Look up actual documents filed at the FEC)

*Based on data released by the FEC on March 06, 2019 except for independent expenditure and communication cost, contributions to federal candidates, and contributions from individual donor data, which were released by the FEC on February 01, 2019.

2018 PAC Summary Data

Select a Cycle: 2018

Total Receipts	\$7,788,357
Total Spent	\$7,706,807
Begin Cash on Hand	\$425,861
End Cash on Hand	\$514,553
Debts	\$1,500,000
Date of last report	December 31, 2018

2018 PAC Contribution Data

Contributions from this PAC to federal candidates (list recipients) (94% to Democrats, 5% to Republicans)	\$2,395,000
Contributions to this PAC from individual donors of \$200 or more (list donors)	\$5,272,610

Official PAC Name:
AMERICAN ASSOCIATION FOR JUSTICE POLITICAL ACTION COMMITTEE (AAJ PAC)
Location: WASHINGTON, DC 20001
Industry: Lawyers/Law Firms; Trial lawyers & law firms
Treasurer: TUREEN, HEATHER
FEC Committee ID: C00024521
(Look up actual documents filed at the FEC)

*Based on data released by the FEC on March 06, 2019 except for independent expenditure and communication cost, contributions to federal candidates, and contributions from individual donor data, which were released by the FEC on February

Costs

- Using anesthesia directed sedation
 - Cost 3.2 billion over 10 years
 - Assuming 50% use for screening colonoscopies
 - Range 2.7 – 11.9 billion saved

Joint Statement ASGE, ACG,AGA

“There are insufficient data to demonstrate that improved clinical outcomes or care quality derive from the use of capnography in adults undergoing targeted moderate sedation for upper endoscopy and colonoscopy.”

7 references given supporting no significant clinical impact on use of capnography.

ASA Standards for Basic Anesthetic Monitoring

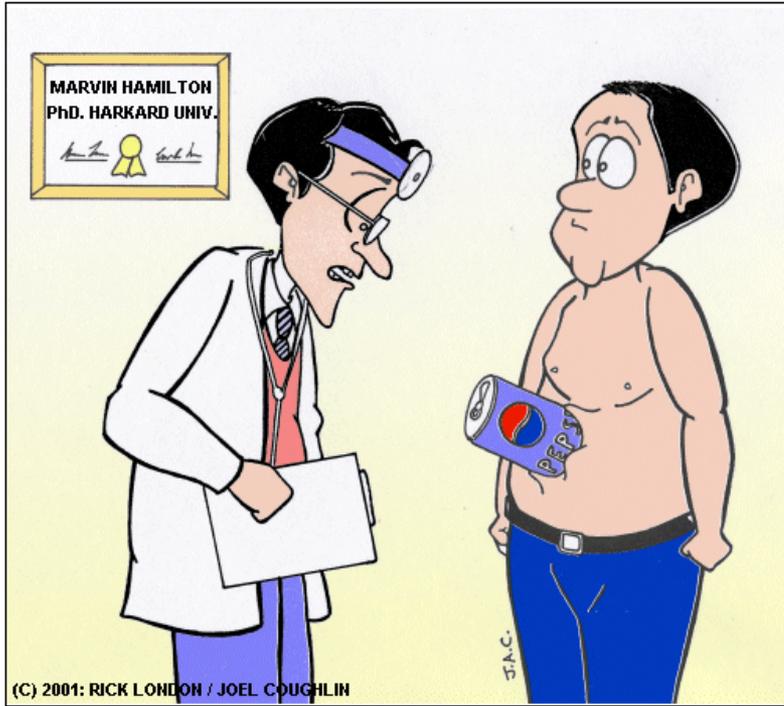
- Statement was added in Oct 2010 effective date of July 2011:

“During moderate or deep sedation the adequacy of ventilation shall be evaluated by continual observation of qualitative clinical signs and monitoring for the presence of exhaled carbon dioxide unless precluded or invalidated by the nature of the patient, procedure, or equipment.”

No reference given on effectiveness of capnography.

Obstructive Sleep Apnea Moderate Sedation

- Cardiorespiratory complications
 - 639 patients
 - OSA does not clearly increase the risk of complications
- Case control OSA patients
 - 200 patients
 - No increased risk of complications

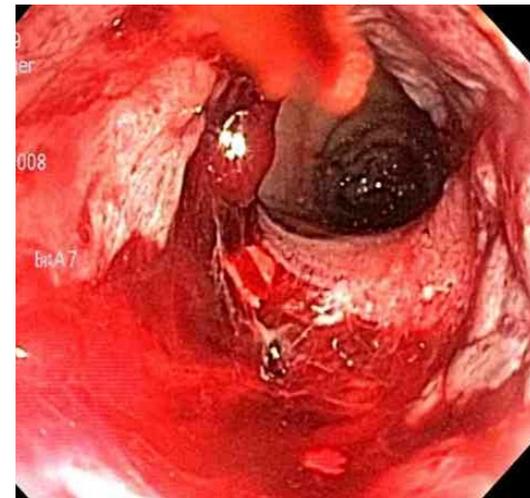


LOOKS LIKE DYSPEPSIA, RALPH



Colonoscopy

- **Cardiopulmonary**
 - Transient hypoxemia $230/100,000 = 0.23\%$
 - Other studies 6-11% of hypoxemia and 5-7% of hypotension
- **Perforation**
 - 0.01% to 0.3%
- **Hemorrhage**
 - 0.1% to 0.6%
- **Postpolypectomy Electrocoagulation Syndrome**
 - 0.003% to 0.1%
 - 1 to 5 days after procedure symptoms similar to diverticulitis
- **Death**
 - 0.007% to 0.03%

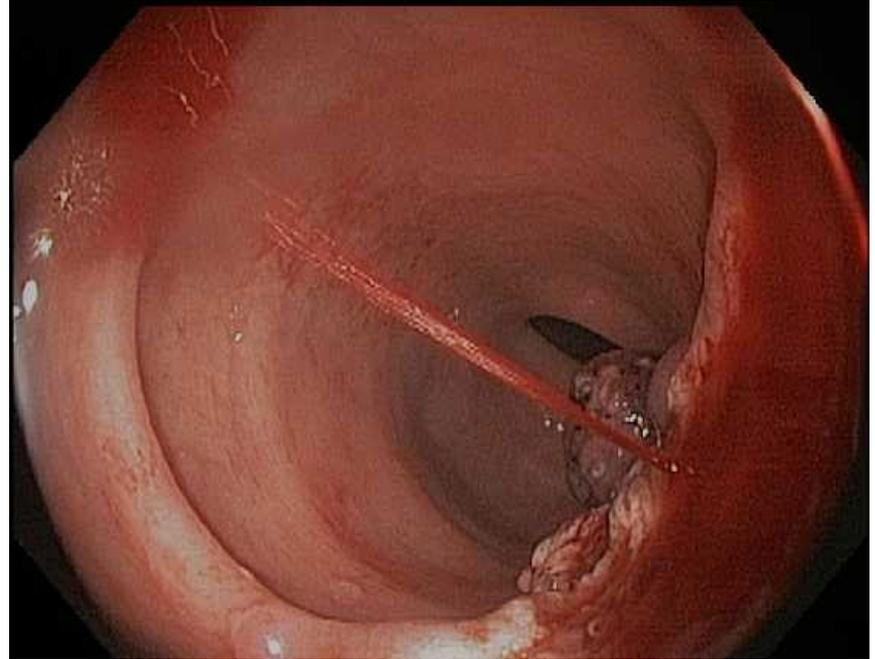


Colonoscopy Continued

- Infection
 - Transient bacteremia with polyp removal - 4%
 - Range 0%-25%
 - No recommendation for antibiotic prophylaxis
 - Still a statement for orthopedic surgery after joint replacement, retired in 2012
- Gas explosion
 - 9 reported cases

Uncommon Colonoscopy Complications

- Splenic Rupture
- Acute Appendicitis
- Diverticulitis
- Subcutaneous emphysema



Upper Endoscopy

- Perforation
 - 0.04%
- Perforation with dilation esophagus
 - Mortality 2% to 36%
 - Much lower with covered stents
- Perforation with gastric outlet obstructions
 - 7.4%
- Bleeding
 - 3% to 7% varies on location with small bowel being largest
- Stricture after mucosal ablation of esophagus
 - 2%-8%

Hemosuccus Pancreaticus

- Bleeding after FNA of pancreatic mass or liver mass



Silver Stool (Thomas Sign)

- Melena of GI bleeding and clay colored stool of jaundice
 - Obstructive mass at sphincter of oddi

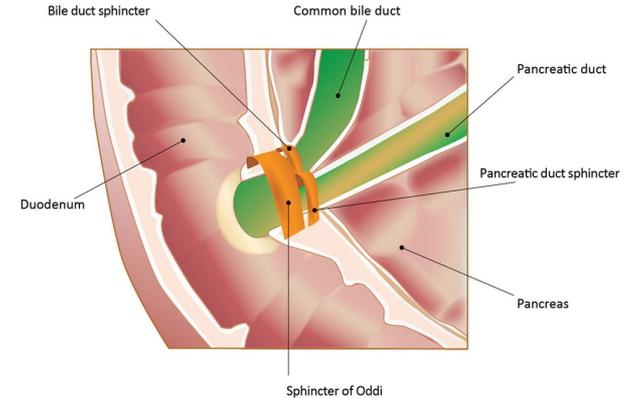


Mortality of ERCP and Cholecystectomy

- Therapeutic ERCP
 - 0.4-0.5% Mortality
- Laparoscopic Cholecystectomy
 - Case series of 1220 mortality rate 0%
 - Case series of 2117 mortality rate 0.5% (one surgeon had all the mortality)
 - 0.1% in surgical textbooks
 - Case series of 9542 mortality rate 0.1%

ERCP Adverse Events

- 9.7% risk pancreatitis largest meta-analysis
 - Since publication interventions have shown reduction
 - Increased hydration **LACTATED RINGER**
 - Indomethacin 100 mg PR
 - Increased use of pancreatic stents
 - Risk factors
 - Female
 - Age
 - Normal total bilirubin
 - History of pancreatitis

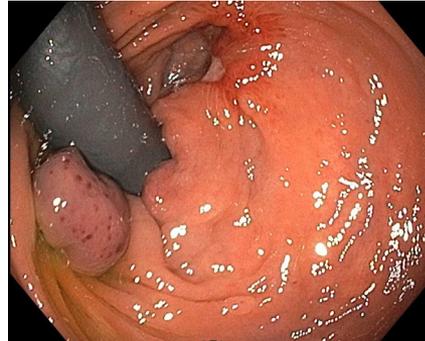
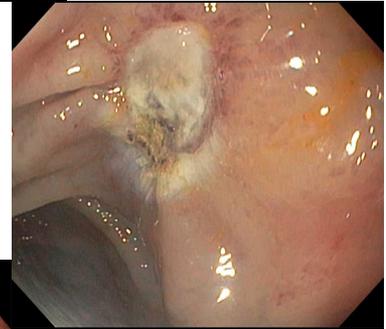
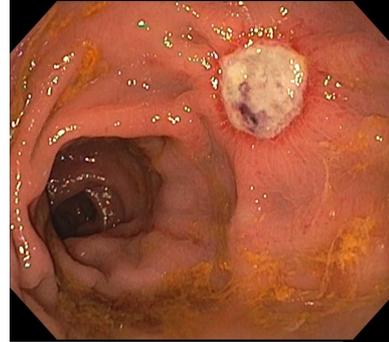


ERCP perforation



Hemorrhoids Banding

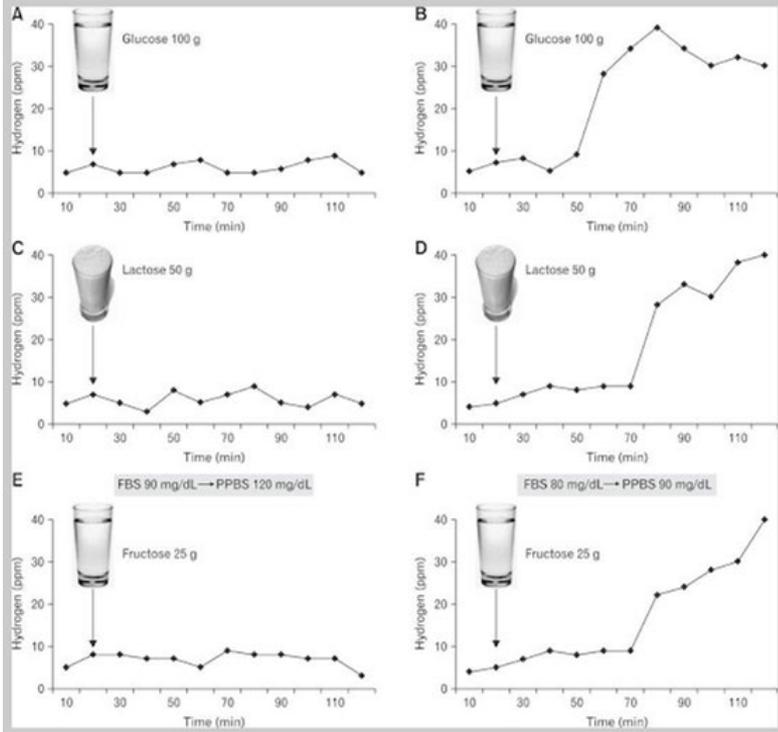
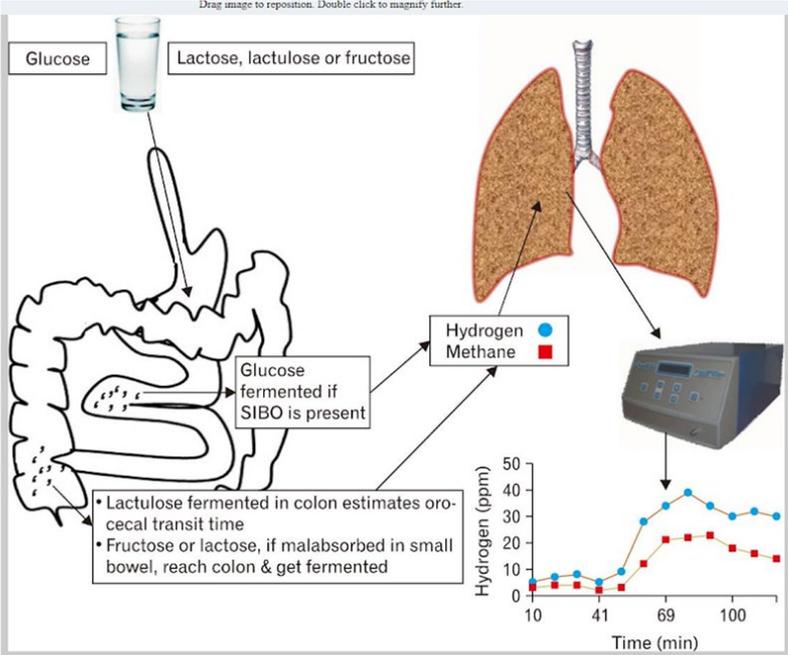
- Pain
 - Mild pain in 14% severe pain in 5.8%
 - Some newer products support no pain
- Bleeding 1.7%
- Infection 0.05%
- Fissure and or fistula 0.4%
 - Newer products advertise much lower rate



Air Embolize Uncommon

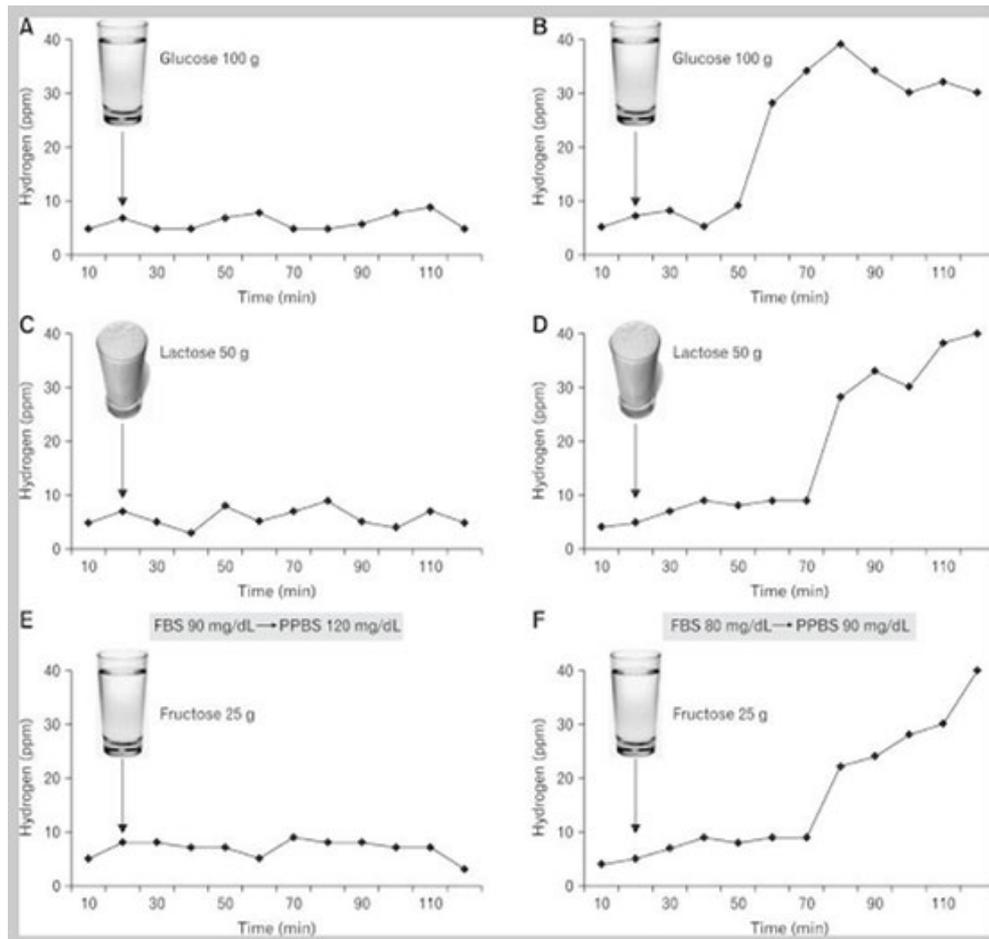
- Approximately 49 reported cases
 - High mortality upto 50% many of these prior to use of CO2 for inflation
- Cases
 - ERCP highest rate
 - Stent placement
 - Dilation
- Treatment
 - Trendelenburg, Oxygen
 - Decompression during procedure
 - Hyperbaric oxygen therapy

SIBO Testing



Testing Interpretation

- Increase of 12ppm above base
 - Glucose
 - Sensitivity 40%
 - Specificity 80%
 - Lactulose
 - Sensitivity 31%
 - Specificity 86%
 - Double Peak Lactulose Diagnostic
- Increase above 20ppm within 90m
 - Considered positive also



Testing limitations

- No gold standard as only 30% of gut bacteria are culturable
- Glucose and Lactulose may not reach end of small bowel if absorbed
- Rapid intestinal transit
- Slow intestinal transit
- Other gases produced not measured
- Positive test may not be caused by SIBO
 - Treat and follow if improved symptoms

- Methane is a marker of constipation and more difficult to test

FODMAP How it Works

- Fermentable Oligo Di Monosaccharides And Polyols
 - Oligosaccharide
 - Fructans
 - Galactooligosaccharides
 - Disaccharides
 - Lactose
 - Monosaccharides
 - Fructose
 - Polyols or sugar alcohols
 - Sorbitol mannitol xylitol

Foods suitable on a low-fodmap diet

fruit	vegetables	grain foods	milk products	other
fruit banana, blueberry, boysenberry, cantaloupe, cranberry, durian, grape, grapefruit, honeydew melon, kiwifruit, lemon, lime, mandarin, orange, passionfruit, papaw, raspberry, rhubarb, rockmelon, star anise, strawberry, tangelo <small>Note: if fruit is dried, eat in small quantities</small> 	vegetables alfalfa, bamboo shoots, bean shoots, bok choy, carrot, celery, choko, choy sum, anise, ginger, green beans, lettuce, olives, parsnip, potato, pumpkin, red capsicum (bell pepper), silver beet, spinach, squash, swede, sweet potato, taro, tomato, turnip, yam, zucchini herbs basil, chili, coriander, ginger, lemongrass, marjoram, mint, oregano, parsley, rosemary, thyme	cereals gluten-free bread or cereal products bread 100% spelt bread rice oats polenta other arrowroot, millet, psyllium, quinoa, sorghum, tapioca 	milk lactose-free milk*, oat milk*, rice milk*, soy milk* <small>*check for additives</small> cheeses hard cheeses, and brie and camembert yoghurt lactose-free varieties ice-cream substitutes gelati, sorbet butter substitutes olive oil	tofu sweeteners sugar* (sucrose), glucose, artificial sweeteners not ending in '-ol' honey substitutes golden syrup*, maple syrup*, molasses, treacle <small>*small quantities</small> 

Eliminate foods containing fodmaps

excess fructose	lactose	fructans	galactans	polyols
fruit apple, mango, nashi, pear, lined fruit, in natural juice, watermelon sweeteners fructose, high fructose corn syrup large total fructose dose concentrated fruit sources, large serves of fruit, dried fruit, fruit juice honey corn syrup, fruitsana	milk milk from cows, goats or sheep, custard, ice cream, yoghurt cheeses soft unripened cheeses eg cottage, cream, mascarpone, ricotta	vegetables artichoke, asparagus, beetroot, broccoli, brussels sprouts, cabbage, eggplant, fennel, garlic, leek, okra, onion (all), shallots, spring onion cereals wheat and rye, in large amounts eg bread, crackers, cookies, couscous, pasta fruit custard apple, persimmon, watermelon miscellaneous chicory, dandelion, inulin, pistachio	legumes baked beans, chickpeas, kidney beans, lentils, soy beans	fruit apple, apricot, avocado, blackberry, cherry, longan, lychee, nashi, nectarine, peach, pear, plum, prune, watermelon vegetables cauliflower, green capsicum (bell pepper), mushroom, sweet corn sweeteners sorbitol (420), mannitol (421), isomalt (953), maltitol (965), xylitol (967) 

Giardia

- Diagnosed it once on active duty military returning from Iraq
- Not once since moving to Montana

Cryptosporidium

- Diagnosed once on young lady taking care of sick fawn

Chronic Wasting Disease

- First showed up in Colorado in 1960's
- Transmissible spongiform encephalopathy
 - Mad cow disease
 - Prion mediated and are in all tissues of infected animals
 - Sheds prions to saliva urine and feces
- Carry disease for approximately 2 years
- Detectable visually only several months from death due to the disease

- 5% of deer have delayed presentation (5 years) due to some immunity

Cologuard®

Table 1. Sensitivity and Specificity of the Multitarget Stool DNA Test and the Fecal Immunochemical Test (FIT) for the Most Advanced Findings on Colonoscopy.

Most Advanced Finding	Colonoscopy (N = 9989)	Multitarget DNA Test (N = 9989)		FIT (N = 9989)	
		Positive Results	Sensitivity (95% CI)	Positive Results	Sensitivity (95% CI)
		<i>no.</i>	<i>no.</i>	<i>no.</i>	<i>%</i>
Colorectal cancer					
Any	65	60	92.3 (83.0–97.5)	48	73.8 (61.5–84.0)
Stage I to III*	60	56	93.3 (83.8–98.2)	44	73.3 (60.3–83.9)
Colorectal cancer and high-grade dysplasia	104	87	83.7 (75.1–90.2)	66	63.5 (53.5–72.7)
Advanced precancerous lesions†	757	321	42.4 (38.9–46.0)	180	23.8 (20.8–27.0)
Nonadvanced adenoma	2893	498	17.2 (15.9–18.6)	220	7.6 (6.7–8.6)
			Specificity (95% CI)		Specificity (95% CI)
All nonadvanced adenomas, non-neoplastic findings, and negative results on colonoscopy	9167	1231	86.6 (85.9–87.2)	472	94.9 (94.4–95.3)
Negative results on colonoscopy	4457	455	89.8 (88.9–90.7)	162	96.4 (95.8–96.9)

References

- Shen NT, et al. *Gastroenterology*. June 2017, 152(8):1889-1900.
- Multisociety Sedation Curriculum for Gastrointestinal Endoscopy, May 2012. *Gastroenterology*. 2009; 137:1229-1237.
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