27 – Helicobacter and Clostridium Difficile

Speaker: David M. Aronoff, MD

Helicobacter* and *Clostridioides difficile

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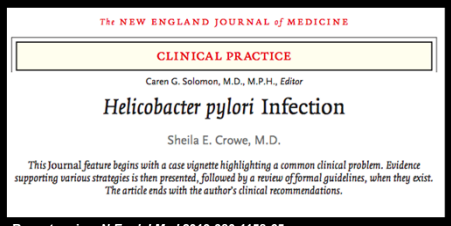
Disclosures of Financial Relationships with Relevant Commercial Interests

- **Research Grant - Pfizer (*C. difficile* pathogenesis)**

HELICOBACTER PYLORI


The NEW ENGLAND JOURNAL of MEDICINE

CLINICAL PRACTICE

Caren G. Solomon, M.D., M.P.H., *Editor*

Helicobacter pylori Infection

Sheila E. Crowe, M.D.

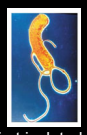
This Journal feature begins with a case vignette highlighting a common clinical problem. Evidence supporting various strategies is then presented, followed by a review of formal guidelines, when they exist. The article ends with the author's clinical recommendations.

Recent review *N Engl J Med* 2019;380:1158-65.

Microbiology: *Helicobacter pylori*

Gastric Mucosa

- Spiral-shaped
- Flagellated
- Non-invasive



First isolated in 1983

Nobel Prize (Marshall & Warren, 2005)

NEJM 362: 1597, 2010

Agar

- Slow-growing (3-7 days)
- Gram negative rod
- Microaerophilic (5% O_2)
  - Catalase +
  - Oxidase +
  - **Urease +** → **Survival**, **Colonization**, **Diagnostic testing**

Urea → CO_2 + NH_3 → ↑pH

Question #1

A young woman undergoes upper endoscopy for unexplained nausea and vomiting. The stomach appears normal. Surveillance biopsies are taken and the gastric biopsy urease test is positive. The biopsies are most likely to show:

A. Hp organisms, but no gastric or esophageal inflammation.
B. Hp organisms plus gastric inflammation (gastritis).
C. Hp organisms plus esophagitis.
D. Neither Hp organisms, nor inflammation because the urease test is often false positive with a normal endoscopy.

Question #2

What is the most likely source for humans to acquire *H. pylori* infection?

A. Perinatally from mother
B. Ingestion of raw vegetables
C. Ingestion of undercooked meat
D. Ingested tap water from a municipal source
E. Contact with infected secretions from another human

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Helicobacter pylori: Key Points

- Humans are the only natural Hp host
- Infects > 50% of the world's population
  - US ~20-40%*
- A leading chronic infection in humans
  - Similar to dental caries
- Majority are asymptomatic but all have chronic active gastritis
- Severity of gastritis varies depending on the Hp strain & the host

*At greater risk, African Americans, Hispanics, Native Americans

NEJM 380:1158-65, 2019
NEJM 362:1597, 2010
Gut 66:6, 2017

Transmission of *H. pylori*

- Exact route of transmission is not known
- Likely **fecal-oral or oral-oral**
- Intrafamilial spread – (person-to-person, esp. mother-to-child)
- Low socioeconomic status, poor sanitation, crowding associated with ↑transmission

JAMA 282:2240, 1999 & Crowe SE, UpToDate (2018)

Disease Paths for *Helicobacter pylori* Infection

Asymptomatic gastritis	85-90%
Peptic ulcer (DU, GU)	1-10%
Gastric cancer	0.1-3%
MALT lymphoma	<0.01%

DU, duodenal ulcer
GU, gastric ulcer
MALT, mucosal-associated lymphoid tissue

NEJM 347: 1175, 2002
Gut 66:6, 2017

H. pylori: Disease Associations

***H. pylori* is a World Health Organization-designated carcinogen & the strongest known risk factor for non-cardia gastric adenocarcinoma**

- #1 cause of chronic gastritis
- PUD: 90% DU, 80% GU
- MALT lymphomas (72 – 98%)
- Gastric Cancer (60 – 90%)*

Hp causal

- Iron deficiency anemia, B12 deficiency, ITP
- Eradication Hp neither causes nor exacerbates GERD
- Hp poss. **reduces** risk for Barrett's esophagus/esophageal CA

HP is classified by WHO as a Class 1 carcinogen.
MALT = mucosal-associated lymphoid tissue

Maastricht V. Gut 66:6, 2017
Kasahun GG, Infect Drug Resist 13:1567-1573, 2020
Shah SC, et al. Gastroenterology 2021;160:1831–18

Question #3

A 25-year-old African American woman complains of 6 weeks of symptoms consistent with dyspepsia unrelieved by current use of antacids & an OTC PPI.

The best approach to the diagnosis of *H. pylori* infection in this patient is:

A. Immediate Hp serology
B. Immediate Hp stool antigen EIA
C. Endoscopy with rapid urease test (RUT)
D. Immediate ^{13}C Urea Breath Test
E. D/C PPI for 2 weeks then Hp stool antigen EIA

Diagnosis of *H. pylori* Infection

Noninvasive (global)	Sensitivity	Specificity	
Urea Breath Test (^{13}C)	> 90 – 95%	> 90 – 95%	Live Hp
Stool Antigen (monoclonal)	> 90 – 95%	> 90 – 95%	Live & dead Hp
Serology	85%	79%	Detects exposure

Biopsy-based (sampling error)	Sensitivity	Specificity	
Rapid urease test	90%	95%	2-5 bx recommended
Histology	90 – 95%	95 – 98%	
Culture	73%	100%	Difficult

UBT considered 'best test'. Antigen test is usually less expensive.
Use only monoclonal stool Ag tests.
Histology requires 10^4 organisms to visualize

BMJ 344:44, 2012

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Testing Limitations for Hp

PPI
Antibiotics
Bismuth
Bleeding
} Interfere with all Hp tests

False negatives due to decreased Hp burden.
Recommend delay diagnostic testing until:

- PPI stopped for 2-4 weeks (**OTC antacids & H2RA do not affect UBT/SA testing**)
- Antibiotics, bismuth stopped for 4 weeks
- Bleeding stopped for 4-8 weeks

Crowe SE, UpToDate (2018)
Crowe SE, NEJM 380:1158-65 (2019)

Initial Diagnosis of *H. pylori* with Dyspepsia

- Stool antigen test (SAT)
- Urea Breath Test (UBT)
  - 'Test and Treat' in younger population (< 60 yo)
- Endoscopy mandatory if ≥60 years old or 'alarm symptoms or signs':
  - Unexplained iron-def anemia
  - GI bleeding
  - Unintentional weight Loss
  - Palpable mass
  - Severe abdominal pain
  - Persistent vomiting
  - Progressive dysphagia / odynophagia

Crowe SE, UpToDate (2018)
Crowe SE, NEJM 380:1158-65 (2019)

Question #4

- Which of the following is the most appropriate next step for evaluating a 29 year old previously healthy but overweight male patient with typical retrosternal heartburn symptoms?
  - A. Stool antigen test for *H. pylori*
  - B. Urea breath test for *H. pylori*
  - C. No testing for *H. pylori*
  - D. Serological testing for *H. pylori*
  - E. Empiric therapy for *H. pylori* regardless of testing

Question #5

A 23 yo woman presents with persistent epigastric discomfort diagnosed as Hp+ gastritis by endoscopy. Fecal Hp antigen is also positive. Last year she was treated with azithromycin for a respiratory tract infection. As a child, she was treated repeatedly with PCN/amoxicillin for recurrent tonsillitis.

What do you recommend for therapy?

A. Clarithromycin + amoxicillin + PPI
B. Metronidazole + erythromycin + PPI
C. Bismuth subsalicylate + TCN + metronidazole + PPI
D. Metronidazole + amoxicillin + PPI
E. PPI therapy alone given her age

Who should be treated for *H. pylori* infection?

Houston Consensus Conference on Testing for *Helicobacter pylori* Infection in the United States

Hashem B. El-Serag,[1,2] John Y. Kao,[3] Fasiha Kanwal,[1,2,] Mark Gilger,[3,4] Frank LoVecchio,[5] Steven F. Moss,[12] Sheila Crowe,[13] Adam Elfant,[11] Thomas Haas,[14] Ronald J. Hapke,[14] and David Y. Graham[1,2]

- "We recommend that all patients with active *H pylori* infection be treated"
- "Infection causes chronic progressive damage to the gastric mucosa that in 20%–25% of individuals will result in life-threatening clinical outcomes such as peptic ulcer or gastric cancer"

El-Sarag HB, *et al. Clin Gastroenterol Hepatol 2018;16:992–1002*

Who should be **tested & treated** for *H. pylori* infection?

Established Indications

- PUD (active/prior hx)
- MALT lymphoma
- Atrophic gastritis
- After gastric CA resection
- 1st degree relative w/ gastric Ca

Consider

- Non-ulcer dyspepsia*
- Use of NSAIDs/ASA
- Long-term PPI use
- Fe deficiency anemia (unexplained)
- ITP (low evidence base)
- Live in high gastric Ca region
- Asymptomatic infection**

*estimate ~10% respond
Goal: eradicate **prior to atrophy or metaplasia. Treatment reverses atrophy but not metaplasia.

Crowe SE. NEJM 380:1158-65 (2019)
Chey W, Am J Gastroenterol;114:1829–1832 (2019)

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Principles of *Helicobacter pylori* Therapy

1. Ask about abx exposure hx (clarithromycin/metronidazole/fluoroquinolones)
2. Discuss adherence
3. Use high dose PPI (BID dose; increase gastric pH>4-5)
   - *H. pylori* grows optimally at pH 6-8
   - Acidity hinders stability & activity of macrolides, amoxicillin
4. Longer (**14 days**) rather than shorter treatment courses
5. Combination drug therapy is essential
6. Consider abx resistance patterns & testing*

Outcome is determined by Hp antibiotic sensitivity, drug dosing, treatment duration & treatment compliance. Smoking inhibits therapeutic responses.

*clarithromycin, metronidazole, levofloxacin

Fallone CA, *et al. Gastroenterology.* 2016 Jul;151(1):51-69.e14

Eradication of *Helicobacter pylori*

- Triple therapy with a PPI, clarithromycin, & amoxicillin or metronidazole is **not favored** due to increased prevalence of macrolide resistance (but might still be an option on boards!)
  - Clarithromycin resistance in the US now ≥ 15%
- Use a bismuth-based **quadruple therapy** for 14 days as 1st-line therapy:
  - Bismuth subsalicylate or subcitrate
  - Tetracycline (**not** doxycycline)
  - Metronidazole
  - PPI

Shah SC, *et al. Gastroenterology* 2021;160:1831–1841
Cho J, *et al. Gastroenterol Clin N Am* 50 (2021) 261–282
Hulten KG, *et al. Gastroenterology* 2021

RIFABUTIN-Based Combinations

- 2020: The FDA approved **fixed-dose combination** of omeprazole, amoxicillin & rifabutin (Talicia) for *Hp* treatment in adults
- Omeprazole 10 mg, amoxicillin 250 mg, & rifabutin 12.5 mg
  - The recommended dosage is 4 capsules (with food) every 8 hours for 14 days.

Summary: Omeprazole/Amoxicillin/Rifabutin (*Talicia*)

- A fixed-dose, rifabutin-based, 3-drug combination FDA-approved for treatment of *Helicobacter pylori* infection.
- First rifabutin-based product to be approved for treatment of *H. pylori* infection.
- Rifabutin-based triple therapy has been used for years as a salvage regimen for treatment-refractory *H. pylori* infection.
- Approval was based on the results of two trials in treatment-naive patients; *H. pylori* was eradicated in about 80% of those treated with the combination.
- How the efficacy of *Talicia* compares to that of other regimens used for first-line treatment of *H. pylori* infection is unknown.
- Rates of *H. pylori* resistance to rifabutin have been low; whether more widespread use as part of a first-line regimen would result in higher rates of resistance remains to be established.
- Common adverse effects include diarrhea, headache, rash, and dyspepsia.
- Has the potential to interact with many other drugs.

The Medical Letter (2020)

Eradication of *Helicobacter pylori*

- Fluoroquinolone resistance is common now (>50%)
  - They are not recommended in 1st-line treatment regimens
- Resistance to amoxicillin, tetracycline & rifabutin is **uncommon**
- Clinical significance of resistance to metronidazole not straightforward

Shah SC, *et al. Gastroenterology* 2021;160:1831–1841
Cho J, *et al. Gastroenterol Clin N Am* 50 (2021) 261–282
Hulten KG, *et al. Gastroenterology* 2021

Question #6

After treatment of this patient for Hp gastritis, the *H. pylori* stool antigen test should be repeated:

A. On the final day of *H. pylori* therapy
B. Two weeks after completion of *H. pylori* therapy
C. Eight weeks after completion of *H. pylori* therapy
D. The test should not be repeated to assess cure

Management Issue: **Test of cure** for *H. pylori* Infection

- Stool antigen test Perform ≥ 4 weeks post-rx*
- Urea Breath Test Perform ≥ 4 weeks post-rx.

Some recommend testing 6-8 wks post-rx.

Endoscopy required if gastric ulcer, for example.

*FDA-approved

Maastricht V. Gut 66:6, 2017

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KEY TAKE AWAYS

DIAGNOSIS:

- In most: Stool Hp antigen test, UBT
- If ≥60 years old or alarm symptoms / signs then endoscopy is mandatory

KEY TAKE AWAYS

TREATMENT:

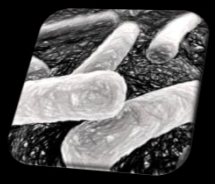
- Quadruple therapy favored over triple therapy
- Increasing emphasis on antibiotic resistance testing
  - Fecal or biopsy **genotypic** testing for clarithromycin, FQ
  - MIC testing for clarithromycin, nitroimidazole, FQ resistance
  - Challenging

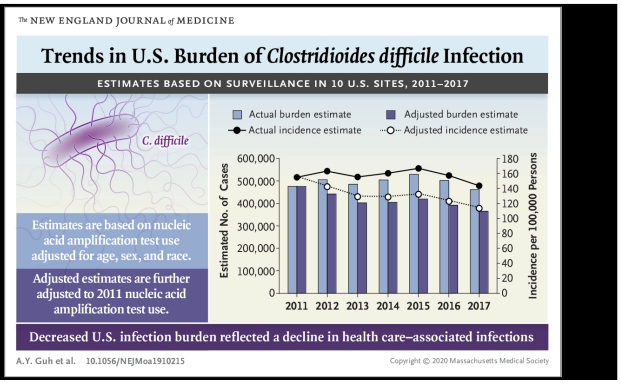
KEY TAKE AWAYS

FOLLOW UP:

- TOC mandatory (stool Hp antigen test, UBT)
- At least 4 weeks after completion of therapy

CLOSTRIDIOIDES DIFFICILE





Antibiotic-associated Diarrhea (AAD)

- Common
  - In 5-25% of antibiotic treatment courses especially with > 3 days of Abx but one dose is sufficient
- 10-40% of AAD is associated with *C. difficile* infection (CDI) but nearly all AA **colitis** is CDI
- Disruption of colon microbiome & bile acid physiology are key mechanisms

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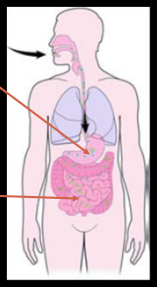
Pathogenesis of CDI

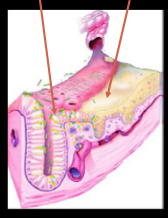
1. **CDI spores** survive in the environment for long periods of time. Following ingestion, they traverse the acidic environment of the stomach.

2. Spores germinate within the intestine.



3. Altered lower intestine flora (due to antimicrobial use) allows proliferation of *C. difficile* in colon.

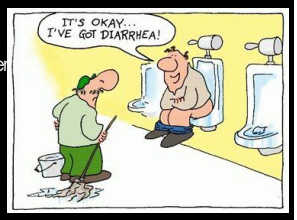
4. Toxin A & B Production leads to colon damage +/- pseudomembrane.



Slide adapted from CDC.gov. Sunenshine & McDonald Cleve Clin J Med 2006; 73(2):187-197.

Common Clinical Manifestations

- Watery & mucusy diarrhea up to 10 - 15 times daily
- Lower abdominal pain & cramping
- Low grade fever (15%+)
- Leukocytosis (> 15,000 cells/µl = sever
- Nausea
- Anorexia
- Malaise

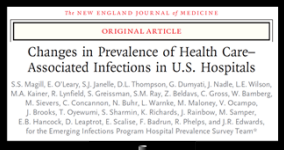


Complications of CDI

- Sepsis ± multiple organ dysfunction
- Megacolon: need for surgical intervention
  - Colectomy
  - Loop ilios tomy
- Bowel Perforation
- Lack of treatment response
- Recurrent infection (20%+)
  - Relapse
  - Reinfection

Epidemiology of CDI

2015



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ORIGINAL ARTICLE

Changes in Prevalence of Health Care–Associated Infections in U.S. Hospitals

S.S. Magill, E. O'Leary, S.J. Janelle, D.L. Thompson, G. Dumyati, J. Nadle, L.E. Wilson, M.A. Kainer, R. Lynfield, S. Greissman, S.M. Ray, Z. Beldavs, C. Gross, W. Bamberg, M. Sievers, C. Concannon, N. Buhr, L. Warnke, M. Maloney, V. Ocampo, J. Brooks, T. Oyewumi, S. Sharmin, K. Richards, J. Rainbow, M. Samper, E.B. Hancock, D. Leaptrot, E. Scalise, F. Badrun, R. Phelps, and J.R. Edwards, for the Emerging Infections Program Hospital Prevalence Survey Team*

Magill S, *et al. NEJM* 2014;370:1198-208

Photo from http://www.mckeeassociates.com/blog/2013/03/healthcare-associated-infections-plague-cr

Top Causative Pathogens	% of HAI	Rank
C. difficile	15	1
S. aureus	11	2
E. coli	10	3
Candida spp.	6	4
Enterococcus spp	5	5
Enterobacter spp.	5	6
P. aeruginosa	5	7
K. pneumo/oxytoca	5	8
Streptococcus	5	9

Major Risk Factors for Acquisition of CDI

1. **Antibiotic use**
   - Disruption of microbiome
2. **Recent hospitalization or LTCF**
   - Increased exposure
   - Co-morbidities reduce immunity or alter microbiome
3. **Age > 65 years**
   - Reduced gastric acidity
   - Impaired immunity
   - Altered microbiome

REMEMBER:
Even healthy people in the community without antibiotic exposure can get CDI

Dubberke E, *et al. Infect Control Hosp Epidemiol* 2011;32(4):360-366
Pacheco & Johnson. *Curr Opin Gastroenterol* 2013, 29:42-48
Loo V, *et al. NEJM.* 365;18

Minor Risk Factors for Acquisition of CDI

4. Gastric acid suppression (**proton pump inhibitor**)
   - Reduced biochemical defense
   - Altered microbiome
5. Abdominal surgeries
   - Altered microbiome
6. Immunocompromised host
   - Impaired mucosal immunity
   - Altered microbiome

McFarland LV. *Curr Opin Gastroenterol.* 2009 Jan;25(1):24-35
Dubberke E, *et al. Infect Control Hosp Epidemiol* 2011;32(4):360-366
Pacheco & Johnson. *Curr Opin Gastroenterol* 2013, 29:42-48

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CDI Severity

- **Leukocytosis**
- **AKI**
- **Sepsis/shock**
- **Megacolon**

Stool frequency is not part of severity assessment

Clinical Definition	Supportive Clinical Data
Nonsevere	Leukocytosis with a WBC count of ≤15,000 cells/mL and a serum creatinine level <1.5 mg/dL
Severe	Leukocytosis with a WBC count of ≥15,000 cells/mL or a serum creatinine level >1.5 mg/dL
Fulminant	Hypotension or shock, ileus, megacolon

Table from Wilcox M, *IDSE* (2018)
McDonald LC, *et al. Clin Infect Dis.* 2018 Mar 19;66(7):987-994

C. difficile Diagnostic Testing

Whom to test?

Appropriate epidemiology/ill with diarrhea/endoscopic findings

No laxatives within last 48 hrs

Test diarrheal stools (unless ileus). *One stool.*

>3 liquid stools over 24h

Only test specimens if patient > 1 year old

McDonald LC, *et al. Clin Infect Dis.* 2018 Mar 19;66(7):987-994

C. difficile Diagnostic Testing

Simplified approach:

Diarrhea* + **Toxigenic *C. difficile* &/or toxin in stool** → **TREAT**

*No laxatives or other obvious causes

C. difficile Diagnostic Testing

Nucleic acid amplification test (NAAT; PCR):

Detects the gene for toxin B

Advantages

- High sensitivity
- Rapid
- Relatively inexpensive

Disadvantages

- Does not detect actual toxin
- Cannot differentiate colonization from infection

Patient selection is critical

C. difficile Diagnostic Testing

Glutamate dehydrogenase (GDH) antigen EIA:

Detects *C. difficile* bacteria by secreted antigen

Advantages

- High sensitivity
- Rapid
- Relatively inexpensive

Disadvantages

- Does not detect toxin
- Detects NON-toxigenic strains
- Cannot differentiate colonization from infection

Must be combined to test for toxin (NAAT or EIA)

C. difficile Diagnostic Testing

Toxin A/B detection by EIA:

Detects *C. difficile* toxin(s) directly

Advantages

- Good specificity
- Rapid
- Relatively inexpensive

Disadvantages

- Poor sensitivity
- False positives possible

Usually used in a 2-step protocol with NAAT or GDH

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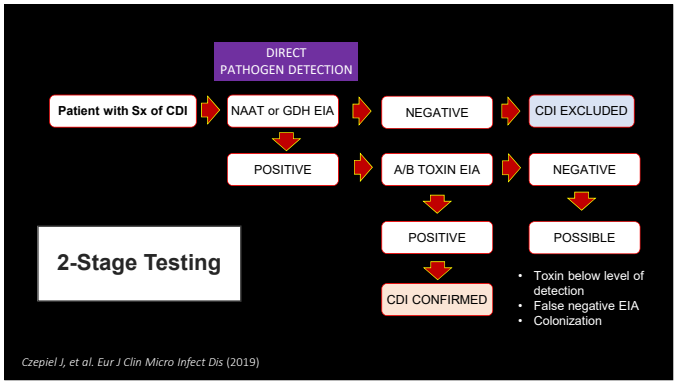

CDI TAKE AWAYS

Careful selection of patients for testing, especially with NAATs, is extremely important

Only patients with diarrhea (≥3 stools in ≤24 hrs)

NO formed or soft stools (unless ileus)

NO 'Test of Cure'

Question #7

- 67 year old woman develops diarrhea while hospitalized for community acquired pneumonia. She is afebrile, her WBC count is 12,000/μl, creatinine is 1.2 mg/dl (baseline 1.0 mg/dl) and she is experiencing 12 small loose stools daily with abdominal cramping. Stool PCR is positive for *C. difficile* toxin B. Which of the following therapies is recommended?
  - Metronidazole 500 mg po TID x 10 days
  - Vancomycin 500 mg PO qid x 10 days
  - Vancomycin 125 mg PO qid x 10 days
  - Bezlotoxumab + vancomycin x 10 days
  - Fidaxomicin 200 mg PO BID + metronidazole 500 mg PO TID x 10 days

Therapy of CDI

- D/C antibiotics/change to 'lower risk abx'
- No antiperistaltics
- This is a time of transition for treatment guidelines
- Recurrent CDI occurs in **≥1 in 5** patients

McDonald LC, *et al. Clin Infect Dis.* 2018 Mar 19:66(7):987-994
Kelly CR, *et al. Am J Gastroenterol* 2021;00:1–24
Poylin V, *et al. Dis Colon Rectum* 2021; 64: 650–668

Therapy of CDI

Table 1. Recommendations for the Treatment of *Clostridium difficile* Infection in Adults

Clinical Definition	Supportive Clinical Data	Recommended Treatment[a]
Initial episode, non-severe	Leukocytosis with a white blood cell count of ≤15 000 cells/mL and a serum creatinine level <1.5 mg/dL	**VANCOMYCIN 125 mg po QID x 10 d** **FIDAXOMICIN 200 mg po BID x 10 d**
Initial episode, severe[b]	Leukocytosis with a white blood cell count of ≥15 000 cells/mL or a serum creatinine level >1.5 mg/dL	
Initial episode, fulminant	Hypotension or shock, ileus, megacolon	• VAN, 500 mg 4 times per day by mouth or by nasogastric tube. If ileus, consider adding rectal instillation of VAN. Intravenously administered metronidazole (500 mg every 8 hours) should be administered together with oral or rectal VAN, particularly if ileus is present.

No more metronidazole
(unless mild disease, in young person, +/- cost constraints)

McDonald LC, *et al. Clin Infect Dis.* 2018 Mar 19:66(7):987-994
Kelly CR, *et al. Am J Gastroenterol* 2021;00:1–24
Poylin V, *et al. Dis Colon Rectum* 2021; 64: 650–668

Recurrent CDI

Table 1. Recommendations for the Treatment of *Clostridium difficile* Infection in Adults

Clinical Definition	Supportive Clinical Data	Recommended Treatment[a]
First recurrence	…	• VAN 125 mg given 4 times daily for 10 days if metronidazole was used for the initial episode, OR • Use a prolonged tapered and pulsed VAN regimen if a standard regimen was used for the initial episode (eg, 125 mg 4 times per day for 10–14 days, 2 times per day for a week, once per day for a week, and then every 2 or 3 days for 2–8 weeks), OR • FDX 200 mg given twice daily for 10 days if VAN was used for the initial episode
Second or subsequent recurrence	…	• VAN in a tapered and pulsed regimen, OR • VAN, 125 mg 4 times per day by mouth for 10 days followed by rifaximin 400 mg 3 times daily for 20 days, OR • FDX 200 mg given twice daily for 10 days, OR • Fecal microbiota transplantation[c]

McDonald LC, *et al. Clin Infect Dis.* 2018 Mar 19:66(7):987-994
Kelly CR, *et al. Am J Gastroenterol* 2021;00:1–24
Poylin V, *et al. Dis Colon Rectum* 2021; 64: 650–668

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Recurrent CDI

- Bezlotoxumab, a monoclonal antibody directed against toxin B produced by C. difficile, has been approved as adjunctive therapy for patients who are receiving antibiotic treatment for CDI & who are at high risk for recurrence
- ≥65 years old with >1 additional risk factor:
  - Experiencing 2nd episode of CDI within 6 mo
  - Immunocompromised, or severe CDI

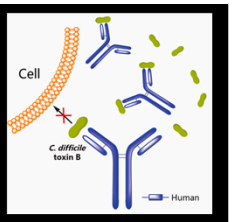

Figure from http://en.pharmacodia.com/web/drug/1_9806.html
McDonald LC, *et al. Clin Infect Dis.* 2018 Mar 19;66(7):987-994
Kelly CR, *et al. Am J Gastroenterol* 2021;00:1–24.
Poylin V, *et al. Dis Colon Rectum* 2021; 64: 650–668

Prevention of *C. difficile* Disease (HCW & visitors)

Contact precautions for patient care.

Gloves, gowns while diarrhea persists.

Single rooms

Handwashing with SOAP & WATER

Alcohol gel rubs do not kill *Cd* spores

Sporocidal solutions for hospital cleaning.

(eg. hypochlorite solutions)

Antibiotic restriction policies

(Antimicrobial stewardship programs).

Lancet ID 17:194, 2017 Scotland
Lancet ID 17:411, 2017 England

CDI **TAKE AWAYS**

Epidemiology
- Most CDI is health-care associated

Diagnosis
- Need to demonstrate toxin B in stool with NAATs, EIA
- Send only unformed stools when diarrhea meets CDC definition

Treatment: Primary or Recurrent CDI
- Vancomycin & fidaxomicin > Metronidazole
- Bezlotoxumab & fidaxomicin associated with lower risk for recurrent CDI
- Consider FMT for second or more recurrence

Prevention
- Hand wash as alcohol gels ineffective
- Bleach
- Antimicrobial Stewardship Programs

New Guidelines 2021

Clinical Practice Guideline by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA): 2021 Focused Update Guidelines on Management of *Clostridioides difficile* Infection in Adults[1]

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Clinical Infectious Diseases 2021

Thank you

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