Lower Gastrointestinal Bleeding
Gary Silber

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Lower Gastrointestinal Bleeding

Gary Silber, MD*

The questions below should help focus the reading of this article.
1. What are causes of false positive or false negative test results for blood in stools?
2. Which conditions are most commonly associated with lower intestinal bleeding in different age groups?
3. What are the clinically significant features of juvenile intestinal polypos?
4. Which conditions are most likely to cause major lower gastrointestinal bleeding?

Finding blood in the stool of an infant or child can be very alarming to parents. Fortunately, it is not necessarily a sign of serious illness. The spectrum of disease to be considered in the case of infants and children is markedly different from that of adults. Rarely does lower gastrointestinal bleeding portend malignancy.

During the past 25 years, our ability to identify the source of a patient's bleeding has improved markedly. Previously, 20% to 50% of infants and children with blood in their stools remained undiagnosed. Today, we are able to diagnose or at least localize the bleeding site in over 90% of cases.

The differential diagnosis of lower gastrointestinal bleeding is extensive, but can be greatly facilitated by taking into account the patient's age (Table 1). Furthermore, the character of the bleeding, the volume of blood lost, and the absence or presence of associated symptoms can also aid in identifying both the cause and the diagnostic work-up needed. This paper focuses only on lower gastrointestinal sources of bleeding. Discussion of other causes, such as gastritis, esophagitis, peptic ulcer disease, and esophageal varices, should be sought elsewhere.

Is it really blood?
Before beginning an expensive and possibly invasive work-up, confirmation that blood is being passed and an attempt to categorize the source, if possible, as the upper or lower intestinal tract should be made.

Blood in the stool can vary in appearance from bright red to tarry black. Hematochezia is the passage of bright red blood, and melena refers to the passage of dark tarry stools. Certain foods and medicines may cause the stool to appear bloody or to test positive for blood (Table 2). In the majority of hospitals, guaiac, benzidine, or benzidine derivative test pads (Hemocult or Hemotest) are used to detect blood. These tests use a hydrogen peroxide developer and are based on the peroxidase activity of hemoglobin and its derivatives, including oxyhemoglobin, reduced hemoglobin, methemoglobin, and carboxyhemoglobin. In the presence of hydrogen peroxide, these substances catalytically oxidize substrates such as guaiac or benzidine. This oxidation produces a color change in the substrate, thereby indicating a positive reaction.

Even though this test is the basis for our determination of blood in the stool, there are other problems with it. The amount of blood required to yield a positive reaction varies as a result of differences in fecal hydration, hemoglobin degradation, and the presence of certain substances that inhibit the oxidation of the indicator dye. False negative results can be obtained if the patient is ingesting large doses of ascorbic acid or if intestinal bacteria have degraded the hemoglobin to porphyrin. False positive results can be obtained if the patient has eaten rare red meat or peroxidase-containing fruits and vegetables, such as broccoli, radishes, cauliflower, cantaloupe, or turnips.

Hemoquant is a test being marketed that appears to be more sensitive than other available testing methods. This test is an assay based on heme-derived porphyrin, and it quantifies both total fecal hemoglobin and that fraction of hemoglobin that has been converted to porphyrin by intestinal flora. Its use is dictated by cost and the need for exactitude.

Upper vs lower gastrointestinal tract bleeding
Once it has been established that a child has experienced intestinal bleeding, localization of the bleeding site as in the upper or lower gastrointestinal tract is important. Bright red blood that coats but is not mixed with the stool is most likely to indicate bleeding from the anorectal area. Blood that is darker in color or more intimately mixed with the feces indicates a bleeding site higher in the intestinal tract. Black tarry stools are generally indicative of bleeding sites

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TABLE 1. Differential Diagnosis of Lower Gastrointestinal Bleeding

<table>
<thead>
<tr>
<th>Newborn (Birth to 1 mo)</th>
<th>Infant (1 mo to 2 y)</th>
<th>Preschool (2 to 5 y)</th>
<th>School Age (&gt;5 y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swallowed m....</td>
<td>Hirschsprung disease</td>
<td>Juvenile polyp</td>
<td>Inflammatory bowel disease</td>
</tr>
<tr>
<td>Necrotizing enterocolitis</td>
<td>Anal fissure</td>
<td>Infectious colitis</td>
<td>Hemolytic uremic syndrome</td>
</tr>
<tr>
<td>Malrotation with volvulus</td>
<td>Allergic colitis</td>
<td>Meckel diverticulum</td>
<td>Hinchon-Schoenlein purpura</td>
</tr>
<tr>
<td>Hirschsprung disease</td>
<td>Intussusception</td>
<td>Hemolytic uremic syndrome</td>
<td>Juvenile polyp</td>
</tr>
<tr>
<td>Coagulopathy</td>
<td>Meckel diverticulum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allergic colitis</td>
<td>Intestinal duplication</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infectious colitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lymphophodular hyperplasia</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TABLE 2. Food and Medicines Giving Stool A Bloody Appearance

- Flavored gelatin
- Chocolate
- Kool-Aid
- Iron
- Antibiotics (Amoxicillin)
- Bismuth preparations (Pepto-Bismol)
- Beets
- Red licorice

from the duodenum into the stomach occurs.

After confirmation of a lower gastrointestinal bleeding site, an attempt must be made to determine an etiology. In taking the patient history, the determination of the degree of blood seen can be helpful in planning the diagnostic work-up. Rectal bleeding can be a one-time phenomenon, or it can occur intermittently or daily and vary from occasional streaks of blood to massive hemorrhage. Anal fissures, lymphoidular hyperplasia, and juvenile colonic polyps usually will only produce minimal evidence of bleeding. However, Meckel diverticula, duplications, and autoamputated colonic polyps are associated with major bleeding.

The presence of associated conditions and other signs and symptoms can also be important. For instance, a history of acute or chronic symptoms may suggest inflammatory bowel disease. Anorectal pain may imply an anal fissure or proctitis, but abdominal pain associated with bleeding would suggest an ischemic process. An infectious etiology would need to be ruled out if there were associated diarrhea, vomiting, and fever.

Numerous physical signs can also help direct the physician’s investigation. Abnormal rashes, purpura, or buccal mucosal discolorations may suggest inflammatory bowel disease, Hinchon-Schoenlein purpura, or Peutz-Jeghers polyposis syndrome. Abdominal examination may reveal marked tenderness, with or without a palpable mass, suggesting an ischemic process or intussusception.

During a rectal examination, a polyp may be palpable, and stool can be obtained for microscopic examination after it is stained with methylene blue. If leukocytes are present, a bacterial infection or inflammatory bowel disease would have to be ruled out.

The utilization of radiographic studies as well as endoscopic evaluation also have a role in the diagnostic work-up. If the patient’s problem suggests an obstructive or ischemic process, plain films of the abdomen followed by barium enema may be indicated. However, one should realize that the ability to obtain reliable stool cultures will be compromised by this procedure, and any endoscopic or scintigraphic evaluation will be delayed. In many instances, especially in the case of colonic polyps and inflammatory bowel disease, endoscopic evaluation is the procedure of choice (Fig 1).

To simplify the differential diagnosis, it is helpful to divide the pediatric population into the newborn period (less than 1 month of age), infancy (1 month to 2 years of age), preschool years (2 to 5 years of age), and school-age period (more than 5 years of age).

DISEASE ENTITIES ACCORDING TO AGE

Newborn Period

Rectal bleeding in the newborn period is not a common finding. Here, it must be confirmed that the blood is fetal in origin and not swallowed maternal blood (melena neonatorum). This can be done by performing the Apt/Downey test. In this test, stool is mixed with sodium hydroxide. A color change signifies the presence of maternal blood. The test is based on the conversion of oxyhemoglobin to alkaline globin hematin when mixed with alkali. Fetal hemoglobin is much more resistant to denaturation than maternal blood and will not undergo any color change. The stools to be tested must be grossly bloody (red) and not tarry; tarry stools indicate that the oxyhemoglobin has already been converted to hematin.

Serious entities signified by blood in the stool during the newborn period include necrotizing enterocolitis,
Hirschsprung disease with enterocolitis, and malrotation with an associated volvulus. Necrotizing enterocolitis is associated generally with prematurity. Affected infants have an average birth weight of 1500 g and a mean gestational age of 30 to 32 weeks. However, 10% of all cases of classical necrotizing enterocolitis do occur in full-term infants. Current practice emphasizes prompt recognition, aggressive monitoring, and early treatment to minimize morbidity and mortality. The first symptoms are usually seen between the third and tenth day of life, and they include temperature instability or apnea and bradycardia—all nonspecific signs of sepsis. Signs more specific to the gastrointestinal tract may then arise, including abdominal distention, increased gastric residuals, and gastrointestinal bleeding either in the form of guaiac positive or grossly bloody stools. Physical examination may reveal decreased bowel sounds, abdominal tenderness, and abdominal wall erythema. The initial laboratory evaluation should include a complete blood count with differential and platelets, the measurement of arterial blood gas, and cultures of blood, urine, and stool. Radiologic examination of the abdomen in the anteroposterior manner may show pneumatosis intestinalis, the hallmark radiologic finding of the disease. Medical or surgical management proceeds according to the severity and course of the disease.

Malrotation with midgut volvulus is most commonly seen during this period, and constitutes a surgical emergency. Newborns initially experience bilious vomiting, abdominal distention, and sometimes melena. Melena is present only in 10% to 20% of cases, and it signifies that vascular compromise has already occurred to some degree. The newborn in this case is usually well and suddenly develops symptoms. Radiographs may show a paucity of bowel gas. Depending on clinical status, the newborn may go directly to surgery. Otherwise, a definitive diagnosis can be made by either a barium enema localizing the cecum or an upper gastrointestinal series to examine duodenal size, location of the ligament of Treitz, and malrotation of the jejunum. Once the diagnosis is made, surgical correction is performed.

Hirschsprung disease with enterocolitis may occur in the newborn period with gastrointestinal bleeding. In a recent survey of more than 2000 infants and children with Hirschsprung disease, most of whom were neonates or infants, 24% had enterocolitis. However, the risk of enterocolitis remains high until 6 months of age. The diagnosis of Hirschsprung disease should be considered in any newborn who does not pass meconium in the
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first 24 to 48 hours of life. Common symptoms in those patients with enterocolitis include abdominal distention, diarrhea, and fever. Only one quarter of the patients have blood in their stools.

Historically, the barium enema (Fig 2) has been used to screen for Hirschprung disease. However, this study can be misleading, especially in newborns, because marked dilatation proximal to the aganglionic segment may not have had time to develop. Today, many institutions are using rectal motility studies to determine which patients need further study. The definitive diagnosis is made by rectal biopsy showing the complete absence of ganglion cells in the Meissner and the Auerbach plexus. Histochmical staining for acetylcholinesterase activity has been reported to be beneficial in diagnosis.

The treatment of Hirschprung disease usually involves surgical correction. In most cases, a diverting colostomy is created followed by a second stage intestinal pull-through technique of fully innervated intestine.

Finally, another cause of rectal bleeding in this age group is a coagulopathy. This can be the result of infection, platelet dysfunction or vitamin K deficiency. With this problem one may also see petechiae, or ecchymotic areas on the newborn.

One Month To Two Years of Age

In this age group, both very benign and very serious lesions may be associated with lower gastrointestinal bleeding. These range from anal fissures and lymhnodular hyperplasia to intussusception and Meckel diverticulum. Furthermore, one should not forget that, except for necrotizing enterocolitis, congenital diseases (especially Hirschprung disease) need to be considered.

Anal fissures are the most common cause of lower gastrointestinal bleeding, although statistics concerning the actual incidence of the condition are difficult to obtain, because most cases go unreported. One group of researchers reported that 17% of all children with gastrointestinal bleeding studies had a fissure, the vast majority of whom were less than 1 year of age. In most cases, fissures are secondary to constipation. Constipation may result following the passage of a large firm stool that causes a superficial tear of the squamous cell-lined anal canal. Because this area is extremely sensitive, the patient experiences more pain with each bowel movement. The child reacts by withholding stool, thereby increasing constipation and pain and initiating a vicious cycle. Diagnosis is made on the basis of the patient's history and inspection of the anal canal, especially its posterior aspect. Treatment usually consists of stool softeners and warm sitz baths. In more severe cases, topical analgesic ointments may be used; however, a high incidence of sensitization should preclude general or chronic use.

The pediatrician should always also keep in mind that anal fissures, regardless of the age group and especially in boys, may be the result of sexual abuse. Careful questioning should be done to rule out this possibility. Internal examination may be required.

Milk- or soy-induced enterocolitis usually occurs during the first month of life or shortly thereafter. The prevalence of this condition has been reported to be between 0.2% and 7.5%, with one group in England reporting it as the most common cause of infantile colitis. Enterocolitis can also develop in the breast-fed baby.

Manifestations may be acute or insidious. Acute manifestations include vomiting and diarrhea, possibly stained with blood. These symptoms commonly develop 12 to 48 hours after the introduction of formula. More insidious symptoms include abdominal pain, persistent diarrhea of moderate severity, blood in the stools, and failure to thrive.

The diagnosis of this condition is clinical, based on a dietary oral-elimination challenge test. Laboratory tests are usually not helpful. Proctoscopy or small bowel biopsy may be beneficial. Hematochezia is usually associated with frank colitis. Grossly, the colonic mucosae can appear erythematous and friable; microscopically, infiltrates of polymorphonuclear cells, plasma cells, and eosinophils can be seen in the lamina propria. Goldman set up criteria to make this diagnosis, consisting of three consecutive challenge tests (Table 3). However, because it is very difficult to get parents to agree to repeat testing, many clinicians use only one challenge.

Treatment for protein sensitivity usually consists of placing the infant on a casein-hydrolysatc formula. In unusual cases, the introduction of solids may result in other sensitivity reactions and so should be undertaken with caution. Cow milk and soy protein sensitivity usually resolves by 2 years of age, at which time the child can be placed on a totally nonrestrictive diet.

During late infancy, intussusception, Meckel diverticulum, and (less commonly) duplications of the small intestine need to be considered as causes of lower gastrointestinal bleeding.

Idiopathic intussusception may occur in children 3 months to 3 years of age and usually occurs in patients 4 to 10 months of age, with 65% of cases occurring before 1 year of age and 80% by 2 years of age. The cause of idiopathic intussusception is unknown. The vast majority of cases occurs in the region of the ileocecal valve, and no lead point can be identified. In an older child, a lead point—such as a polyp, Meckel diverticulum, or a hypertrophied lymphoid patch—is more likely to be found. Lymphosarcoma must also be considered in patients who experience symptoms after the age of 6 years.

Typically, intussusception is indicated when healthy, well-nourished infants are awakened from sleep by
Fig 3. Intussusception. Barium enema showing coiled spring appearance of intestine on evacuation.

Severe abdominal pain. They will draw up their legs and subsequently vomit. They may then pass a normal stool and show marked improvement. Shortly thereafter, however, pain reappears that lasts a couple of minutes and recurs at regular intervals. Eventually, the infants will become pale, apathetic, and diaphoretic, and may pass stools mixed with blood and mucus. These stools may be currant jelly in color because of this mixture; however, this is not a consistent finding. Hematochezia may not occur if symptoms have been present less than 12 hours. In many cases, physical examination may help to determine that a sausage-shaped abdominal mass can be palpated on the right side. Plain radiographs may show evidence of obstruction, but they are relatively insensitive early in the course of this condition. Diagnosis is confirmed by barium enema, which may also be therapeutic (Fig 3).

In fact, barium enema examination delivering hydrostatic pressure may resolve the episode entirely. Studies indicate that this is successful in 75% of cases. If this approach fails, laparotomy is warranted. Recently, studies from Japan have shown good results with air reduction of intussusception, and this technique is now being used in the United States on a limited basis. Additionally, a recent report details the use of normal saline hydrostatic enema.

Meckel diverticulum may be found in this age group as well as in the preschool child with either intermittent bleeding or massive gastrointestinal bleeding. Meckel diverticulum is the result of incomplete obliteration of the omphalomesenteric duct, and it is usually located within 100 cm of the ileocecal valve. This condition may be totally asymptomatic or cause complications, such as hemorrhage or intestinal obstruction. In those patients having complications, 60% are less than 2 years of age and more than 30% are less than 1 year of age.

In most cases, the cause of bleeding is ectopic gastric mucosae within the diverticulum. Acute production here causes ulceration opposite or adjacent to the orifice of the diverticulum. The bleeding is usually painless and can vary from being minimal recurrent episodes of hematochezia to a massive shock-producing hemorrhage. The diverticulum can be confirmed by performing a 99m technetium pertechnetate or Meckel scan, a study based on the affinity of the radioisotope for gastric mucosae. The accuracy of this study can be improved if the infant is given H-2 histamine antagonists for 24 to 48 hours before the test. False positive results have been reported in patients with intussusception, hydrophobia, arteriovenous malformations, and inflammatory bowel disease. At times, an exploratory laparotomy may be the only way to confirm a suspected Meckel diverticulum.

All symptomatic Meckel diverticuli should be excised surgically. Because bleeding usually stops spontaneously, patients with massive hemorrhage can be stabilized before surgery.

Duplications of the small intestine are uncommon, but they can cause lower gastrointestinal bleeding. Such duplications are usually found in the ileum as long tubular crypts that give an appearance of doubling over of the intestine. They usually connect with the bowel at their distal end and may contain gastric mucosae, causing peptic ulceration of the intestine and subsequent bleeding. Treatment is surgical resection of the affected segment.

Lymphnodular hyperplasia of the colon is a benign lesion seen in this age group and in preschool children. Controversy exists as to whether or not rectal bleeding should be attributed to this condition. Infants and children with this condition are asymptomatic except that blood, bright red in color, is present in multiple stools. Blood loss is usually minimal and only rarely will be associated with anemia. Diagnosis of lymphnodular hyperplasia is made by sigmoidoscopy (Fig 4) or by air contrast radiography, although radiographic appearance can be misinterpreted as minute mucosal ulcerations. There is no treatment for this problem, but it usually resolves spontaneously within 3 months.

Preschool (2 to 5 Years of Age)

Period

Although the preschool child poses a specific set of diagnostic considerations, there is a fair amount of overlap between this age group and that of the infant.

The two conditions most likely to cause bleeding in this age group are juvenile polyps and infectious enterocolitis.

Numerous infectious agents cause blood in the stool, usually in association with diarrhea (Table 4). Viral agents generally do not cause overt blood losses in the stool. Although different organisms vary in clinical
manifestation (Table 5), a stool culture typically is needed to identify the offending organism. Several organisms merit discussion.

Clostridium difficile is a bacteria that causes pseudomembranous colitis in association with the use of a number of antibiotics (Table 6). The pathogenesis of pseudomembranous colitis is thought to be secondary to the proliferation of the clostridia organism during the course of antibiotic treatment. Antibiotics decrease normal bowel flora, allowing the clostridia to predominate. Consequently, the quantity of toxin produced by clostridia increases, inciting a colonic mucosal reaction termed pseudomembranous colitis. Clinical symptoms from pseudomembranous colitis can occur either during antibiotic treatment or 1 to 3 weeks after treatment has ceased. Patients commonly have watery diarrhea with blood and mucus, and may experience fever and abdominal pain. Diagnosis requires demonstration of the clostridia toxin in stool; simply verifying the presence of C difficile does not confirm the diagnosis of pseudomembranous colitis. Special caution is required regarding diagnosis in infancy. One study has demonstrated that 30% of infants up to 3 months of age and 10% of infants up to 2 years of age may carry the organism, as well as its toxin, but be totally asymptomatic. Proctoscopy or sigmoidoscopy also can be helpful in diagnosis (Fig 5). Grossly, whitish-yellow elevated plaques appear on the wall of the colonic mucosae. Microscopically, an intense inflammatory reaction with polymorphonuclear cells, fibrin, and cellular debris replacing the lamina propria occurs.

The first approach to treatment is the cessation of the offending antibiotic. Oral vancomycin and metronidazole both have also been used effectively in the treatment of pseudomembranous colitis. There is, however, a relatively high recurrence rate of up to 20%.

Entamoeba histolytica is a waterborne protozoan parasite that also can cause bloody diarrhea. The incidence rate for infection by this organism is highest on Indian reservations and in lower socioeconomic areas of the south central and southwestern United States. In up to 10% of the population, infection is asymptomatic, which is especially important given that humans are the only reservoirs for this parasite and that transmission is by the fecal to oral route through hands, food, or water.

Clinical symptoms of an amoebic infection include abdominal pain and acute diarrhea with blood and mucus in the stools. Complications secondary to amoebic infection include intestinal perforation and liver abscesses. Examination of the stool for ova and parasites will not always yield an organism because microscopic examination may miss the cysts or trophozoites. Amoebic serology can be beneficial, however; up to 90% of those patients with amoebic colitis have positive serology. Treatment for this organism involves using two antibiotics, metronidazole and iodoquinoil.

Aeromonas hydrophila has also been implicated recently in gastrointestinal bleeding. This organism is more commonly found during the warm weather months and survives in both fresh and salt water. Three main patterns of illness are seen with infection by this organism. In the majority of cases, individuals develop watery diarrhea without blood that resolves after 1 week. About 25% of those infected with A hydrophila develop diarrhea with blood and mucus that can last up to 1 month. Finally, a third group of patients experience symptoms for as long as 3 months, requiring physicians to consider inflammatory bowel disease in the differential diagnosis.

The mechanism of action of the enterotoxin produced by A hydrophila is unknown. Diagnosis is made by stool culture on special media not commonly used in most microbiology laboratories. Because this is a self-limited disease, antibiotics usually are not used. However, in those children with a malignancy or liver disease, therapy should be considered with TMP-SMX.

Painless rectal bleeding in an otherwise healthy preschool child should immediately arouse suspicion of a juvenile polyp. Polyps are seen mainly in children 2 to 8 years of age, with a peak incidence occurring at 3 to 4 years of age; polyps rarely occur before 1 year of age or during adolescence. Juvenile polyps account for 90% of all polyps found in children and carry no malignant potential. The average polyp (Fig 6) is about 1 cm in diameter, has a thin stalk (or a pedicle) covered by normal colonic mucosae, and may be ulcerated. Previously, it was thought that 85% of these lesions were found in the rectosigmoid colon and the remainder in the proximal colon; as many as 75% of the polyps were believed to be solitary. However, more recent data based on colonoscopy indicate that the frequency of multiple polyps may be as high as 60%, and as many as 25% of polyps may be located proximal to the transverse colon.

Children with juvenile polyps will usually have minimal rectal bleeding, with streaks of fresh blood on the outside of the stool. Less frequently, a child will experience profuse blood loss or a chronic iron deficiency from occult blood loss. There may be some associated abdominal pain secondary to traction on the polyp. The polyp may protrude or prolapse at the anus if it is rectal in location and can be felt by digital exam. Many autoamputate before treatment. Diagnostically, an air contrast barium enema, performed after a complete cleaning of the colon using a balanced electrolyte solution, may aid in establishing the definitive diagnosis. However, if a pediatric gastroenterologist is available, colonoscopy is becoming the procedure of choice. Currently, treatment of juvenile polyps consists of full colonoscopy with endoscopic polypectomy. In the hands of a trained pediatric gastroenterologist or surgeon, this procedure can be performed safely using sedation in the outpatient setting.

**TABLE 4. Infectious Agents Associated With Hematochezia**

<table>
<thead>
<tr>
<th>Salmonella</th>
<th>Shigella</th>
<th>Campylobacter jejuni</th>
<th>Yersinia enterocolitica</th>
<th>Escherichia coli</th>
<th>C. difficile</th>
<th>Aeromonas hydrophila</th>
<th>Entamoeba histolytica</th>
</tr>
</thead>
</table>

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**TABLE 5. Organisms Associated With Gastrointestinal Bleeding**

<table>
<thead>
<tr>
<th>Organism</th>
<th>Symptoms</th>
<th>Blood in Stool</th>
<th>Transmission</th>
<th>Antibiotic Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmonella</td>
<td>Fever, Diarrhea, Abdominal pain</td>
<td>Up to 10% gross blood</td>
<td>Food or drink</td>
<td>None unless bacteremic, immune-compromised or &lt;6 months of age</td>
</tr>
<tr>
<td>Shigella</td>
<td>Fever, Vomiting, Diarrhea</td>
<td>Secondary to mucosal invasion</td>
<td>Person-to-person Small inoculum (10 organisms)</td>
<td>Yes</td>
</tr>
<tr>
<td>Campylobacter jejuni</td>
<td>Fever, Diarrhea, Abdominal pain</td>
<td>Can be seen in infants &lt;7 wk of age</td>
<td>Contained in water, milk, meat, and poultry Person-to-person transmission Small inoculum (100 organisms)</td>
<td>Yes</td>
</tr>
<tr>
<td>Yersinia enterocolitits</td>
<td>Fever, Diarrhea, Abdominal pain May mimic acute appendicitis</td>
<td>Up to 25% of cases</td>
<td>Milk</td>
<td>Not established</td>
</tr>
<tr>
<td>Enteroinvasive Escherichia coli</td>
<td>Fever, Vomiting, Diarrhea</td>
<td>Yes</td>
<td>Food or water Large inoculum needed</td>
<td>Symptomatic</td>
</tr>
<tr>
<td>Enterohemorrhagic Escherichia coli</td>
<td>Diarrhea, Abdominal pain, Fever (rare)</td>
<td>May be cause of 30% of undiagnosed cases</td>
<td>Diarrhea</td>
<td>Symptomatic</td>
</tr>
</tbody>
</table>

**TABLE 6. Antibiotics Associated With the Occurrence of Pseudomembranous Colitis**

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clindamycin</td>
<td>Dicloxacillin</td>
</tr>
<tr>
<td>Lincomycin</td>
<td>Cephalexin</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>Cephaloridine</td>
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<td>Penicillin</td>
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<td>Tetracycline</td>
<td>Cephalaxine</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>Cephradine</td>
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<tr>
<td>Carbenicillin</td>
<td>Streptomycin</td>
</tr>
<tr>
<td>Oxacillin</td>
<td>Novobiocin</td>
</tr>
</tbody>
</table>

Several polyposis syndromes have been observed during infancy and childhood of which pediatricians need to be aware, because treatment strategies differ for each.

Hematochezia may be found on initial examination in the case of several multisystem diseases, including hemolytic uremic syndrome, which is the most prevalent of these conditions reported in infants and children up to 3 years of age. Thus, a gastrointestinal manifestation may delay the diagnosis until renal or hematologic abnormalities are recognized. The intestinal manifestations are usually self-limiting and rarely result in major morbidity.

In the case of Henoch-Schoenlein purpura, gastrointestinal manifestations occur in 50% of cases and include colicky abdominal pain, melena, or bloody diarrhea. These symptoms may precede the characteristic rash in 20% of cases, often delaying the establishment of the diagnosis. Gastrointestinal complications related to Henoch-Schoenlein purpura include acute gastrointestinal hemorrhage (5%) and intussusception (3%). Physicians differ concerning the use of corticosteroids to alleviate these gastrointestinal problems. However, a recent study indicated that these problems were self-limiting and did not justify the use of steroids.

**School-Aged Children**

For the most part, the diagnostic considerations relevant to the pre-school child also apply to the school-aged child, with the single addition of inflammatory bowel disease. This topic was recently reviewed in this publication (Pediatrics in Review 1987;8) and so will not be discussed in great detail here.

The most common symptom of inflammatory bowel disease is diarrhea.
with or without blood. This is an initial finding in 80% of patients with Crohn disease and in all patients with ulcerative colitis. In some cases, extraintestinal manifestations (such as weight loss, anorexia, or arthralgias) may predominate. It is necessary to distinguish between ulcerative colitis and acute self-limited colitis, which may predominate. It is necessary to determine the need for specific tests, such as abdominal radiographs, stool cultures, and an endoscopic evaluation.

We have come a long way in our ability to diagnose the causes of lower gastrointestinal bleeding. With the availability of newer radiographic and nuclear medicine modalities and the ability to visualize the colon endoscopically, the need for exploratory laparotomy for diagnosis is rarer. While surgery may still be the therapy of choice, new diagnostic modalities give the surgeon much more preoperative information.

SUGGESTED READING


## Lower Gastrointestinal Bleeding

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