# Clinical Strategies for Managing Acute Gastrointestinal Hemorrhage and Anemia Without Blood Transfusion*

## GENERAL MANAGEMENT PRINCIPLES

1. **Formulate a comprehensive clinical management plan** to facilitate rapid decision-making and avoid treatment delays, integrating a combination of blood conservation modalities.
2. Exercising clinical judgment, **be prepared to modify routine practice** (e.g., rapid and aggressive arrest of bleeding, tolerance of moderate hypotension during uncontrolled bleeding).
3. **Discuss anticipated or potential procedures** and their risks and benefits with the patient/substitute decision-maker.
4. **Ensure the availability of well-trained, experienced personnel** and needed drugs and equipment for prevention and rapid control of hemorrhage.
5. **Adopt an interdisciplinary and collaborative team approach** among involved specialties (gastroenterology, medicine, radiology, surgery, anesthesiology, intensive care, hematology) with active management by the lead clinician.
6. **Maintain ongoing communication** regarding patient management. Where there are multiple conditions treated by multiple physicians, interspecialty collaboration and coordination is particularly important.
7. **Consult promptly with specialist physicians** who have experience in the management of patients without allogeneic blood transfusion. Recognition of risk factors for bleeding or anemia may help clinicians to predict/anticipate the need for preventive or control measures.
8. **Maintain continuous, close surveillance for signs and symptoms of blood loss** or deterioration. Set a lower threshold for early intervention in patients for whom allogeneic blood transfusion is not an option.
9. **Expeditious arrest of blood loss and judicious volume management are life saving.** In the actively bleeding patient who cannot be transfused, it is not an option to hope that gastrointestinal (GI) bleeding will abate spontaneously. All available therapy must be optimized to reduce blood loss and maintain perfusion. In the face of severe hemorrhage, early recourse to definitive measures to control and arrest bleeding is of paramount importance.
10. **Transfer** a stabilized patient, if necessary, to a major center **before the patient's condition deteriorates.**

## GENERAL THERAPEUTIC PRINCIPLES

1. Judicious fluid resuscitation. In the presence of uncontrolled hemorrhage, consider permissive moderate hypotension and controlled fluid resuscitation until bleeding is promptly arrested so as not to exacerbate ongoing bleeding. Maintain normovolemia in the anemic patient after hemorrhage is controlled.
2. History taking, physical examination, resuscitative measures, diagnostic procedures, lavage, etc., are dynamic processes that may proceed concomitantly.
3. Rapid diagnosis, expeditious localization and arrest of hemorrhage, as well as anticipation and prophylaxis against recurrent hemorrhage are the cornerstones of the management of acute GI bleeding without blood transfusion.
4. Use available diagnostic interventions that can most rapidly localize the bleeding site(s).
5. Promptly arrest active bleeding by early institution of specific therapy by well-trained and skilled endoscopists or surgeons.
6. Use pharmacological agents to suppress gastric acid, improve coagulation status, and promote hemostasis.

## CONTENTS — PAGE


**1. ASSESSMENT AND INITIAL MANAGEMENT**
- A. Patient History ... 3
- B. Initial Resuscitation ... 3
- C. Selective Laboratory Evaluation/Screening ... 3
- D. Diagnosis and Localization of Bleeding Site ... 3
- E. Diagnostic Interventions ... 4
- F. Maintain a High Level of Clinical Suspicion of Bleeding ... 4

**2. PROMPT ARREST OF BLEEDING**
- A. Rapid Diagnosis and Therapy ... 4

**3. JUDICIOUS VOLUME RESUSCITATION**
- A. Nonblood Volume Expanders ... 5
- B. Avoid Excessive Fluid Administration ... 5

**4. PHARMACOLOGICAL ENHANCEMENT OF HEMOSTASIS**
- A. Augment Clotting Factor Activity ... 5
- B. Reverse Anticoagulation ... 5
- C. Acid-Suppressive Therapy (Raise Gastric pH) ... 6
- D. Induce Splanchnic Vasoconstriction ... 6
- E. Other Agents With Hemostatic Effects ... 6
- F. Modify/Discontinue NSAIDs ... 6
- G. Inhibit Fibrinolysis ... 6

**5. UPPER GI BLEEDING**
- A. Peptic Ulcer Hemorrhage ... 6
- B. Bleeding Gastroesophageal Varices ... 7
- C. Mallory-Weiss Tears ... 7
- D. Dieulafoy's Lesion ... 8
- E. Gastrointestinal Angiomata and Other Conditions ... 8

**6. LOWER GI BLEEDING**
- A. Medical Therapy ... 8
- B. Diverticular Hemorrhage ... 8
- C. Angiodysplasias (Vascular Ectasia, Arteriovenous Malformations) ... 8
- D. Anorectal Hemorrhage ... 8
- E. Postpolypectomy Site Bleeding ... 9
- F. Inflammatory Bowel Disease (Including Colitis, Crohn's) ... 9
- G. Dieulafoy's Lesion ... 9
- H. Meckel's Diverticulum ... 9

**7. AVOID IATROGENIC ANEMIA**
- A. Restricted Diagnostic Phlebotomy ... 9

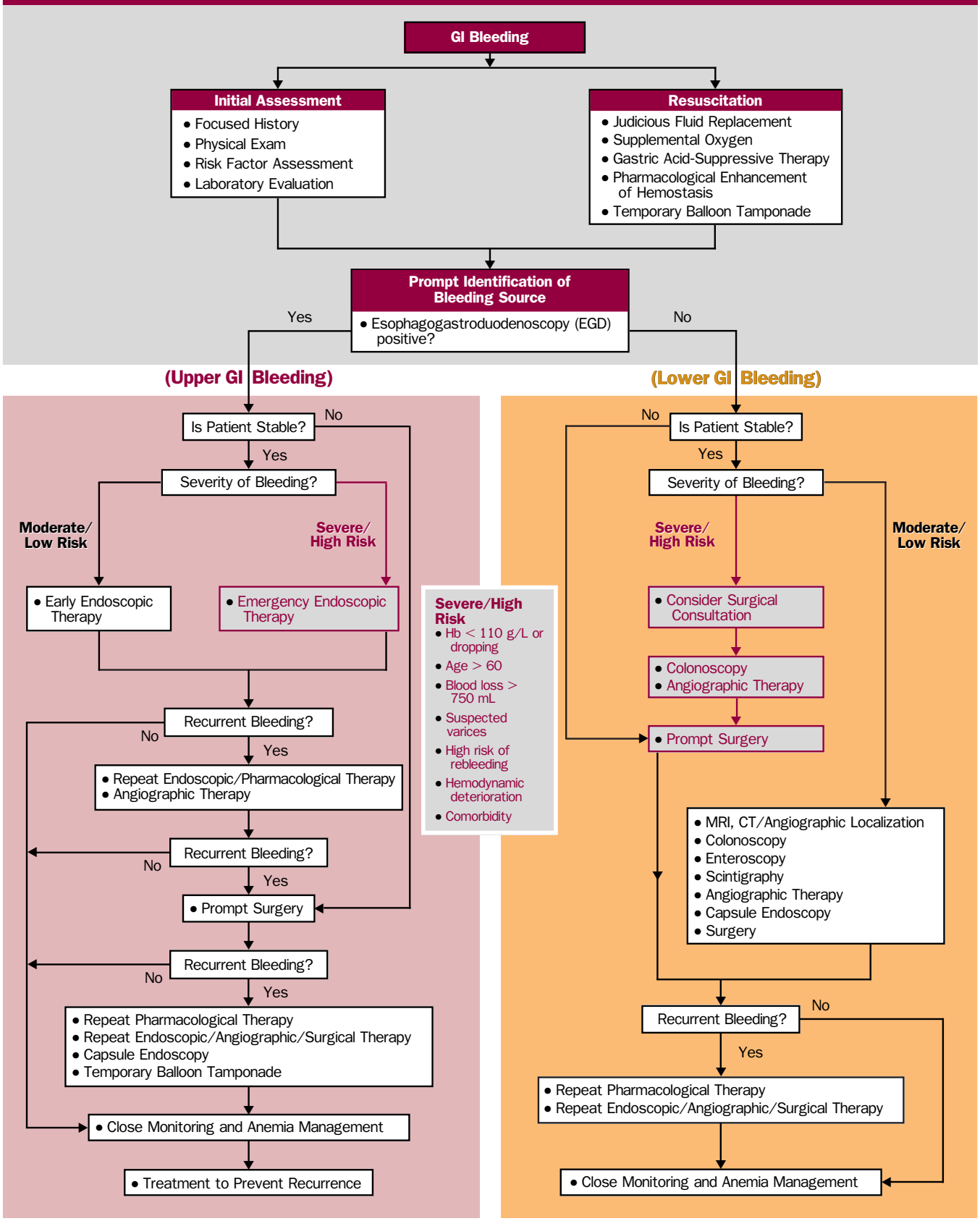
**8. ANEMIA MANAGEMENT**
- A. Early Erythropoiesis-Stimulant Therapy ... 9
- B. Iron Therapy and Hematinic Support ... 10

**9. TOLERANCE OF ANEMIA**
- A. Moderate Normovolemic Anemia Is Well Tolerated ... 10
- B. Compensatory Mechanisms in Normovolemic Anemia ... 10
- C. Effects of Stored Red Blood Cell Transfusion ... 10



* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

# ALGORITHM FOR NONBLOOD MANAGEMENT OF GASTROINTESTINAL (GI) BLEEDING




This algorithm outlines the basic care of patients. Practice will vary according to the clinical situation, local resources, personnel, and expertise.

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

## 1. ASSESSMENT AND INITIAL MANAGEMENT[1-7]

**Clinical Action Alerts:**

- Patients who present with active upper or lower gastrointestinal (GI) bleeding represent a high-risk medical emergency that requires immediate aggressive intervention.
- The management priorities are to support the circulation and simultaneously identify and arrest the source of bleeding.
- Determination of the severity of bleeding should be based on the estimated magnitude of the initial hemorrhage and the rate of current bleeding. This can be ascertained from the history and physical examination, hemodynamic status, presenting symptoms, and endoscopic findings.
- In the bleeding patient, initial assessment can take place during resuscitation.

### A. Patient History[8-12]

1. **Medical history and physical examination**
   a. Hemodynamic instability (e.g., spontaneous drop in blood pressure, persistent tachycardia, tachypnea, light-headedness, hypoperfusion)
      (1) Cardiac history may help assessment of cardiorespiratory reserve
   b. Recent history of chemotherapy or radiotherapy affecting the abdomen or rectum (e.g., gynecologic malignancy, prostate cancer)
   c. Comorbid disease (e.g., hepatic, renal) or coagulopathy
   d. Peptic ulcers, varices, gastritis, colonic diverticulosis or polyps, inflammatory bowel disease, hemorrhoids, liver disease, alcohol use, recent trauma/injury or stress, vomiting
   e. Jaundice, ascites or other signs of hepatic disease, a tumor mass, bruit from an abdominal vascular lesion, purpuric lesions, petechiae, ecchymosis, telangiectasias, splenomegaly
2. **Characteristics of bleeding**
   a. Source, onset, and duration of bleeding, color and appearance of blood (i.e., hematemesis, melena, or hematochezia)
   b. Volume of blood loss and perceived rate of hemorrhage (e.g., condition at presentation—dizziness, faint, angina)
3. **Past history of GI bleeding**
   a. Peptic ulcer disease (*Helicobacter pylori* infection), esophagogastric varices, Zollinger-Ellison syndrome (ZES), erosive esophagitis, arteriovenous malformations (AVMs), hereditary hemorrhagic telangiectasia (Rendu-Osler-Weber syndrome), intestinal polyposis (Peutz-Jeghers syndrome), etc.
   b. Previous gastrointestinal surgery
4. **History of anemia**
5. **History of GI disease/bleeding disorders**
   a. Personal and family history
      (1) Hepatic disease, GI cancers, etc.
      (2) Congenital/acquired bleeding disorders may be known from birth, nosebleeds, easy bruising, tonsillectomy, dental extraction, menorrhagia, previous surgery, pregnancy, etc.
      (3) Other inherited conditions associated with bleeding such as Rendu-Osler-Weber syndrome or blue rubber bleb nevus syndrome
6. **Medication history**
   a. Recent use of anticoagulants or platelet aggregation inhibitors[13,14]
   b. Recent use of medications associated with peptic ulcer bleeding or erosions (e.g., ASA, ASA-containing medications, NSAIDs), especially in elderly patients[15-18]
   c. Identify other recent medications or drug interactions that may adversely affect hemostasis (e.g., steroids, selective serotonin reuptake inhibitors [SSRIs], antibiotics)[19,20]

### B. Initial Resuscitation

1. **Protect the airway**
2. **Supplementary oxygen**
   a. Consider initiating high-flow oxygen to offset loss of red blood cells
3. **Controlled fluid/volume management** (See also **3.B.**)

### C. Selective Laboratory Evaluation/Screening

1. **Complete blood count**
2. **PT (INR), PTT, template bleeding time** (as indicated)
3. **Blood chemistry panel** (including blood urea nitrogen [BUN], creatinine)
4. **Additional investigation** (as indicated)
   a. Liver function tests
   b. Renal function tests
   c. Coagulation tests (if bleeding disorder suspected)

### D. Diagnosis and Localization of Bleeding Site[21-23]

1. **Amount of blood loss**
   a. Some indicators of major blood loss:[24-26]
      (1) Orthostatic hypotension/tachycardia suggests a 10-20% volume loss[27]
      (2) Hypotension, pallor, and resting tachycardia may indicate a 30-40% volume loss
      (3) Acidosis
      (4) Hematochezia may imply at least 1000 mL of blood entering the upper GI tract
      (5) Blood urea >25 mmol/L in patients without prior renal disease is a marker for significant (perhaps >1000 mL) blood loss[28]
2. **Indicators of bleeding source**
   a. **Blood urea nitrogen/creatinine ratio**[29,30]
      (1) An elevated BUN/creatinine ratio (>36) suggests upper GI hemorrhage
   b. **Hematemesis, hematochezia, and melena**
      (1) Hematemesis and/or positive nasogastric aspirates suggest upper GI bleeding and are an indication for emergency endoscopy
      (2) Melena can be indicative of both upper and lower GI bleeding
      (3) Hematochezia suggests lower GI bleeding but occasionally results from vigorous upper GI bleeding
      (4) Hematemesis with frank blood or coffee ground-like material suggests upper GI bleeding
      (5) Red hematemesis and concomitant hematochezia (maroon stool and/or fresh clots per rectum) suggest massive brisk upper GI bleeding
   c. **Additional indication of lesions**
      (1) History of heartburn, dysphagia, or regurgitation may suggest gastroesophageal reflux, which can lead to hemorrhage from severe erosive esophagitis

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

(2) Patients with prior peptic ulcer disease who have not undergone *Helicobacter pylori* eradication; patients with portal hypertension who have stopped beta-blockers acutely

(3) Patients taking NSAIDs (especially ASA) have increased likelihood of developing gastric or duodenal ulceration as well as injury to the large and small bowel

(4) History of coughing, vomiting, or retching prior to onset of bleeding suggests a Mallory-Weiss tear

(5) Patients with prior esophageal varices are more likely to have rebleeding from varices or bleeding secondary to portal hypertensive gastropathy

(6) Pain may imply a mucosal lesion such as peptic ulcer disease

(7) In recurrent bleeding from an unknown site despite prior diagnostic evaluation, arteriovenous malformations or Dieulafoy lesions should be considered

### *E.* Diagnostic Interventions

**Clinical Action Alerts:**

- Treatment without allogeneic transfusion involves total commitment to finding and arresting any blood loss. Aggressive investigation and therapy is required.
- The clinical urgency of low-level persistent bleeding may not be recognized until compensatory mechanisms fail and blood pressure falls.

1. **Nasogastric lavage/aspiration**[31-33]
   a. Proceed to emergent endoscopy if upper GI bleeding is suspected from nasogastric (NG) aspirate; routine NG aspiration is controversial
2. **Anorectal examination**[34]
   a. Rectal tone, character of stool, and presence of any mass
3. **Early endoscopy**[35-42]
   a. Early/urgent endoscopy is defined as within 12 hours of presentation. Early endoscopy has been shown to reduce the incidence of further bleeding and improve survival rates. Some investigators recommend that endoscopy should be performed sooner (within 4 hours), particularly for bleeding patients, to reduce hospitalization and costs[36,39,41,43,44] (See also **2.A.1.b.**)
   b. Endoscopic appearance of a bleeding ulcer or stigmata of recent hemorrhage has value in determining prognosis and guiding treatment[43,45]
   c. Consider early preendoscopic administration of erythromycin to improve visualization[46,47]
4. **Prompt colonoscopy**[48-54]
   a. Consider a rapid purge. Complications such as perforation are more common in the uncleansed colon because of poor visibility
5. **Expeditious angiography/embolization**[55-60]
   *Note:* Provocative bleeding techniques to improve diagnostic yield in stable patients with recurrent obscure bleeding should be used with extreme caution.[61-63] If employed, they should be attended by appropriate precautions, i.e., where appropriate resuscitation can immediately be initiated if needed, including reversal agents, intravenous hydration, and therapeutic measures to control bleeding (angiographic, endoscopic, or surgical).
6. **Wireless video capsule endoscopy**[64-70]
   *Note:* Use of capsule endoscopy early in the course of the workup of patients allows more rapid diagnosis and improved patient care. It could also lessen the costs associated with obscure bleeding.[71]
7. **MRI or helical computed tomography (CT) scans**[72-75]
8. **Early laparotomy and exploratory surgery**[76]

The following diagnostic interventions are generally used in the elective setting.

9. **Enteroclysis**[77,78]
10. **Enteroscopy**
    a. Double-balloon enteroscopy[79,80]
    b. Push enteroscopy[81-84]
    c. Intraoperative enteroscopy[85]
11. **Scintigraphy/radionuclide imaging**[86-88]
    a. Technetium 99m-labeled erythrocytes[89,90]
    b. Technetium 99m-labeled sulfur colloid[91]

### *F.* Maintain a High Level of Clinical Suspicion of Bleeding

1. **Serial monitoring of hemoglobin level**
   a. Decreases in hemoglobin level require rapid clarification
   b. Decreases in the hematocrit lag the clinical course and are not reliable indicators of the magnitude of acute bleeding but may be useful for indication of ongoing hemorrhage
2. **Adopt a lower threshold for intervention**
   a. In patients that cannot be transfused, consider endoscopic, radiological, or surgical intervention on less clear-cut indications in order to identify and arrest bleeding as early as possible

## 2. PROMPT ARREST OF BLEEDING

### *A.* Rapid Diagnosis and Therapy

1. **Immediate endoscopic and pharmacological therapy**[92,93]
   a. Endoscopy should be performed as soon as safely possible in patients at high risk for further bleeding or death[94]
   b. Expeditious endoscopic therapy facilitates rapid triage and is associated with reduced blood loss, hospital stay, costs, and the risk of recurrent bleeding and surgery[38,41,44,48,95-98] (See also **1.E.3.a.**)
   c. In cases of severe ulcer or variceal bleeding, consider empirical therapy with a high-dose IV proton pump inhibitor (PPI) or octreotide/somatostatin as a concomitant medical therapy while awaiting endoscopy or surgery
2. **Prompt surgical management**
   a. If active bleeding cannot be controlled by pharmacological, endoscopic, or angiographic therapy or if there is exsanguinating hemorrhage, the patient requires an urgent operation[99,100]
   b. To minimize blood loss, consider limiting surgery to the minimum required to control hemorrhage
   c. Consider immediate definitive surgery to stop bleeding rather than delayed surgery,[100-103] particularly in patients more than 60 years of age

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

## 3. JUDICIOUS VOLUME RESUSCITATION

**Clinical Action Alerts:**

- Prompt but judicious fluid resuscitation of hemodynamically unstable patients as well as supplementary oxygen optimizes the circulation of remaining red cells and improves oxygen delivery.
- The most common cause of poor response to fluid therapy is continued hemorrhage.
- Maintain normovolemia and oxygen support in the anemic nonbleeding patient.

### A. Nonblood Volume Expanders

#### 1. Crystalloids

a. Normal saline

b. Ringer's lactate

*Note:* In moderate amounts, crystalloids are not associated with significant side effects, particularly on hemostasis. There is laboratory evidence that infusion of crystalloids may induce a state of hypercoagulability.[104,105] Large volumes of crystalloids are more likely to cause edema formation, impair pulmonary function, and lead to dilutional coagulopathy.

#### 2. Colloids

a. Pentastarch/hetastarch

b. Gelatin

c. Dextran

*Notes:*

1. High-molecular-weight hydroxyethyl starches (HES) (e.g., 450 kDa) with high degrees of substitution (DS: 0.7), other highly substituted HES preparations, and dextrans may increase the risk of bleeding in patients who have either congenital or acquired coagulation abnormalities in a dose-dependent manner.[106,107]
2. While all colloids and crystalloids dilute platelets and coagulation factors, dextrans are associated with a bleeding tendency by inhibiting platelet aggregation, reducing activation of factor VIII, and promoting fibrinolysis.[108]

#### 3. Oxygen therapeutics[109,110] (when available for clinical use)

*Notes:*

1. Avoid circulatory overload, especially in profoundly anemic patients.[111,112] Fluid administration by rigid adherence to a protocol without ongoing clinical assessment should be avoided.
2. Even during relative hypotension, microcirculatory blood flow and oxygenation are not always dependent on blood pressure.[113,114]

### B. Avoid Excessive Fluid Administration

#### 1. Normalization of blood pressure may worsen bleeding

a. In uncontrolled hemorrhage, there is evidence that elevation of blood pressure (e.g., by fluid resuscitation, pressor medications) before definitive control of bleeding may result in progressive and repeated rebleeding[115-118]

b. Current evidence suggests that rapid administration of fluids into the circulation in the face of ongoing bleeding can temporarily restore vital signs but cause loss of autoregulatory vasoconstriction and more rapid loss of blood at the bleeding site(s), as well as more rapid loss of coagulation factors. The increased blood pressure and flow at the bleeding site(s) will wash away clots and platelet plugs[119,120]

c. Evidence from gastroenterology and trauma studies suggests that in acute life-threatening hemorrhage, consider moderate controlled resuscitation and tolerance of mild-to-moderate hypotension, i.e., blood pressure at the lowest possible level that maintains tissue perfusion (e.g., systolic blood pressure of 90-100 mm Hg in a normotensive patient)[115,120-123] until bleeding can be definitively controlled

## 4. PHARMACOLOGICAL ENHANCEMENT OF HEMOSTASIS

### A. Augment Clotting Factor Activity

#### 1. Desmopressin[6,124-127] (e.g., DDAVP®, Octostim®, Stimate®)

#### 2. Vitamin K[128-130]

*Note:* Patients may be vitamin K deficient due to inadequate dietary intake/malnutrition, limited absorption (e.g., debilitated patients),[131] biliary obstruction, antibiotics, anticoagulants (e.g., nicoumalone, warfarin).

#### 3. Recombinant activated factor VIIa (rFVIIa) (e.g., NovoSeven®, NiaStase®)

a. Early use of rFVIIa can be life saving in nonhemophilic patients without inherited bleeding disorders who are bleeding at sites with limited possibilities for endoscopic hemostasis[132]

b. Recombinant FVIIa has been used as adjunctive therapy to reduce blood loss in nonhemophilic patients in various clinical situations including ulcer,[133] variceal,[134-136] or diverticular bleeding;[137] surgery;[138-142] postoperative bleeding;[143-146] coagulopathy associated with liver disease;[147-151] renal failure;[145,152,153] thrombocytopenia;[154-158] congenital or acquired platelet function disorders;[159-161] and acquired bleeding tendencies[162-164]

c. Consider use of rFVIIa in disseminated intravascular coagulation[165,166]

d. Although certain characteristics of rFVIIa may theoretically increase the risk of thrombosis, analysis of existing clinical data suggests a highly favorable safety and efficacy profile.[167] Thrombotic events have been reported in patients with a predisposition to thromboembolic complications.[168] Consider lower doses of the drug for at-risk patients

#### 4. Treatment for congenital or acquired hemorrhagic disorders

a. Coagulation factor replacement therapy

*Note:* Factors VIIa, VIII, IX are available as recombinant products.

b. Cryoprecipitate

### B. Reverse Anticoagulation

#### 1. Medical therapy

a. Vitamin K (phytonadione)[169]

b. Prothrombin complex concentrate[170-172] (e.g., Autoplex®, Beriplex®)

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

c. Recombinant coagulation factor VIIa[173-175] or IX[176,177] (e.g., BeneFix®, Proplex T®)

### C. Acid-Suppressive Therapy (Raise Gastric pH)

1. **Proton pump inhibitors (PPIs), $H_2$-receptor antagonists ($H_2$RAs), etc.** (See **5.** and **6.**)

### D. Induce Splanchnic Vasoconstriction

1. **Somatostatin, octreotide, vasopressin, etc.** (See **5.** and **6.**)

### E. Other Agents With Hemostatic Effects

1. **Conjugated estrogens**[178-183] (e.g., Premarin®)

   *Note:* Conjugated estrogens activate the coagulation pathway, shorten prolonged bleeding times, and stop bleeding in patients with platelet dysfunction due to uremia.

2. **Recombinant erythropoietin** (e.g., Procrit®, Eprex®)

   *Notes:*

   1. Erythropoietin has been reported to promote hemostasis in bleeding from diffuse lesions of the GI tract (e.g., angiodysplasias, radiation proctitis, adenocarcinoma).[184]
   2. Recombinant erythropoietin may produce a moderate, transient dose-dependent rise in platelet reactivity and in the platelet count, within the normal range, during treatment. This regresses during the course of continued therapy.[185,186]

3. **Consider thrombopoietic stimulant therapy**

   a. Recombinant human interleukin-11[187] (e.g., Neumega®)

### F. Modify/Discontinue NSAIDs[188-190]

1. **Discontinuation/substitution/dose reduction**

   a. Discontinuation/dose reduction of aspirin, aspirin-containing medications, NSAIDs, anticoagulants, other medications and herbal preparations associated with bleeding (e.g., garlic, ginkgo biloba, ginseng)

   b. For patients requiring analgesics who are at moderate risk of rebleeding, consider substitution with non-NSAID analgesics, less gastrotoxic NSAIDs (e.g., etodolac, nonacetylated salicylates), cotherapy with gastroprotective agents (e.g., PPI, misoprostol, double-doses of $H_2$RAs), or COX-2-specific inhibitors (coxibs)

### G. Inhibit Fibrinolysis

1. **Tranexamic acid**[191-198] (e.g., Cyklokapron®)

   *Notes:*

   1. There is evidence that in acute upper GI hemorrhage, high fibrinolytic activity correlates with increased bleeding.[199]
   2. Although anecdotal reports have raised the possibility of increased thrombosis risk with antifibrinolytics, no controlled studies indicate an increased risk.
   3. Since bleeding has more serious and immediate risks than morbidity associated with thrombotic complications, short-term use of tranexamic acid should be considered, perhaps in combination with an $H_2$-receptor antagonist ($H_2$RA).

2. **Epsilon-aminocaproic acid**[200-203] (e.g., Amicar®)

## 5. UPPER GI BLEEDING

**Clinical Action Alerts:**

- The fundamental general and therapeutic principles outlined at the beginning of this document should be applied in the clinical management of upper GI bleeding.
- If endoscopic expertise is not available, consider surgery or administer pharmacological agents (e.g., high-dose acid-suppressive therapy, octreotide, terlipressin), use balloon tamponade, and transfer patient.
- Failure to stop severe emergent and/or refractory ulcer hemorrhage promptly with endoscopic (e.g., thermal, injection, mechanical, or combination therapy), pharmacological, or angiographic therapy should prompt immediate surgical intervention. In general, avoid a "watch and wait" approach to the bleeding patient.
- If operative management is required, also refer to the document "Clinical Strategies for Avoiding and Controlling Hemorrhage and Anemia Without Blood Transfusion in Surgical Patients."[204]

### A. Peptic Ulcer Hemorrhage[94,205,206]

1. **Acid-suppressive pharmacological therapy** (in combination with endoscopy)

   a. **Proton pump inhibitors (PPIs)**[207-211] (e.g., omeprazole [Losec®], pantoprazole [Panto®])

   b. **Histamine $H_2$-receptor antagonists ($H_2$RAs)**[212,213] (e.g., cimetidine [e.g., Tagamet®], ranitidine [e.g., Zantac®])

   c. **Antacids**

   *Notes:*

   1. Pharmacological agents may be administered in combination with endoscopic therapy. There is evidence suggesting that use of PPIs before and after endoscopic therapy improves outcomes, especially if there may be delay before endoscopy.[214-216]
   2. PPIs are more effective than $H_2$RAs and antacids.

2. **Endoscopic therapy**[217-219]

   a. **Thermal/electrocoagulation methods**

      (1) Heater probe[214,220-222]

      (2) Monopolar/multipolar electrocoagulation[223-227]

         i. *Injection Gold Probe*™ (*injection and electrohemostasis catheter*)[228,229]

      (3) Argon plasma coagulation[230-232]

      (4) Microwave coagulation[233]

      (5) Laser therapy[218,234,235]

      *Note:* See "Combination Therapy" below.

   b. **Injection sclerotherapy**

      (1) Epinephrine[236-238]

      (2) Epinephrine plus thrombin[239,240]

      (3) Epinephrine plus polidocanol[241-243]

      (4) Fibrin glue[244,245] (e.g., Beriplast®, Tisseel®)

   c. **Mechanical hemostasis/occlusion**

      (1) Band ligation[246-248]

      (2) Endoscopic hemostatic clips (endoclips/hemoclips)[242,249-252]

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

(3) Consider balloon tamponade as a temporary measure to control bleeding while awaiting definitive hemostatic intervention[253,254]

d. **Combination therapy**

(1) Epinephrine injection and thermocoagulation[215,228,229,238,255-259]

(2) Injection therapy and mechanical hemostasis[260,261]

*Notes:*

1. Patients with actively bleeding ulcers, ulcers with nonbleeding visible vessels, and ulcers with nonbleeding adherent clots should receive combination therapy (e.g., epinephrine injection followed by either thermal or mechanical hemostatic approaches).[256,258,259]
2. Initial epinephrine injection into the base of actively bleeding ulcers diminishes bleeding and allows better visualization of the bleeding site for thermal coagulation. For ulcers with nonbleeding adherent clots, epinephrine injection helps prevent bleeding during the guillotining and shaving down of the overlying clot.[255]

3. **Surgical management**[204,262,263]

a. **Emergency surgery**

(1) Oversewing of bleeding vessels[99,101,264-266]

(2) Highly selective vagotomy

(3) Gastric resection[267]

*Notes:*

1. Surgery should be performed if bleeding cannot be controlled endoscopically or if rebleeding occurs after endoscopic hemostasis.
2. The surgical procedure chosen depends on what operation can be performed rapidly to control hemorrhage. Consider performing extensive procedures in stages.[6] For small ulcers, oversewing or excision of the ulcer is adequate. For larger ulcers, gastrectomy may be required to secure hemostasis. Surgery should be limited to the minimum required to stop bleeding.

4. **Angiographic/radiological therapy**

a. **Angiographic embolization**[268]

5. **Minimizing risk of recurrent hemorrhage**

a. Selective use of second-look endoscopic examination/therapy[269,270]

b. PPI or $H_2$RA administration after endoscopic therapy[209,271-274]

c. Selective *combination* endoscopic treatment[255,275]

d. Testing for *Helicobacter pylori* infection and eradication[276-278]

*Note:* Prevent recurrent bleeding in high-risk users of NSAIDs.[279-281]

## B. Bleeding Gastroesophageal Varices[282,283]

1. **Early pharmacological therapy[284] with endoscopic therapy**[285-287]

a. Somatostatin/octreotide[288-291]

*Note:* There is evidence that octreotide therapy commenced as soon as a patient with suspected variceal bleeding enters the hospital, in combination with endoscopic methods, will assist early control of hemorrhage and prevent early recurrent bleeding.[292-294]

b. Terlipressin[295-297] alone or with nitroglycerin[298-300]

c. Vasopressin[301,302] alone or with nitroglycerin[303,304]

2. **Management of esophageal varices**

a. Band ligation[305-308]

b. Injection sclerotherapy[309-312]

*Note:* Endoscopic variceal ligation has been shown to be superior to sclerotherapy for all major outcomes, including recurrent bleeding.

c. Combination therapy

(1) Band ligation (or sclerotherapy) and somatostatin/octreotide[92,291,293]

(2) Band ligation (or sclerotherapy) and argon plasma coagulation[313,314]

(3) Sclerotherapy and cyanoacrylate injection[315,316]

d. Balloon tamponade[317-321]

*Note:* Although placement of hemostatic balloons can achieve immediate control of bleeding in nearly all types of varices, they should be regarded as a temporary stabilizing measure; there is a high risk of rebleeding. Definitive control of hemorrhage should not be delayed.

3. **Management of gastric varices**[305,309,322]

a. Endoscopic injection therapy[309,323]

(1) Cyanoacrylate[324-327] (e.g., Dermabond®, Glubran®, Histoacryl®)

(2) Fibrin glue/thrombin[328,329] (e.g., Beriplast®, Tisseel®)

b. Band ligation[330,331]

c. Combination of detachable snare and injection therapy[332]

d. Balloon tamponade[317,321,333,334]

4. **Surgical management**

a. Splenorenal/portacaval/portosystemic shunting[335-339]

b. Transection/devascularization[340]

5. **Radiological management**

a. Transjugular intrahepatic portosystemic shunt (TIPS)[341-344]

b. Balloon-occluded retrograde transvenous obliteration[345-348]

c. Transcatheter sclerotherapy[349,350]

6. **Prevention of recurrent variceal bleeding**

a. Band ligation[351-353]

b. Sclerotherapy[354-356]

c. Beta-blocker therapy[357]

(1) Propranolol[358,359]

(2) Nadolol[360,361]

*Note:* Use of a combination of endoscopic and pharmacological techniques may be more effective than monotherapy for prophylaxis of variceal rebleeding.[360-363]

d. Prophylactic antibiotic therapy[364,365]

e. Prophylactic transjugular intrahepatic portosystemic shunt (TIPS)[366,367] alone or with adjunctive angiotherapy[368]

f. Liver transplant surgery[204]

*Note:* Prevention of a ***first variceal bleed*** (primary prophylaxis) can be achieved using noncardioselective beta-blockers (e.g., propranolol, nadolol), endoscopic band ligation, combined beta-blockade plus banding (for large varices), combined beta-blockade plus isosorbide mononitrate, or sclerotherapy.

## C. Mallory-Weiss Tears

1. **Band ligation**[369-372]
2. **Epinephrine injection therapy**[373-375]
3. **Hemoclipping**[373,376]
4. **Multipolar electrocoagulation**[377]
5. **Balloon tamponade**[378]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

### D. Dieulafoy's Lesion

1. **Band ligation**[379-382]
2. **Hemoclipping**[382-385]
3. **Combination of epinephrine injection and heater probe therapy**[384,386]
4. **Consider temporary balloon tamponade**[387]

### E. Gastrointestinal Angiomata and Other Conditions

1. **Gastric antral vascular ectasia (watermelon stomach)**[388]
   a. Argon plasma coagulation[389-391]
   b. Laser therapy[392]
   c. Pharmacological therapy[179,193]
2. **Hereditary hemorrhagic telangiectasia/angiodysplasia/vascular malformations**
   a. Pharmacological therapy[181-183,193,201,203]
   b. Thermal coagulation[393,394]
   c. Consider angiography and embolization[395]
3. **Acute hemorrhagic gastritis**
   a. Discontinue NSAIDs
   b. $H_2$ blockers, PPIs, sucralfate, antacids
   c. Antibiotic therapy if *Helicobacter pylori* is present
   d. Somatostatin/octreotide
   e. Vasopressin
   f. Consider subtotal or total gastrectomy
4. **Esophageal cancer (including Barrett's esophagus)**
   a. Argon plasma coagulation[396-398]
   b. Thermal/multipolar electrocoagulation[399]
   c. Photodynamic therapy/laser[400,401]
   d. Surgical resection
5. **Aortoenteric fistula**
   a. Temporary occlusion[402,403]
   b. Angiographic or surgical/endovascular management[404,405]
6. **Hemobilia**
   a. Arteriography and embolization[406]
7. **Blue rubber bleb nevus syndrome (Bean's disease)**
   a. Endoscopic management[407-409]
   b. Surgical management[410,411]

## 6. LOWER GI BLEEDING[412]

**Clinical Action Alerts:**

- The fundamental general and therapeutic principles outlined at the beginning of this document should be applied in the clinical management of lower GI bleeding.
- Data support an early and aggressive approach to localization of the bleeding source before blood loss becomes significant.
- Surgical intervention should be performed without delay in bleeding patients who fail endoscopic and/or angiographic therapy. In cases of severe bleeding, prompt total or subtotal colectomy can be life saving.
- If operative management is required, also refer to the document "Clinical Strategies for Avoiding and Controlling Hemorrhage and Anemia Without Blood Transfusion in Surgical Patients."[204]

### A. Medical Therapy

1. **Discontinuation/substitution of aspirin, NSAIDs, anticoagulants, other medications**
2. **Somatostatin/octreotide therapy**[413-415]

### B. Diverticular Hemorrhage

1. **Endoscopic therapy**[416,417]
   a. Colonoscopic thermal/coagulation therapy
      (1) Thermal contact probes[54,418]
      (2) Bipolar electrocoagulation[54,419,420]
      (3) Laser therapy[418,421]
   b. Injection therapy[418,422,423]
   c. Mechanical hemostasis/occlusion
      (1) Band ligation[424]
      (2) Hemoclipping[425,426]
   d. Combination therapy
      (1) Coagulation therapy or mechanical hemostasis and injection sclerotherapy[54,427]
2. **Angiographic therapy**
   a. Angiographic embolization[428,429]
   b. Infusion of vasoconstrictive agents
      (1) Terlipressin/vasopressin[430,431]

   *Notes:*
   1. Infusion of terlipressin/vasopressin may be used to achieve temporary control of bleeding to permit surgical intervention. Angiographic embolization avoids the vasoconstrictive effects of vasopressin in patients with myocardial ischemia, hypertension, etc.
   2. When the source of bleeding is obscure, provocative bleeding should be used with extreme caution in anemic patients who cannot be transfused.
3. **Surgery**[432,433]

### C. Angiodysplasias (Vascular Ectasia, Arteriovenous Malformations)

1. **Endoscopic therapy**
   a. Colonoscopic thermal coagulation/electrocoagulation[434,435]
   b. Injection therapy[436]
   c. Band ligation[437]
2. **Pharmacological therapy**
   a. Somatostatin/octreotide[414,415]
   b. Conjugated estrogens[178]
   c. Recombinant activated factor VII (rFVIIa)[164]
   d. Consider tranexamic acid[193,194]
   e. Consider thalidomide therapy[438]
3. **Angiographic therapy**[439,440]
4. **Surgery**

### D. Anorectal Hemorrhage

1. **External/internal hemorrhoids**
   a. Band ligation[441,442] alone or with sclerotherapy[443]
   b. Stapled hemorrhoidectomy/hemorrhoidopexy[444,445]
   c. Surgical excision[446]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

d. Thermal/electrocoagulation[447-451]
e. Ultrasonic scalpel[452,453]
f. Other hemostatic techniques[454]

2. **Radiation-induced proctitis/colitis**
a. Formalin therapy[455-457] (i.e., 4% aqueous solution of formaldehyde)
b. Argon plasma coagulation[458-460]
c. Electrocoagulation[461]
d. Laser therapy[462]
e. Surgical management[463,464]
f. Cryotherapy[465]

3. **Anorectal varices**
a. Argon plasma coagulation[466]
b. Band ligation[467,468]
c. Cyanoacrylate injection[469] (e.g., Dermabond®, Glubran®, Histoacryl®)
d. Transjugular intrahepatic portosystemic shunt (TIPS)[470]
e. Surgery

### E. Postpolypectomy Site Bleeding

1. **Endoscopic therapy**
a. Colonoscopic thermal/electrocoagulation alone or with epinephrine injection[471-473]
b. Band ligation[474,475]
c. Hemoclips/detachable snares[476,477]
d. Fibrin glue[478] (e.g., Beriplast®, Tisseel®)

2. **Pharmacological therapy**
a. Decrease/suspend anticoagulation therapy[479]
b. Consider recombinant activated factor VII (rFVIIa)[149]

3. **Angiographic therapy**[440,471]

4. **Surgery**

### F. Inflammatory Bowel Disease (Including Colitis, Crohn's)

1. **Diagnosis/localization of bleeding**
a. Colonoscopy[480]
b. CT/angiography[481]
c. Wireless capsule endoscopy[482-484] (for small bowel sources)

2. **Hemostatic therapy**
a. Injection sclerotherapy[485]
b. Recombinant activated factor VII (rFVIIa)[146,486]
c. Consider angiographic embolization[487]
d. Consider infliximab therapy[488,489] (e.g., Remicade®)
e. Surgical resection[490-492]

### G. Dieulafoy's Lesion

1. **Endoscopic endoloop**[493]

### H. Meckel's Diverticulum

1. **Radionuclide or wireless capsule endoscopic imaging**[494,495]
2. **Minimally invasive surgical excision**[496,497]

## 7. AVOID IATROGENIC ANEMIA

### A. Restricted Diagnostic Phlebotomy[498]

1. **Perform only essential tests**[499]
2. **Coordinate and consolidate blood tests**[500]
a. Minimize frequency of diagnostic sampling[501]
b. Multiple tests per sample[502]
3. **Minimize volume of diagnostic blood sampling**
a. Pediatric (small-volume) phlebotomy tubes for adults[503]
b. Blood microsampling/microchemistry techniques[504,505]

## 8. ANEMIA MANAGEMENT

**Clinical Action Alerts:**

- It is prudent to investigate and control blood loss aggressively and systematically as early as possible, taking advantage of the window of opportunity rather than attempting to treat severe anemia after massive blood loss has occurred.
- If ICU management is required, also refer to the document "Clinical Strategies for Managing Hemorrhage and Anemia Without Blood Transfusion in Critically Ill Patients."[506]
- In the acute setting, the following anemia management techniques have been used successfully in combination with other modalities (e.g., optimization of oxygen delivery, minimization of oxygen demand).

### A. Early Erythropoiesis-Stimulant Therapy

1. **Erythropoietin or darbepoetin alfa**
a. In the setting of acute anemia, reported recombinant erythropoietin (rHuEPO) doses have ranged from 150 to more than 600 U/kg/day to accelerate recovery from acute anemia[36,109,507-511]
b. A randomized controlled trial involving 160 medical and surgical ICU patients demonstrated that rHuEPO at a dose of 300 U/kg daily for 5 days and then on alternate days for a minimum of 2 weeks significantly reduced the rate of blood transfusion[512]
c. In a randomized controlled trial involving 30 patients with anemia due to GI hemorrhage, rHuEPO plus IM iron was shown to accelerate correction of anemia significantly compared to iron alone[513]
d. Some patients require higher rHuEPO doses to achieve an adequate response. In the critically ill, there is evidence suggesting that a frequent rHuEPO dosing interval (e.g., 150-300 U/kg/day) may be more effective than single weekly doses (e.g., 600 U/kg).[507] If the cause of poor response to rHuEPO cannot be identified or corrected, consider using a higher dose[508,514-518]
e. For severe anemia, concomitant IV iron potentiates the response to erythropoiesis-stimulating agents.[519-521] Aggressive anemia therapy should not be delayed until the hemoglobin level falls to critical levels[522]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

f. For severe acute anemia, consider initial IV administration of erythropoietin followed by subcutaneous dosing. The IV route achieves higher plasma erythropoietin concentrations, while the subcutaneous route provides more sustained levels[509,523-525]

g. In patients with inflammatory bowel disease (IBD), the therapeutic equivalent dose of 400-900 U/kg/wk of rHuEPO has been estimated to be 2.0-4.5 µg/kg/wk of darbepoetin alfa (DPO)[526]

*Notes:*

1. Early initiation of erythropoiesis-stimulant therapy will address the lag time to adequate response by the bone marrow.
2. Aside from iron deficiency, factors associated with a poor response to erythropoiesis-stimulant therapy include infection, inflammatory or malignant processes, occult blood loss, and hematologic disease.[527,528]
3. In patients with chronic kidney disease or hypertension, erythropoiesis-stimulating agents have been associated with increased hypertension. Monitor for hypertension and consider initiation of or increase in antihypertensive therapy.
4. Data is emerging that systemic administration of recombinant erythropoietin may have cardio- and renoprotective effects[529,530] independent of the hemoglobin level.
5. Pure red-cell aplasia is a rare complication restricted mainly to chronic renal failure patients receiving long-term subcutaneous erythropoietin therapy (i.e., renal dialysis patients).[531]

### B. Iron Therapy and Hematinic Support[532]

1. **Intravenous (IV) iron**[526,533-535] (use test dose)

*Notes:*

1. Intravenous route of administration improves bioavailability, rapidly increases stores, avoids potential malabsorption or gastric irritation (e.g., oral iron).
2. After test dose, administer iron dextran by dilution in normal saline (e.g., 500 ml) and slow IV infusion (e.g., over 1-8 hours) to reduce the risk of adverse reaction.[536-538]

2. **Folic acid**
3. **Vitamin $B_{12}$**

## 9. TOLERANCE OF ANEMIA

### A. Moderate Normovolemic Anemia Is Well Tolerated

1. **In hemodynamically stable patients with coexisting disease, moderate euvolemic anemia is well tolerated**[539-543]
2. **10/30 transfusion threshold has no scientific basis**[544-546]

### B. Compensatory Mechanisms in Normovolemic Anemia[547]

1. **Increased cardiac output**
2. **Redistribution of blood flow**
3. **Increased tissue oxygen extraction**
4. **Decreased oxygen affinity of hemoglobin**

### C. Effects of Stored Red Blood Cell Transfusion

1. **Reversal of hypercoagulable response to hemorrhage**

a. There is evidence that upper GI hemorrhage induces local physiological responses that may act in a protective manner to promote hemostasis: inhibition of acid secretion[548] and a hypercoagulable state.[549] Transfusion of stored (citrate anticoagulated) blood reverses the hypercoagulable state, resulting in rebleeding[115,117,550]

2. **Impaired oxygen-unloading capacity**

a. Stored red blood cells have decreased capacity for unloading oxygen (increased oxygen affinity) because of decreased levels of 2,3-DPG. This may be reversible within 24-48 hours[551-553]

3. **Other adverse clinical outcomes**

a. Allogeneic blood transfusion is associated with an increased risk of infection,[554-557] increased length of stay,[558] cancer recurrence,[559-562] and impaired wound healing[563] and is independently associated with higher mortality[115,564-569]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

## References

**Database Abbreviations:**
PMID: Medline®/PubMed® Unique Identifier (Index Medicus)
EMBASE: Embase® Accession Number (Excerpta Medica)
ISI: Institute for Scientific Information IDS Number

### Assessment and Initial Management


1. Elta GH. Approach to the patient with gross gastrointestinal bleeding. In: Yamada T, Alpers DH, Kaplowitz N, et al, editors. *Textbook of Gastroenterology*. 4th ed. Philadelphia: Lippincott Williams & Wilkins; 2003. p. 698-723. [ISBN: 978-0-781-72861-4]
2. Jutabha R, Jensen DM. Acute upper gastrointestinal bleeding. In: Friedman SL, McQuaid KR, Grendell JH, editors. *Current diagnosis and treatment in gastroenterology*. 2nd ed. New York: Lange/McGraw-Hill; 2003. p. 53-69. [ISBN: 978-0-838-51551-8]
3. Rockey DC. Gastrointestinal bleeding. In: Feldman M, Friedman LS, Sleisenger MH, editors. *Sleisenger and Fordtran's gastrointestinal and liver disease: pathophysiology, diagnosis, management*. 7th ed. Philadelphia: Saunders/Elsevier; 2002. p. 211-48. [ISBN: 978-0-721-69284-5]
4. Cameron EA, Pratap JN, Sims TJ, et al. Three-year prospective validation of a pre-endoscopic risk stratification in patients with acute upper-gastrointestinal haemorrhage. *Eur J Gastroenterol Hepatol* 2002;14(5):497-501. [PMID: 11984147]
5. Blatchford O, Murray WR, Blatchford M. A risk score to predict need for treatment for upper-gastrointestinal haemorrhage. *Lancet* 2000;356(9238):1318-21. [PMID: 11073021]
6. Thomas JM, Wong CJ. Management of gastrointestinal hemorrhage in patients who refuse blood transfusion. *Ann R Coll Physicians Surg Can* 1999;32(2):76-8. [ISSN: 0035-8800]
7. Lieberman D. Gastrointestinal bleeding: initial management. *Gastroenterol Clin North Am* 1993;22(4):723-36. [PMID: 7905862]
8. Eisen GM, Dominitz JA, Faigel DO, et al; American Society for Gastrointestinal Endoscopy. Standards of Practice Committee. An annotated algorithmic approach to upper gastrointestinal bleeding. *Gastrointest Endosc* 2001;53(7):853-8. [PMID: 11375617]
9. Eisen GM, Dominitz JA, Faigel DO, et al; American Society for Gastrointestinal Endoscopy. Standards of Practice Committee. An annotated algorithmic approach to acute lower gastrointestinal bleeding. *Gastrointest Endosc* 2001;53(7):859-63. [PMID: 11375618]
10. Peters JM. Management of gastrointestinal bleeding in children. *Curr Treat Options Gastroenterol* 2002;5(5):399-413. [PMID: 12207863]
11. Rayhorn N, Thrall C, Silber G. A review of the causes of upper gastrointestinal tract bleeding in children. *Gastroenterol Nurs* 2001;24(1):23-7. [PMID: 11847718]
12. Rayhorn N, Thrall C, Silber G. A review of the causes of lower gastrointestinal tract bleeding in children. *Gastroenterol Nurs* 2001;24(2):77-82. [PMID: 11847732]
13. Johnsen SP, Sørensen HT, Mellemkjoer L, et al. Hospitalisation for upper gastrointestinal bleeding associated with use of oral anticoagulants. *Thromb Haemost* 2001;86(2):563-8. [PMID: 11522004]
14. Ibáñez L, Vidal X, Vendrell L, et al; The Spanish-Italian Collaborative Group For The Epidemiology Of Gastrointestinal Bleeding. Upper gastrointestinal bleeding associated with antiplatelet drugs. *Aliment Pharmacol Ther* 2006;23(2):235-42. [PMID: 16393302]
15. Lewis JD, Kimmel SE, Localio AR, et al. Risk of serious upper gastrointestinal toxicity with over-the-counter nonaspirin nonsteroidal anti-inflammatory drugs. *Gastroenterology* 2005;129(6):1865-74. [PMID: 16344055]
16. Gostout CJ. Gastrointestinal bleeding in the elderly patient. *Am J Gastroenterol* 2000;95(3):590-5. [PMID: 10710045]
17. García Rodríguez LA, Cattaruzzi C, Troncon MG, Agostinis L. Risk of hospitalization for upper gastrointestinal tract bleeding associated with ketorolac, other nonsteroidal anti-inflammatory drugs, calcium antagonists, and other antihypertensive drugs. *Arch Intern Med* 1998;158(1):33-9. [PMID: 9437376]
18. Wolfe MM, Lichtenstein DR, Singh G. Gastrointestinal toxicity of nonsteroidal antiinflammatory drugs. *N Engl J Med* 1999;340(24):1888-99. [PMID: 10369853]
19. Dalton SO, Johansen C, Mellemkjær L, et al. Use of selective serotonin reuptake inhibitors and risk of upper gastrointestinal tract bleeding: a population-based cohort study. *Arch Intern Med* 2003;163(1):59-64. [PMID: 12523917]
20. Lanas A, Serrano P, Bajador E, et al. Risk of upper gastrointestinal bleeding associated with non-aspirin cardiovascular drugs, analgesics and nonsteroidal anti-inflammatory drugs. *Eur J Gastroenterol Hepatol* 2003;15(2):173-8. [PMID: 12560762]
21. Jensen DM. Current diagnosis and treatment of severe obscure GI hemorrhage. *Gastrointest Endosc* 2003;58(2):256-66. [PMID: 12872101]
22. Kovacs TO, Jensen DM. Recent advances in the endoscopic diagnosis and therapy of upper gastrointestinal, small intestinal, and colonic bleeding. *Med Clin North Am* 2002;86(6):1319-56. [PMID: 12510456]
23. Zuckerman GR, Prakash C. Acute lower intestinal bleeding. Part I: Clinical presentation and diagnosis. *Gastrointest Endosc* 1998;48(6):606-17. [PMID: 9852451]
24. McGee S, Abernethy WB 3rd, Simel DL. Is this patient hypovolemic? *JAMA* 1999;281(11):1022-9. [PMID: 10086438]
25. Wilcox CM, Alexander LN, Cotsonis G. A prospective characterization of upper gastrointestinal hemorrhage presenting with hematochezia. *Am J Gastroenterol* 1997;92(2):231-5. [PMID: 9040197]
26. Baron BJ, Scalea TM. Acute blood loss. *Emerg Med Clin North Am* 1996;14(1):35-55. [PMID: 8591784]
27. Witting MD, Wears RL, Li S. Defining the positive tilt test: a study of healthy adults with moderate acute blood loss. *Ann Emerg Med* 1994;23(6):1320-3. [PMID: 8198307]
28. Pumphrey CW, Beck ER. Raised blood urea concentration indicates considerable blood loss in acute upper gastrointestinal haemorrhage. *Br Med J* 1980;280(6213):527-8. [PMID: 6966172]
29. Ernst AA, Haynes ML, Nick TG, Weiss SJ. Usefulness of the blood urea nitrogen/creatinine ratio in gastrointestinal bleeding. *Am J Emerg Med* 1999;17(1):70-2. [PMID: 9928705]
30. Chalasani N, Clark WS, Wilcox CM. Blood urea nitrogen to creatinine concentration in gastrointestinal bleeding: a reappraisal. *Am J Gastroenterol* 1997;92(10):1796-9. [PMID: 9382039]
31. Cappell MS. Safety and efficacy of nasogastric intubation for gastrointestinal bleeding after myocardial infarction: an analysis of 125 patients at two tertiary cardiac referral hospitals. *Dig Dis Sci* 2005;50(11):2063-70. [PMID: 16240216]
32. Aljebreen AM, Fallone CA, Barkun AN for the RUGBE Investigators. Nasogastric aspirate predicts high-risk endoscopic lesions in patients with acute upper-GI bleeding. *Gastrointest Endosc* 2004;59(2):172-8. [PMID: 14745388]
33. Witting MD, Magder L, Heins AE, et al. Usefulness and validity of diagnostic nasogastric aspiration in patients without hematemesis. *Ann Emerg Med* 2004;43(4):525-32. [PMID: 15039700]
34. Bono MJ. Lower gastrointestinal tract bleeding. *Emerg Med Clin North Am* 1996;14(3):547-56. [PMID: 8681883]
35. Parente F, Anderloni A, Bargiggia S, et al. Outcome of non-variceal acute upper gastrointestinal bleeding in relation to the time of endoscopy and the experience of the endoscopist: a two-year survey. *World J Gastroenterol* 2005;11(45):7122-30. [PMID: 16437658]
36. Nawaz I, Kundu R, Ahtaridis G, Gordon S. Management of acute gastrointestinal bleed without blood transfusion: a specialized unit experience [abstract]. *Am J Gastroenterol* 2005;100(9 Suppl):S280-1. [PMID: 16143006]
37. Spiegel BM, Vakil NB, Ofman JJ. Endoscopy for acute nonvariceal upper gastrointestinal tract hemorrhage: is sooner better? A systematic review. *Arch Intern Med* 2001;161(11):1393-404. [PMID: 11386888]
38. Chak A, Cooper GS, Lloyd LE, et al. Effectiveness of endoscopy in patients admitted to the intensive care unit with upper GI hemorrhage. *Gastrointest Endosc* 2001;53(1):6-13. [PMID: 11154481]
39. Fox VL. Gastrointestinal bleeding in infancy and childhood. *Gastroenterol Clin North Am* 2000;29(1):37-66. [PMID: 10752017]
40. Lee JG, Turnipseed S, Romano PS, et al. Endoscopy-based triage significantly reduces hospitalization rates and costs of treating upper GI bleeding: a randomized controlled trial. *Gastrointest Endosc* 1999;50(6):755-61. [PMID: 10570332]



* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

41. Cooper GS, Chak A, Way LE, et al. Early endoscopy in upper gastrointestinal hemorrhage: associations with recurrent bleeding, surgery, and length of hospital stay. *Gastrointest Endosc* 1999;49(2):145-52. [PMID: 9925690]

42. Lin HJ, Wang K, Perng CL, et al. Early or delayed endoscopy for patients with peptic ulcer bleeding. A prospective randomized study. *J Clin Gastroenterol* 1996;22(4):267-71. [PMID: 8771420]

43. Rockall TA, Logan RF, Devlin HB, Northfield TC; National Audit of Acute Upper Gastrointestinal Haemorrhage. Selection of patients for early discharge or outpatient care after acute upper gastrointestinal haemorrhage. *Lancet* 1996;347(9009):1138-40. [PMID: 8609747]

44. Longstreth GF, Feitelberg SP. Outpatient care of selected patients with acute non-variceal upper gastrointestinal haemorrhage. *Lancet* 1995;345(8942):108-11. [PMID: 7815854]

45. Freeman ML. Value of stigmata in decision-making in gastrointestinal haemorrhage. *Baillieres Best Pract Res Clin Gastroenterol* 2000;14(3):411-25. [PMID: 10952805]

46. Frossard JL, Spahr L, Queneau PE, et al. Erythromycin intravenous bolus infusion in acute upper gastrointestinal bleeding: a randomized, controlled, double-blind trial. *Gastroenterology* 2002;123(1):17-23. [PMID: 12105828]

47. Coffin B, Pocard M, Panis Y, et al; Groupe des endoscopistes de garde á l'AP-HP. Erythromycin improves the quality of EGD in patients with acute upper GI bleeding: a randomized controlled study. *Gastrointest Endosc* 2002;56(2):174-9. [PMID: 12145593]

48. Green BT, Rockey DC, Portwood G, et al. Urgent colonoscopy for evaluation and management of acute lower gastrointestinal hemorrhage: a randomized controlled trial. *Am J Gastroenterol* 2005;100(11):2395-402. [PMID: 16279891]

49. Elta GH. Urgent colonoscopy for acute lower-GI bleeding. *Gastrointest Endosc* 2004;59(3):402-8. [PMID: 14997144]

50. Schmulewitz N, Fisher DA, Rockey DC. Early colonoscopy for acute lower GI bleeding predicts shorter hospital stay: A retrospective study of experience in a single center. *Gastrointest Endosc* 2003;58(6):841-6. [PMID: 14652550]

51. Strate LL, Syngal S. Timing of colonoscopy: impact on length of hospital stay in patients with acute lower intestinal bleeding. *Am J Gastroenterol* 2003;98(2):317-22. [PMID: 12591048]

52. García Sánchez M, González Galilea A, López Vallejos P, et al. Role of early colonoscopy in severe acute lower gastrointestinal bleeding [Spanish]. *Gastroenterol Hepatol* 2001;24(7):327-32. [PMID: 11481066]

53. Ohyama T, Sakurai Y, Ito M, et al. Analysis of urgent colonoscopy for lower gastrointestinal tract bleeding. *Digestion* 2000;61(3):189-92. [PMID: 10773724]

54. Jensen DM, Machicado GA, Jutabha R, Kovacs TO. Urgent colonoscopy for the diagnosis and treatment of severe diverticular hemorrhage. *N Engl J Med* 2000;342(2):78-82. [PMID: 10631275]

55. Wang HH, Bai B, Wang KB, et al. Interventional therapy for acute hemorrhage in gastrointestinal tract. *World J Gastroenterol* 2006;12(1):134-6. [PMID: 16440433]

56. Waugh J, Madan A, Sacharias N, Thomson K. Embolization for major lower gastrointestinal haemorrhage: five-year experience. *Australas Radiol* 2004;48(3):311-7. [PMID: 15344979]

57. Burgess AN, Evans PM. Lower gastrointestinal haemorrhage and superselective angiographic embolization. *ANZ J Surg* 2004;74(8):635-8. [PMID: 15315561]

58. Aina R, Oliva VL, Therasse E, et al. Arterial embolotherapy for upper gastrointestinal hemorrhage: outcome assessment. *J Vasc Interv Radiol* 2001;12(2):195-200. [PMID: 11265883]

59. Bandi R, Shetty PC, Sharma RP, et al. Superselective arterial embolization for the treatment of lower gastrointestinal hemorrhage. *J Vasc Interv Radiol* 2001;12(12):1399-405. [PMID: 11742013]

60. Patel TH, Cordts PR, Abcarian P, Sawyer MA. Will transcatheter embolotherapy replace surgery in the treatment of gastrointestinal bleeding? *Curr Surg* 2001;58(3):323-7. [PMID: 11397495]

61. Wright CA, Petersen BT, Bridges CM, Alexander JA. Heparin provocation for identification and treatment of a gastric Dieulafoy's lesion. *Gastrointest Endosc* 2004;59(6):728-30. [PMID: 15114325]

62. Mernagh JR, O'Donovan N, Somers S, et al. Use of heparin in the investigation of obscure gastrointestinal bleeding. *Can Assoc Radiol J* 2001;52(4):232-5. [PMID: 11512295]

63. Bloomfeld RS, Smith TP, Schneider AM, Rockey DC. Provocative angiography in patients with gastrointestinal hemorrhage of obscure origin. *Am J Gastroenterol* 2000;95(10):2807-12. [PMID: 11051352]

64. Eisen GM, Eliakim R, Zaman A, et al. The accuracy of PillCam ESO capsule endoscopy versus conventional upper endoscopy for the diagnosis of esophageal varices: a prospective three-center pilot study. *Endoscopy* 2006;38(1):31-5. [PMID: 16429352]

65. Kavin H, Berman J, Martin TL, et al. Successful wireless capsule endoscopy for a 2.5-year-old child: obscure gastrointestinal bleeding from mixed, juvenile, capillary hemangioma-angiomatosis of the jejunum. *Pediatrics* 2006;117(2):539-43. [PMID: 16452379]

66. Triester SL, Leighton JA, Leontiadis GI, et al. A meta-analysis of the yield of capsule endoscopy compared to other diagnostic modalities in patients with obscure gastrointestinal bleeding. *Am J Gastroenterol* 2005;100(11):2407-18. [PMID: 16279893]

67. Guilhon de Araujo Sant'Anna AM, Dubois J, Miron MC, Seidman EG. Wireless capsule endoscopy for obscure small-bowel disorders: final results of the first pediatric controlled trial. *Clin Gastroenterol Hepatol* 2005;3(3):264-70. [PMID: 15765446]

68. Jones BH, Fleischer DE, Sharma VK, et al. Yield of repeat wireless video capsule endoscopy in patients with obscure gastrointestinal bleeding. *Am J Gastroenterol* 2005;100(5):1058-64. [PMID: 15842579]

69. Seidman EG, Sant'Anna AM, Dirks MH. Potential applications of wireless capsule endoscopy in the pediatric age group. *Gastrointest Endosc Clin N Am* 2004;14(1):207-17. [PMID: 15062393]

70. Enns R, Go K, Chang H, Pluta K. Capsule endoscopy: a single-centre experience with the first 226 capsules. *Can J Gastroenterol* 2004;18(9):555-8. [PMID: 15457294]

71. Goldfarb NI, Phillips A, Conn M, et al. Economic and health outcomes of capsule endoscopy: opportunities for improved management of the diagnostic process for obscure gastrointestinal bleeding. *Dis Manag* 2002;5(3):123-35. [EMBASE: 2002336768]

72. Yoon W, Jeong YY, Shin SS, et al. Acute massive gastrointestinal bleeding: detection and localization with arterial phase multi-detector row helical CT. *Radiology* 2006;239(1):160-7. [PMID: 16484350]

73. Rajan R, Dhar P, Praseedom RK, et al. Role of contrast CT in acute lower gastrointestinal bleeding. *Dig Surg* 2004;21(4):293-6. [PMID: 15308870]

74. Ernst O, Bulois P, Saint-Drenant S, et al. Helical CT in acute lower gastrointestinal bleeding. *Eur Radiol* 2003;13(1):114-7. [PMID: 12541118]

75. Rieber A, Aschoff A, Nussle K, et al. MRI in the diagnosis of small bowel disease: use of positive and negative oral contrast media in combination with enteroclysis. *Eur Radiol* 2000;10(9):1377-82. [PMID: 10997423]

76. Legrand MJ, Jacquet N. Surgical approach in severe bleeding peptic ulcer. *Acta Gastroenterol Belg* 1996;59(4):240-4. [PMID: 9085625]

77. Sailer J, Peloschek P, Schober E, et al. Diagnostic value of CT enteroclysis compared with conventional enteroclysis in patients with Crohn's disease. *AJR Am J Roentgenol* 2005;185(6):1575-81. [PMID: 16304016]

78. Boudiaf M, Jaff A, Soyer P, et al. Small-bowel diseases: prospective evaluation of multidetector row helical CT enteroclysis in 107 consecutive patients. *Radiology* 2004;233(2):338-44. [PMID: 15459329]

79. Heine GD, Hadithi M, Groenen MJ, et al. Double-balloon enteroscopy: indications, diagnostic yield, and complications in a series of 275 patients with suspected small-bowel disease. *Endoscopy* 2006;38(1):42-8. [PMID: 16429354]

80. Su MY, Liu NJ, Hsu CM, et al. Double balloon enteroscopy-the last blind-point of the gastrointestinal tract. *Dig Dis Sci* 2005;50(6):1041-5. [PMID: 15986851]

81. Lepère C, Cuillerier E, Van Gossum A, et al. Predictive factors of positive findings in patients explored by push enteroscopy for unexplained GI bleeding. *Gastrointest Endosc* 2005;61(6):709-14. [PMID: 15855976]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

82. Nguyen NQ, Rayner CK, Schoeman MN. Push enteroscopy alters management in a majority of patients with obscure gastrointestinal bleeding. *J Gastroenterol Hepatol* 2005;20(5):716-21. [PMID: 15853984]

83. Cappell MS. Safety of push enteroscopy after recent myocardial infarction. *Dig Dis Sci* 2004;49(3):509-13. [PMID: 15139507]

84. Dulai GS, Jensen DM. Severe gastrointestinal bleeding of obscure origin. *Gastrointest Endosc Clin N Am* 2004;14(1):101-13. [PMID: 15062384]

85. Douard R, Wind P, Panis Y, et al. Intraoperative enteroscopy for diagnosis and management of unexplained gastrointestinal bleeding. *Am J Surg* 2000;180(3):181-4. [PMID: 11084125]

86. Lerer DB, Rozenblit AM, Cynamon J, et al. Spontaneous retroperitoneal hemorrhage localized by blood pool scintigraphy. *Clin Nucl Med* 2004;29(2):96-8. [PMID: 14734906]

87. Howarth DM, Tang K, Lees W. The clinical utility of nuclear medicine imaging for the detection of occult gastrointestinal haemorrhage. *Nucl Med Commun* 2002;23(6):591-4. [PMID: 12029216]

88. O'Neill BB, Gosnell JE, Lull RJ, et al. Cinematic nuclear scintigraphy reliably directs surgical intervention for patients with gastrointestinal bleeding. *Arch Surg* 2000;135(9):1076-81. [PMID: 10982513]

89. Nwakanma L, Meyerrose G, Kennedy S, et al. Recurrent gastrointestinal bleeding diagnosed by delayed scintigraphy with Tc-99m-labeled red blood cells. *Clin Nucl Med* 2003;28(8):691-3. [PMID: 12897664]

90. Levy R, Barto W, Gani J. Retrospective study of the utility of nuclear scintigraphic-labelled red cell scanning for lower gastrointestinal bleeding. *ANZ J Surg* 2003;73(4):205-9. [PMID: 12662227]

91. Ponzo F, Zhuang H, Liu FM, et al. Tc-99m sulfur colloid and Tc-99m tagged red blood cell methods are comparable for detecting lower gastrointestinal bleeding in clinical practice. *Clin Nucl Med* 2002;27(6):405-9. [PMID: 12045430]

## Prompt Arrest of Bleeding

92. Lee YC, Wang HP, Wu MS, et al. Urgent bedside endoscopy for clinically significant upper gastrointestinal hemorrhage after admission to the intensive care unit. *Intensive Care Med* 2003;29(10):1723-8. [PMID: 12915940]

93. Calès P, Masliah C, Bernard B, et al; French Club for the Study of Portal Hypertension. Early administration of vapreotide for variceal bleeding in patients with cirrhosis. *N Engl J Med* 2001;344(1):23-8. [PMID: 11136956]

94. Laine L, Peterson WL. Bleeding peptic ulcer. *N Engl J Med* 1994;331(11):717-27. [PMID: 8058080]

95. Gan AH, Xu AG, Ling H, et al. Value and economic analysis of emergency endoscopy in the diagnosis and treatment of massive upper gastrointestinal hemorrhage [Chinese]. *Zhongguo Wei Zhong Bing Ji Jiu Yi Xue* 2003;15(12):758-61. [PMID: 14659065]

96. Cipolletta L, Bianco MA, Rotondano G, et al. Outpatient management for low-risk nonvariceal upper GI bleeding: a randomized controlled trial. *Gastrointest Endosc* 2002;55(1):1-5. [PMID: 11756905]

97. Cebollero-Santamaria F, Smith J, Gioe S, et al. Selective outpatient management of upper gastrointestinal bleeding in the elderly. *Am J Gastroenterol* 1999;94(5):1242-7. [PMID: 10235201]

98. Hay JA, Maldonado L, Weingarten SR, Ellrodt AG. Prospective evaluation of a clinical guideline recommending hospital length of stay in upper gastrointestinal tract hemorrhage. *JAMA* 1997;278(24):2151-6. [PMID: 9417008]

99. Rogers PN, Murray WR, Shaw R, Brar S. Surgical management of bleeding gastric ulceration. *Br J Surg* 1988;75(1):16-7. [PMID: 3337942]

100. Ovaska JT, Haapiainen RK, Voutilainen PE, Linnankivi AP. Acute surgical treatment of bleeding peptic ulcer. A retrospective analysis of 193 patients. *Ann Chir Gynaecol* 1992;81(1):33-6. [PMID: 1622049]

101. Imhof M, Ohmann C, Röher HD, Glutig H; DUESUC Study Group. Endoscopic versus operative treatment in high-risk ulcer bleeding patients—results of a randomised study. *Langenbecks Arch Surg* 2003;387(9-10):327-36. [PMID: 12536327]

102. Imhof M, Schröders C, Ohmann C, Röher H. Impact of early operation on the mortality from bleeding peptic ulcer—ten years' experience. *Dig Surg* 1998;15(4):308-14. [PMID: 9845604]

103. Morris DL, Hawker PC, Brearley S, et al. Optimal timing of operation for bleeding peptic ulcer: prospective randomised trial. *Br Med J* (*Clin Res Ed*) 1984;288(6426):1277-80. [PMID: 6424827]

## Judicious Volume Resuscitation

104. Ng KF, Lam CC, Chan LC. In vivo effect of haemodilution with saline on coagulation: a randomized controlled trial. *Br J Anaesth* 2002;88(4):475-80. [PMID: 12066721]

105. Boldt J, Haisch G, Suttner S, et al. Are lactated Ringer's solution and normal saline solution equal with regard to coagulation? *Anesth Analg* 2002;94(2):378-84. [PMID: 11812703]

106. Treib J, Haass A, Pindur G, et al. Avoiding an impairment of factor VIII:C by using hydroxyethyl starch with a low in vivo molecular weight [letter]. *Anesth Analg* 1997;84(6):1391. [PMID: 9174332]

107. Treib J, Haass A, Pindur G. Coagulation disorders caused by hydroxyethyl starch. *Thromb Haemost* 1997;78(3):974-83. [PMID: 9308738]

108. Nearman HS, Herman ML. Toxic effects of colloids in the intensive care unit. *Crit Care Clin* 1991;7(3):713-23. [PMID: 1713807]

109. Gannon CJ, Napolitano LM. Severe anemia after gastrointestinal hemorrhage in a Jehovah's Witness: new treatment strategies. *Crit Care Med* 2002;30(8):1893-5. [PMID: 12163811]

110. Cothren C, Moore EE, Offner PJ, et al. Blood substitute and erythropoietin therapy in a severely injured Jehovah's Witness [letter]. *N Engl J Med* 2002;346(14):1097-8. [PMID: 11932486]

111. Arieff AI. Fatal postoperative pulmonary edema: pathogenesis and literature review. *Chest* 1999;115(5):1371-7. [PMID: 10334155]

112. Lowell JA, Schifferdecker C, Driscoll DF, et al. Postoperative fluid overload: not a benign problem. *Crit Care Med* 1990;18(7):728-33. [PMID: 2364713]

113. LeDoux D, Astiz ME, Carpati CM, Rackow EC. Effects of perfusion pressure on tissue perfusion in septic shock. *Crit Care Med* 2000;28(8):2729-32. [PMID: 10966242]

114. Ince C, Sinaasappel M. Microcirculatory oxygenation and shunting in sepsis and shock. *Crit Care Med* 1999;27(7):1369-77. [PMID: 10446833]

115. Blair SD, Janvrin SB, McCollum CN, Greenhalgh RM. Effect of early blood transfusion on gastrointestinal haemorrhage. *Br J Surg* 1986;73(10):783-5. [PMID: 3533203]

116. McCormick PA, Jenkins SA, McIntyre N, Burroughs AK. Why portal hypertensive varices bleed and bleed: a hypothesis. *Gut* 1995;36(1):100-3. [PMID: 7890210]

117. Ginn JL, Ducharme J. Recurrent bleeding in acute upper gastrointestinal hemorrhage: transfusion confusion. *CJEM* 2001;3(3):193-8. [PMID: 17610783] Available at: http://journals.cambridge.org/action/display/Abstract?fromPage=online&aid=9608267&fileId=S1481803500005534 (Accessed February 10, 2016)

118. Solomonov E, Hirsh M, Yahiya A, Krausz MM. The effect of vigourous fluid resuscitation in uncontrolled hemorrhagic shock after massive splenic injury. *Crit Care Med* 2000;28(3):749-54. [PMID: 10752825]

119. Dutton RP. Low-pressure resuscitation from hemorrhagic shock. *Int Anesthesiol Clin* 2002;40(3):19-30. [PMID: 12055510]

120. Duggan JM. Review article: transfusion in gastrointestinal haemorrhage—if, when and how much? *Aliment Pharmacol Ther* 2001;15(8):1109-13. [PMID: 11472313]

121. Sumann G, Kampfl A, Wenzel V, Schobersberger W. Early intensive care unit intervention for trauma care: what alters the outcome? *Curr Opin Crit Care* 2002;8(6):587-92. [PMID: 12454546]

122. Burris D, Rhee P, Kaufmann C, et al. Controlled resuscitation for uncontrolled hemorrhagic shock. *J Trauma* 1999;46(2):216-23. [PMID: 10029024]

123. Tisherman SA, Peitzman AB. Restriction of fluid resuscitation in posttraumatic hypotension. *Curr Opin Crit Care* 1997;3(6):448-54. [ISSN: 1070-5295]

## Pharmacological Enhancement of Hemostasis

124. Reiter RA, Mayr F, Blazicek H, et al. Desmopressin antagonizes the in vitro platelet dysfunction induced by GPIIb/IIIa inhibitors and aspirin. *Blood* 2003;102(13):4594-9. [PMID: 12920042]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

125. Cattaneo M. Desmopressin in the treatment of patients with defects of platelet function. *Haematologica* 2002;87(11):1122-4. [PMID: 12414337]

126. Agnelli G, Parise P, Levi M, et al. Effects of desmopressin on hemostasis in patients with liver cirrhosis. *Haemostasis* 1995;25(5):241-7. [PMID: 7489963]

127. Mannucci PM, Vicente V, Vianello L, et al. Controlled trial of desmopressin in liver cirrhosis and other conditions associated with a prolonged bleeding time. *Blood* 1986;67(4):1148-53. [PMID: 3513867]

128. Hittelet A, Deviere J. Management of anticoagulants before and after endoscopy. *Can J Gastroenterol* 2003;17(5):329-32. [PMID: 12772008]

129. Crowther MA, Douketis JD, Schnurr T, et al. Oral vitamin K lowers the international normalized ratio more rapidly than subcutaneous vitamin K in the treatment of warfarin-associated coagulopathy. A randomized, controlled trial. *Ann Intern Med* 2002;137(4):251-4. [PMID: 12186515]

130. Kaul VV, Munoz SJ. Coagulopathy of liver disease. *Curr Treat Options Gastroenterol* 2000;3(6):433-8. [PMID: 11096602]

131. Alperin JB. Coagulopathy caused by vitamin K deficiency in critically ill, hospitalized patients. *JAMA* 1987;258(14):1916-9. [PMID: 3656602]

132. Levi M, Peters M, Büller HR. Efficacy and safety of recombinant factor VIIa for treatment of severe bleeding: a systematic review. *Crit Care Med* 2005;33(4):883-90. [PMID: 15818119]

133. Vlot AJ, Ton E, Mackaay AJ, et al. Treatment of a severely bleeding patient without preexisting coagulopathy with activated recombinant factor VII. *Am J Med* 2000;108(5):421-3. [PMID: 10759100]

134. Bosch J, Thabut D, Bendtsen F, et al; European Study Group on rFVIIa in UGI Haemorrhage. Recombinant factor VIIa for upper gastrointestinal bleeding in patients with cirrhosis: a randomized, double-blind trial. *Gastroenterology* 2004;127(4):1123-30. [PMID: 15480990]

135. Romero-Castro R, Jimenez-Saenz M, Pellicer-Bautista F, et al. Recombinant-activated factor VII as hemostatic therapy in eight cases of severe hemorrhage from esophageal varices. *Clin Gastroenterol Hepatol* 2004;2(1):78-84. [PMID: 15017636]

136. Tobias JD, Berkenbosch JW. Synthetic factor VIIa concentrate to treat coagulopathy and gastrointestinal bleeding in an infant with end-stage liver disease. *Clin Pediatr* (*Phila*) 2002;41(8):613-6. [PMID: 12403380]

137. Ali ZS, Al-Shaalan H, Jorgensen J. Successful treatment of massive acute lower gastrointestinal bleeding in diverticular disease of colon, with activated recombinant factor VII (NovoSeven). *Blood Coagul Fibrinolysis* 2006;17(4):327-9. [PMID: 16651879]

138. Shao YF, Yang JM, Chau GY, et al. Safety and hemostatic effect of recombinant activated factor VII in cirrhotic patients undergoing partial hepatectomy: a multicenter, randomized, double-blind, placebo-controlled trial. *Am J Surg* 2006;191(2):245-9. [PMID: 16442954]

139. Meijer K, Hendriks HG, De Wolf JT, et al. Recombinant factor VIIa in orthotopic liver transplantation: influence on parameters of coagulation and fibrinolysis. *Blood Coagul Fibrinolysis* 2003;14(2):169-74. [PMID: 12632027]

140. Jeffers L, Chalasani N, Balart L, et al. Safety and efficacy of recombinant factor VIIa in patients with liver disease undergoing laparoscopic liver biopsy. *Gastroenterology* 2002;123(1):118-26. [PMID: 12105840]

141. van Buuren HR, Wielenga JJ. Successful surgery using recombinant factor VIIa for recurrent, idiopathic nonulcer duodenal bleeding in a patient with Glanzmann's thrombasthenia. *Dig Dis Sci* 2002;47(9):2134-6. [PMID: 12353868]

142. Kositchaiwat C, Chuansumrit A. Experiences with recombinant factor VIIa for the prevention of bleeding in patients with chronic liver disease undergoing percutaneous liver biopsies and endoscopic retrograde cholangiopancreatography (ERCP) [letter]. *Thromb Haemost* 2001;86(4):1125-6. [PMID: 11686340]

143. Haas T, Innerhofer P, Kuhbacher G, Fries D. Successful reversal of deleterious coagulopathy by recombinant factor VIIa. *Anesth Analg* 2005;100(1):54-8. [PMID: 15616051]

144. Eikelboom JW, Bird R, Blythe D, et al. Recombinant activated factor VII for the treatment of life-threatening haemorrhage. *Blood Coagul Fibrinolysis* 2003;14(8):713-7. [PMID: 14614349]

145. Ng HJ, Koh LP, Lee LH. Successful control of postsurgical bleeding by recombinant factor VIIa in a renal failure patient given low molecular weight heparin and aspirin. *Ann Hematol* 2003;82(4):257-8. [PMID: 12707733]

146. White B, McHale J, Ravi N, et al. Successful use of recombinant FVIIa (Novoseven®) in the management of intractable post-surgical intra-abdominal haemorrhage [letter]. *Br J Haematol* 1999;107(3):677-8. [PMID: 10583276]

147. Atkison PR, Jardine L, Williams S, et al. Use of recombinant factor VIIa in pediatric patients with liver failure and severe coagulopathy. *Transplant Proc* 2005;37(2):1091-3. [PMID: 15848632]

148. Pavese P, Bonadona A, Beaubien J, et al. FVIIa corrects the coagulopathy of fulminant hepatic failure but may be associated with thrombosis: a report of four cases. *Can J Anaesth* 2005;52(1):26-9. [PMID: 15625252]

149. Mindikoglu AL, Anantharaju A, Villanueva J, et al. Pericardiocentesis and pancreatic aspiration needle biopsy in coagulopathic and thrombocytopenic cirrhotic patient. *Chest* 2003;123(3):956-8. [PMID: 12628903]

150. Anantharaju A, Mehta K, Mindikoglu AL, Van Thiel DH. Use of activated recombinant human factor VII (rhFVIIa) for colonic polypectomies in patients with cirrhosis and coagulopathy. *Dig Dis Sci* 2003;48(7):1414-24. [PMID: 12870806]

151. Bernstein D. Effectiveness of the recombinant factor VIIa in patients with the coagulopathy of advanced Child's B and C cirrhosis. *Semin Thromb Hemost* 2000;26(4):437-8. [PMID: 11092221]

152. Moisescu E, Ardelean L, Simion I, et al. Recombinant factor VIIa treatment of bleeding associated with acute renal failure [letter]. *Blood Coagul Fibrinolysis* 2000;11(6):575-7. [PMID: 10997798]

153. Révész T, Arets B, Bierings M, et al. Recombinant factor VIIa in severe uremic bleeding [letter]. *Thromb Haemost* 1998;80(2):353. [PMID: 9716175]

154. Lisman T, Adelmeijer J, Cauwenberghs S, et al. Recombinant factor VIIa enhances platelet adhesion and activation under flow conditions at normal and reduced platelet count. *J Thromb Haemost* 2005;3(4):742-51. [PMID: 15842358]

155. Virchis A, Hughes C, Berney S. Severe gastrointestinal haemorrhage responding to recombinant factor VIIa in a Jehovah's Witness with refractory immune thrombocytopenia. *Hematol J* 2004;5(3):281-2. [PMID: 15167918]

156. Hoffman R, Eliakim R, Zuckerman T, et al. Successful use of recombinant activated factor VII in controlling upper gastrointestinal bleeding in a patient with relapsed acute myeloid leukemia. *J Thromb Haemost* 2003;1(3):606-8. [PMID: 12871480]

157. Gerotziafas GT, Zervas C, Gavrielidis G, et al. Effective hemostasis with rFVIIa treatment in two patients with severe thrombocytopenia and life-threatening hemorrhage. *Am J Hematol* 2002;69(3):219-22. [PMID: 11891811]

158. Kristensen J, Killander A, Hippe E, et al. Clinical experience with recombinant factor VIIa in patients with thrombocytopenia. *Haemostasis* 1996;26 Suppl 1:159-64. [PMID: 8904193]

159. Almeida AM, Khair K, Hann I, Liesner R. The use of recombinant factor VIIa in children with inherited platelet function disorders. *Br J Haematol* 2003;121(3):477-81. [PMID: 12716372]

160. Monroe DM, Hoffman M, Allen GA, Roberts HR. The factor VII-platelet interplay: effectiveness of recombinant factor VIIa in the treatment of bleeding in severe thrombocytopathia. *Semin Thromb Hemost* 2000;26(4):373-7. [PMID: 11092211]

161. Poon MC, Demers C, Jobin F, Wu JW. Recombinant factor VIIa is effective for bleeding and surgery in patients with Glanzmann thrombasthenia. *Blood* 1999;94(11):3951-3. [PMID: 10572113]

162. Lecumberri R, Panzio C, Paramo JA, et al. Acquired inhibitor of the intrinsic pathway in a non-haemophilic patient. Control of bleeding by recombinant factor VIIa. *Br J Haematol* 2002;119(1):284-5. [PMID: 12358946]

163. Friederich PW, Wever PC, Briët E, et al. Successful treatment with recombinant factor VIIa of therapy-resistant severe bleeding in a patient with acquired von Willebrand disease. *Am J Hematol* 2001;66(4):292-4. [PMID: 11279642]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

164. Meijer K, Peters FT, van der Meer J. Recurrent severe bleeding from gastrointestinal angiodysplasia in a patient with von Willebrand's disease, controlled with recombinant factor VIIa. *Blood Coagul Fibrinolysis* 2001;12(3):211-3. [PMID: 11414636]

165. Laffan MA, Tait RC, Blatný J, et al. Use of recombinant activated factor VII for bleeding in pancreatitis: a case series. *Pancreas* 2005;30(3):279-84. [PMID: 15782108]

166. Moscardó F, Pérez F, de la Rubia J, et al. Successful treatment of severe intra-abdominal bleeding associated with disseminated intravascular coagulation using recombinant activated factor VII. *Br J Haematol* 2001;114(1):174-6. [PMID: 11472364]

167. Roberts HR, Monroe DM 3rd, Hoffman M. Safety profile of recombinant factor VIIa. *Semin Hematol* 2004;41(1 Suppl):101-8. [PMID: 14872430]

168. Roberts HR, Monroe DM, White GC. The use of recombinant factor VIIa in the treatment of bleeding disorders. *Blood* 2004;104(13):3858-64. [PMID: 15328151]

169. Hanslik T, Prinseau J. The use of vitamin K in patients on anticoagulant therapy: a practical guide. *Am J Cardiovasc Drugs* 2004;4(1):43-55. [PMID: 14967065]

170. Lubetsky A, Hoffman R, Zimlichman R, et al. Efficacy and safety of a prothrombin complex concentrate (Octaplex®) for rapid reversal of oral anticoagulation. *Thromb Res* 2004;113(6):371-8. [PMID: 15226091]

171. Preston FE, Laidlaw ST, Sampson B, Kitchen S. Rapid reversal of oral anticoagulation with warfarin by a prothrombin complex concentrate (Beriplex): efficacy and safety in 42 patients. *Br J Haematol* 2002;116(3):619-24. [PMID: 11849221]

172. Pindur G, Mörsdorf S. The use of prothrombin complex concentrates in the treatment of hemorrhages induced by oral anticoagulation. *Thromb Res* 1999;95(4 Suppl 1):S57-61. [PMID: 10499910]

173. Udvardy M, Telek B, Mezey G, et al. Successful control of massive coumarol-induced acute upper gastrointestinal bleeding and correction of prothrombin time by recombinant active factor VII (Eptacog-alpha, NovoSeven) in a patient with a prosthetic aortic valve and two malignancies (chronic lymphoid leukaemia and lung cancer). *Blood Coagul Fibrinolysis* 2004;15(3):265-7. [PMID: 15060425]

174. Levi M, Bijsterveld NR, Keller TT. Recombinant factor VIIa as an antidote for anticoagulant treatment. *Semin Hematol* 2004;41(1 Suppl 1):65-9. [PMID: 14872424]

175. Deveras RA, Kessler CM. Reversal of warfarin-induced excessive anticoagulation with recombinant human factor VIIa concentrate. *Ann Intern Med* 2002;137(11):884-8. [PMID: 12458988]

176. Boulis NM, Bobek MP, Schmaier A, Hoff JT. Use of factor IX complex in warfarin-related intracranial hemorrhage. *Neurosurgery* 1999;45(5):1113-9. [PMID: 10549927]

177. Makris M, Greaves M, Phillips WS, et al. Emergency oral anticoagulant reversal: the relative efficacy of infusions of fresh frozen plasma and clotting factor concentrate on correction of the coagulopathy. *Thromb Haemost* 1997;77(3):477-80. [PMID: 9065997]

178. Mosconi G, Mambelli E, Zanchelli F, et al. Severe gastrointestinal bleeding in a uremic patient treated with estrogen-progesterone therapy. *Int J Artif Organs* 1999;22(5):313-6. [PMID: 10467929]

179. Tran A, Villeneuve JP, Bilodeau M, et al. Treatment of chronic bleeding from gastric antral vascular ectasia (GAVE) with estrogen-progesterone in cirrhotic patients: an open pilot study. *Am J Gastroenterol* 1999;94(10):2909-11. [PMID: 10520843]

180. Heunisch C, Resnick DJ, Vitello JM, Martin SJ. Conjugated estrogens for the management of gastrointestinal bleeding secondary to uremia of acute renal failure. *Pharmacotherapy* 1998;18(1):210-7. [PMID: 9469696]

181. Siple JF, Joseph CL, Pagel KJ, Leigh S. Use of estrogen therapy in a patient with gastrointestinal bleeding secondary to arteriovenous malformations. *Ann Pharmacother* 1997;31(11):1311-4. [PMID: 9391685]

182. Moshkowitz M, Arber N, Amir N, Gilat T. Success of estrogen-progesterone therapy in long-standing bleeding gastrointestinal angiodysplasia. Report of a case. *Dis Colon Rectum* 1993;36(2):194-6. [PMID: 8425426]

183. van Cutsem E, Rutgeerts P, Vantrappen G. Treatment of bleeding gastrointestinal vascular malformations with oestrogen-progesterone. *Lancet* 1990;335(8695):953-5. [PMID: 1970032]

184. Zaharia-Czeizler V. Erythropoietin stops chronic diffuse transfusion-dependent gastrointestinal bleeding [letter]. *Ann Intern Med* 2001;135(10):933. [PMID: 11712898]

185. Homoncik M, Jilma-Stohlawetz P, Schmid M, et al. Erythropoietin increases platelet reactivity and platelet counts in patients with alcoholic liver cirrhosis: a randomized, double-blind, placebo-controlled study. *Aliment Pharmacol Ther* 2004;20(4):437-43. [PMID: 15298638]

186. Stohlawetz PJ, Dzirlo L, Hergovich N, et al. Effects of erythropoietin on platelet reactivity and thrombopoiesis in humans. *Blood* 2000;95(9):2983-9. [PMID: 10779449]

187. Giannini EG. Review article: thrombocytopenia in chronic liver disease and pharmacologic treatment options. *Aliment Pharmacol Ther* 2006;23(8):1055-65. [PMID: 16611265]

188. Sung J, Russell RI, Nyeomans, et al. Non-steroidal anti-inflammatory drug toxicity in the upper gastrointestinal tract. *J Gastroenterol Hepatol* 2000;15 Suppl:G58-68. [PMID: 11100995]

189. Derry S, Loke YK. Risk of gastrointestinal haemorrhage with long term use of aspirin: meta-analysis. *BMJ* 2000;321(7270):1183-7. [PMID: 11073508]

190. De Lédinghen V, Heresbach D, Fourdan O, et al. Anti-inflammatory drugs and variceal bleeding: a case-control study. *Gut* 1999;44(2):270-3. [PMID: 9895389]

191. Hawkey GM, Cole AT, McIntyre AS, et al. Drug treatments in upper gastrointestinal bleeding: value of endoscopic findings as surrogate end points. *Gut* 2001;49(3):372-9. [PMID: 11511559]

192. Dunn CJ, Goa KL. Tranexamic acid: a review of its use in surgery and other indications. *Drugs* 1999;57(6):1005-32. [PMID: 10400410]

193. McCormick PA, Ooi H, Crosbie O. Tranexamic acid for severe bleeding gastric antral vascular ectasia in cirrhosis. *Gut* 1998;42(5):750-2. [PMID: 9659175]

194. Vujkovac B, Lavre J, Šabovič M. Successful treatment of bleeding from colonic angiodysplasias with tranexamic acid in a hemodialysis patient. *Am J Kidney Dis* 1998;31(3):536-8. [PMID: 9506694]

195. Henry DA, O'Connell DL. Effects of fibrinolytic inhibitors on mortality from upper gastrointestinal haemorrhage. *BMJ* 1989;298(6681):1142-6. [PMID: 2500167]

196. von Holstein CC, Eriksson SB, Källén R. Tranexamic acid as an aid to reducing blood transfusion requirements in gastric and duodenal bleeding. *Br Med J* 1987;294(6563):7-10. [PMID: 3101804]

197. Engqvist A, Broström O, von Feilitzen F, et al. Tranexamic acid in massive haemorrhage from the upper gastrointestinal tract: a double-blind study. *Scand J Gastroenterol* 1979;14(7):839-44. [PMID: 395630]

198. Biggs JC, Hugh TB, Dodds AJ. Tranexamic acid and upper gastrointestinal haemorrhage—a double-blind trial. *Gut* 1976;17(9):729-34. [PMID: 789186]

199. al-Mohana JM, Lowe GD, Murray GD, Burns HG. Association of fibrinolytic tests with outcome of acute upper-gastrointestinal-tract bleeding. *Lancet* 1993;341(8844):518-21. [PMID: 8094771]

200. Gunawan B, Runyon B. The efficacy and safety of ε-aminocaproic acid treatment in patients with cirrhosis and hyperfibrinolysis. *Aliment Pharmacol Ther* 2006;23(1):115-20. [PMID: 16393288]

201. Annichino-Bizzacchi JM, Facchini RM, Torresan MZ, Arruda VR. Hereditary hemorrhagic telangiectasia response to aminocaproic acid treatment. *Thromb Res* 1999;96(1):73-6. [PMID: 10554087]

202. Grover N, Johnson A. Aminocaproic acid used to control upper gastrointestinal bleeding in radiation gastritis. *Dig Dis Sci* 1997;42(5):982-4. [PMID: 9149051]

203. Saba HI, Morelli GA, Logrono LA. Brief report: treatment of bleeding in hereditary hemorrhagic telangiectasia with aminocaproic acid. *N Engl J Med* 1994;330(25):1789-90. [PMID: 8190155]

## Upper GI Bleeding

204. Wong CJ, Thomas JM, Shander A, et al. Clinical Strategies for Avoiding and Controlling Hemorrhage and Anemia Without Blood Transfusion in Anesthesiology [poster presentation]. The 12th World Congress of Anaesthesiologists; 2000 Jun 4-9; Montréal, Canada. Reprints available from Hospital Information Services for Jehovah's Witnesses. E-mail: his@jw.org.

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

205. Huang CS, Lichtenstein DR. Nonvariceal upper gastrointestinal bleeding. *Gastroenterol Clin North Am* 2003;32(4):1053-78. [PMID: 14696297]

206. Lau JY, Chung S. Management of upper gastrointestinal haemorrhage. *J Gastroenterol Hepatol* 2000;15 Suppl:G8-12. [PMID: 11100986]

207. Leontiadis GI, Sharma VK, Howden CW. Systematic review and meta-analysis: proton-pump inhibitor treatment for ulcer bleeding reduces transfusion requirements and hospital stay—results from the Cochrane Collaboration. *Aliment Pharmacol Ther* 2005;22(3):169-74. [PMID: 16091053]

208. Khuroo MS, Khuroo MS, Farahat KL, Kagevi IE. Treatment with proton pump inhibitors in acute non-variceal upper gastrointestinal bleeding: a meta-analysis. *J Gastroenterol Hepatol* 2005;20(1):11-25. [PMID: 15610441]

209. Barkun AN, Herba K, Adam V, et al. The cost-effectiveness of high-dose oral proton pump inhibition after endoscopy in the acute treatment of peptic ulcer bleeding. *Aliment Pharmacol Ther* 2004;20(2):195-202. [PMID: 15233700]

210. Gibbons TE, Gold BD. The use of proton pump inhibitors in children: a comprehensive review. *Paediatr Drugs* 2003;5(1):25-40. [PMID: 12513104]

211. Vreeburg EM, Levi M, Rauws EAJ, et al. Enhanced mucosal fibrinolytic activity in gastroduodenal ulcer haemorrhage and the beneficial effect of acid suppression. *Aliment Pharmacol Ther* 2001;15(5):639-46. [PMID: 11328257]

212. Kamada T, Hata J, Kusunoki H, et al. Effect of famotidine on recurrent bleeding after successful endoscopic treatment of bleeding peptic ulcer. *Aliment Pharmacol Ther* 2005;21 Suppl 2:73-8. [PMID: 15943851]

213. Selby NM, Kubba AK, Hawkey CJ. Acid suppression in peptic ulcer haemorrhage: a 'meta-analysis.' *Aliment Pharmacol Ther* 2000;14(9):1119-26. [PMID: 10971227]

214. Barkun A, Sabbah S, Enns R, et al; RUGBE investigators. The Canadian Registry on Nonvariceal Upper Gastrointestinal Bleeding and Endoscopy (RUGBE): Endoscopic hemostasis and proton pump inhibition are associated with improved outcomes in a real-life setting. *Am J Gastroenterol* 2004;99(7):1238-46. [PMID: 15233660]

215. Sung JJ, Chan FK, Lau JY, et al. The effect of endoscopic therapy in patients receiving omeprazole for bleeding ulcers with nonbleeding visible vessels or adherent clots: a randomized comparison. *Ann Intern Med* 2003;139(4):237-43. [PMID: 12965978]

216. Kaviani MJ, Hashemi MR, Kazemifar AR, et al. Effect of oral omeprazole in reducing re-bleeding in bleeding peptic ulcers: a prospective, double-blind, randomized, clinical trial. *Aliment Pharmacol Ther* 2003;17(2):211-6. [PMID: 12534405]

217. Arasaradnam RP, Donnelly MT. Acute endoscopic intervention in non-variceal upper gastrointestinal bleeding. *Postgrad Med J* 2005;81(952):92-8. [PMID: 15701740]

218. Cook DJ, Guyatt GH, Salena BJ, Laine LA. Endoscopic therapy for acute nonvariceal upper gastrointestinal hemorrhage: a meta-analysis. *Gastroenterology* 1992;102(1):139-48. [PMID: 1530782]

219. Sacks HS, Chalmers TC, Blum AL, et al. Endoscopic hemostasis. An effective therapy for bleeding peptic ulcers. *JAMA* 1990;264(4):494-9. [PMID: 2142225]

220. Lokesh Babu TG, Jacobson K, Phang M, et al. Endoscopic hemostasis in a neonate with a bleeding duodenal ulcer. *J Pediatr Gastroenterol Nutr* 2005;41(2):244-6. [PMID: 16056107]

221. Lin HJ, Hsieh YH, Tseng GY, et al. A prospective, randomized trial of endoscopic hemoclip versus heater probe thermocoagulation for peptic ulcer bleeding. *Am J Gastroenterol* 2002;97(9):2250-4. [PMID: 12358241]

222. Jaramillo JL, Carmona C, Gálvez C, et al. Efficacy of the heater probe in peptic ulcer with a non-bleeding visible vessel. A controlled, randomised study. *Gut* 1993;34(11):1502-6. [PMID: 8244132]

223. Bianco MA, Rotondano G, Marmo R, et al. Combined epinephrine and bipolar probe coagulation vs. bipolar probe coagulation alone for bleeding peptic ulcer: A randomized, controlled trial. *Gastrointest Endosc* 2004;60(6):910-5. [PMID: 15605005]

224. Soon MS, Wu SS, Chen YY, et al. Monopolar coagulation versus conventional endoscopic treatment for high-risk peptic ulcer bleeding: a prospective, randomized study. *Gastrointest Endosc* 2003;58(3):323-9. [PMID: 14528202]

225. Laine L, Estrada R. Randomized trial of normal saline solution injection versus bipolar electrocoagulation for treatment of patients with high-risk bleeding ulcers: is local tamponade enough? *Gastrointest Endosc* 2002;55(1):6-10. [PMID: 11756906]

226. Lin HJ, Wang K, Perng CL, et al. Heater probe thermocoagulation and multipolar electrocoagulation for arrest of peptic ulcer bleeding. A prospective, randomized comparative trial. *J Clin Gastroenterol* 1995;21(2):99-102. [PMID: 8583095]

227. Laine L. Multipolar electrocoagulation versus injection therapy in the treatment of bleeding peptic ulcers. A prospective, randomized trial. *Gastroenterology* 1990;99(5):1303-6. [PMID: 2210238]

228. Paspatis GA, Charoniti I, Papanikolaou N, et al. A prospective, randomized comparison of 10-Fr versus 7-Fr bipolar electrocoagulation catheter in combination with adrenaline injection in the endoscopic treatment of bleeding peptic ulcers. *Am J Gastroenterol* 2003;98(10):2192-7. [PMID: 14572567]

229. Lin HJ, Tseng GY, Perng CL, et al. Comparison of adrenaline injection and bipolar electrocoagulation for the arrest of peptic ulcer bleeding. *Gut* 1999;44(5):715-9. [PMID: 10205211]

230. Skok P, Krizman I, Skok M. Argon plasma coagulation versus injection sclerotherapy in peptic ulcer hemorrhage—a prospective, controlled study. *Hepatogastroenterology* 2004;51(55):165-70. [PMID: 15011856]

231. Chau CH, Siu WT, Law BK, et al. Randomized controlled trial comparing epinephrine injection plus heat probe coagulation versus epinephrine injection plus argon plasma coagulation for bleeding peptic ulcers. *Gastrointest Endosc* 2003;57(4):455-61. [PMID: 12665753]

232. Cipolletta L, Bianco MA, Rotondano G, et al. Prospective comparison of argon plasma coagulator and heater probe in the endoscopic treatment of major peptic ulcer bleeding. *Gastrointest Endosc* 1998;48(2):191-5. [PMID: 9717787]

233. Panés J, Viver J, Forne M. Randomized comparison of endoscopic microwave coagulation and endoscopic sclerosis in the treatment of bleeding peptic ulcers. *Gastrointest Endosc* 1991;37(6):611-6. [PMID: 1756919]

234. Sofia C, Portela F, Gregorio C, et al. Endoscopic injection therapy vs. multipolar electrocoagulation vs. laser vs. injection + octreotide vs. injection + omeprazole in the treatment of bleeding peptic ulcers. A prospective randomized study. *Hepatogastroenterology* 2000;47(35):1332-6. [PMID: 11100345]

235. Hui WM, Ng MM, Lok AS, et al. A randomized comparative study of laser photocoagulation, heater probe, and bipolar electrocoagulation in the treatment of actively bleeding ulcers. *Gastrointest Endosc* 1991;37(3):299-304. [PMID: 2070978]

236. Ertekin C, Yanar H, Taviloglu K, et al. Can endoscopic injection of epinephrine prevent surgery in gastroduodenal ulcer bleeding? An analysis of 107 cases. *J Laparoendosc Adv Surg Tech A* 2004;14(3):147-52. [PMID: 15245666]

237. Park CH, Lee SJ, Park JH, et al. Optimal injection volume of epinephrine for endoscopic prevention of recurrent peptic ulcer bleeding. *Gastrointest Endosc* 2004;60(6):875-80. [PMID: 15605000]

238. Chung SS, Lau JY, Sung JJ, et al. Randomised comparison between adrenaline injection alone and adrenaline injection plus heat probe treatment for actively bleeding ulcers. *BMJ* 1997;314(7090):1307-11. [PMID: 9158465]

239. Kubba AK, Murphy W, Palmer KR. Endoscopic injection for bleeding peptic ulcer: a comparison of adrenaline alone with adrenaline plus human thrombin. *Gastroenterology* 1996;111(3):623-8. [PMID: 8780566]

240. Juszkiewicz P, Wajda Z, Dobosz M, et al. The role of endoscopic thrombin injections in the treatment of gastroduodenal bleeding. *S Afr J Surg* 1993;31(3):98-102. [PMID: 8128328]

241. Brullet E, Campo R, Calvet X, et al. A randomized study of the safety of outpatient care for patients with bleeding peptic ulcer treated by endoscopic injection. *Gastrointest Endosc* 2004;60(1):15-21. [PMID: 15229419]

242. Ljubicic N, Supanc V, Vrsalovic M. Efficacy of endoscopic clipping for actively bleeding peptic ulcer: comparison with polidocanol injection therapy. *Hepatogastroenterology* 2004;51(56):408-12. [PMID: 15086170]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

243. Gevers AM, De Goede E, Simoens M, et al. A randomized trial comparing injection therapy with hemoclip and with injection combined with hemoclip for bleeding ulcers. *Gastrointest Endosc* 2002;55(4):466-9. [PMID: 11923755]

244. Petersen B, Barkun A, Carpenter S, et al; Technology Assessment Committee, American Society for Gastrointestinal Endoscopy. Tissue adhesives and fibrin glues. *Gastrointest Endosc* 2004;60(3):327-33. [PMID: 15332018]

245. Rutgeerts P, Rauws E, Wara P, et al. Randomised trial of single and repeated fibrin glue compared with injection of polidocanol in treatment of bleeding peptic ulcer. *Lancet* 1997;350(9079):692-6. [PMID: 9291903]

246. Park CH, Lee WS, Joo YE, et al. Endoscopic band ligation for control of acute peptic ulcer bleeding. *Endoscopy* 2004;36(1):79-82. [PMID: 14722860]

247. Matsui S, Kamisako T, Kudo M, Inoue R. Endoscopic band ligation for control of nonvariceal upper GI hemorrhage: comparison with bipolar electrocoagulation. *Gastrointest Endosc* 2002;55(2):214-8. [PMID: 11818925]

248. Abi-Hanna D, Williams SJ, Gillespie PE, Bourke MJ. Endoscopic band ligation for nonvariceal non-ulcer gastrointestinal hemorrhage. *Gastrointest Endosc* 1998;48(5):510-4. [PMID: 9831841]

249. Raju GS, Gajula L. Endoclips for GI endoscopy. *Gastrointest Endosc* 2004;59(2):267-79. [PMID: 14745407]

250. Ohta S, Goto H, Yukioka T, et al. Efficacy of endoscopic hemoclipping for GI bleeding in relation to severity of shock. *Hepatogastroenterology* 2003;50(51):721-4. [PMID: 12828070]

251. Lin HJ, Perng CL, Sun IC, Tseng GY. Endoscopic haemoclip versus heater probe thermocoagulation plus hypertonic saline-epinephrine injection for peptic ulcer bleeding. *Dig Liver Dis* 2003;35(12):898-902. [PMID: 14703887]

252. Cipolletta L, Bianco MA, Marmo R, et al. Endoclips versus heater probe in preventing early recurrent bleeding from peptic ulcer: a prospective and randomized trial. *Gastrointest Endosc* 2001;53(2):147-51. [PMID: 11174282]

253. Karkos CD, Bruce IA, Lambert ME. Use of the intra-aortic balloon pump to stop gastrointestinal bleeding. *Ann Emerg Med* 2001;38(3):328-31. [PMID: 11524655]

254. Satoh T, Shimoyama T, Fukuda S, et al. Simple hemostatic procedure for hemorrhagic duodenal ulcer: two cases of arterial hemorrhage quickly controlled by balloon compression. *Endoscopy* 2000;32(1):84-6. [PMID: 10691279]

255. Calvet X, Vergara M, Brullet E, et al. Addition of a second endoscopic treatment following epinephrine injection improves outcome in high-risk bleeding ulcers. *Gastroenterology* 2004;126(2):441-50. [PMID: 14762781]

256. Bini EJ, Cohen J. Endoscopic treatment compared with medical therapy for the prevention of recurrent ulcer hemorrhage in patients with adherent clots. *Gastrointest Endosc* 2003;58(5):707-14. [PMID: 14595306]

257. Chung SC, Lau JY, Rutgeerts P, Fennerty MB. Thermal coagulation for nonvariceal bleeding. *Endoscopy* 2002;34(1):89-92. [PMID: 11778137]

258. Bleau BL, Gostout CJ, Sherman KE, et al. Recurrent bleeding from peptic ulcer associated with adherent clot: a randomized study comparing endoscopic treatment with medical therapy. *Gastrointest Endosc* 2002;56(1):1-6. [PMID: 12085028]

259. Jensen DM, Kovacs TO, Jutabha R, et al. Randomized trial of medical or endoscopic therapy to prevent recurrent ulcer hemorrhage in patients with adherent clots. *Gastroenterology* 2002;123(2):407-13. [PMID: 12145792]

260. Lo CC, Hsu PI, Lo GH, et al. Comparison of hemostatic efficacy for epinephrine injection alone and injection combined with hemoclip therapy in treating high-risk bleeding ulcers. *Gastrointest Endosc* 2006;63(6):767-73. [PMID: 16650535]

261. Park CH, Joo YE, Kim HS, et al. A prospective, randomized trial comparing mechanical methods of hemostasis plus epinephrine injection to epinephrine injection alone for bleeding peptic ulcer. *Gastrointest Endosc* 2004;60(2):173-9. [PMID: 15278040]

262. Ohmann C, Imhof M, Röher HD. Trends in peptic ulcer bleeding and surgical treatment. *World J Surg* 2000;24(3):284-93. [PMID: 10658062]

263. Lau WY, Leung KL, Kwong KH, et al. A randomized study comparing laparoscopic versus open repair of perforated peptic ulcer using suture or sutureless technique. *Ann Surg* 1996;224(2):131-8. [PMID: 8757375]

264. Chung CS. Surgery and gastrointestinal bleeding. *Gastrointest Endosc Clin N Am* 1997;7(4):687-701. [PMID: 9376958]

265. Poxon VA, Keighley MR, Dykes PW, et al. Comparison of minimal and conventional surgery in patients with bleeding peptic ulcer: a multicentre trial. *Br J Surg* 1991;78(11):1344-5. [PMID: 1760699]

266. Teenan RP, Murray WR. Late outcome of undersewing alone for gastric ulcer haemorrhage. *Br J Surg* 1990;77(7):811-2. [PMID: 1974475]

267. Millat B, Hay JM, Valleur P, et al; French Associations for Surgical Research. Emergency surgical treatment for bleeding duodenal ulcer: oversewing plus vagotomy versus gastric resection, a controlled randomized trial. *World J Surg* 1993;17(5):568-73. [PMID: 8273376]

268. Ripoll C, Bañares R, Beceiro I, et al. Comparison of transcatheter arterial embolization and surgery for treatment of bleeding peptic ulcer after endoscopic treatment failure. *J Vasc Interv Radiol* 2004;15(5):447-50. [PMID: 15126653]

269. Chiu PW, Lam CY, Lee SW, et al. Effect of scheduled second therapeutic endoscopy on peptic ulcer rebleeding: a prospective randomised trial. *Gut* 2003;52(10):1403-7. [PMID: 12970130]

270. Marmo R, Rotondano G, Bianco MA, et al. Outcome of endoscopic treatment for peptic ulcer bleeding: Is a second look necessary? A meta-analysis. *Gastrointest Endosc* 2003;57(1):62-7. [PMID: 12518133]

271. Hsu PI, Lo GH, Lo CC, et al. Intravenous pantoprazole versus ranitidine for prevention of rebleeding after endoscopic hemostasis of bleeding peptic ulcers. *World J Gastroenterol* 2004;10(24):3666-9. [PMID: 15534928]

272. Lin HJ, Lo WC, Lee FY, et al. A prospective randomized comparative trial showing that omeprazole prevents rebleeding in patients with bleeding peptic ulcer after successful endoscopic therapy. *Arch Intern Med* 1998;158(1):54-8. [PMID: 9437379]

273. Cook D, Guyatt G, Marshall J, et al, for the Canadian Critical Care Trials Group. A comparison of sucralfate and ranitidine for the prevention of upper gastrointestinal bleeding in patients requiring mechanical ventilation. *N Engl J Med* 1998;338(12):791-7. [PMID: 9504939]

274. Christensen A, Bousfield R, Christiansen J. Incidence of perforated and bleeding peptic ulcers before and after the introduction of H2-receptor antagonists. *Ann Surg* 1988;207(1):4-6. [PMID: 2892468]

275. Lau JY, Sung JJ, Lam YH, et al. Endoscopic retreatment compared with surgery in patients with recurrent bleeding after initial endoscopic control of bleeding ulcers. *N Engl J Med* 1999;340(10):751-6. [PMID: 10072409]

276. Arkkila PE, Seppälä K, Kosunen TU, et al. Eradication of Helicobacter pylori improves the healing rate and reduces the relapse rate of nonbleeding ulcers in patients with bleeding peptic ulcer. *Am J Gastroenterol* 2003;98(10):2149-56. [PMID: 14572560]

277. Chan FK, To KF, Wu JC, et al. Eradication of Helicobacter pylori and risk of peptic ulcers in patients starting long-term treatment with non-steroidal anti-inflammatory drugs: a randomised trial. *Lancet* 2002;359(9300):9-13. [PMID: 11809180]

278. Lai KC, Hui WM, Wong WM, et al. Treatment of Helicobacter pylori in patients with duodenal ulcer hemorrhage—a long-term randomized, controlled study. *Am J Gastroenterol* 2000;95(9):2225-32. [PMID: 11007222]

279. Chan FK, Ching JY, Hung LC, et al. Clopidogrel versus aspirin and esomeprazole to prevent recurrent ulcer bleeding. *N Engl J Med* 2005;352(3):238-44. [PMID: 15659723]

280. Chan FK, Hung LC, Suen BY, et al. Celecoxib versus diclofenac plus omeprazole in high-risk arthritis patients: results of a randomized double-blind trial. *Gastroenterology* 2004;127(4):1038-43. [PMID: 15480981]

281. Weideman RA, Kelly KC, Kazi S, et al. Risks of clinically significant upper gastrointestinal events with etodolac and naproxen: a historical cohort analysis. *Gastroenterology* 2004;127(5):1322-8. [PMID: 15521001]

282. Comar KM, Sanyal AJ. Portal hypertensive bleeding. *Gastroenterol Clin North Am* 2003;32(4):1079-105. [PMID: 14696298]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

283. Sharara AI, Rockey DC. Gastroesophageal variceal hemorrhage. *N Engl J Med* 2001;345(9):669-81. [PMID: 11547722]

284. Burroughs AK, Planas R, Svoboda P. Optimizing emergency care of upper gastrointestinal bleeding in cirrhotic patients. *Scand J Gastroenterol* 1998;33(Suppl 226):14-24. [PMID: 9595599]

285. Bañares R, Albillos A, Rincón D, et al. Endoscopic treatment versus endoscopic plus pharmacologic treatment for acute variceal bleeding: a meta-analysis. *Hepatology* 2002;35(3):609-15. [PMID: 11870374]

286. Zhou Y, Qiao L, Wu J, et al. Comparison of the efficacy of octreotide, vasopressin, and omeprazole in the control of acute bleeding in patients with portal hypertensive gastropathy: a controlled study. *J Gastroenterol Hepatol* 2002;17(9):973-9. [PMID: 12167118]

287. De Franchis R, Bañares R, Silvain C. Emergency endoscopy strategies for improved outcomes. *Scand J Gastroenterol* 1998;33 Suppl 226:25-36. [PMID: 9595600]

288. Eroglu Y, Emerick KM, Whitington PF, Alonso EM. Octreotide therapy for control of acute gastrointestinal bleeding in children. *J Pediatr Gastroenterol Nutr* 2004;38(1):41-7. [PMID: 14676593]

289. D'Amico G, Pietrosi G, Tarantino I, Pagliaro L. Emergency sclerotherapy versus vasoactive drugs for variceal bleeding in cirrhosis: a Cochrane meta-analysis. *Gastroenterology* 2003;124(5):1277-91. [PMID: 12730868]

290. Corley DA, Cello JP, Adkisson W, et al. Octreotide for acute esophageal variceal bleeding: a meta-analysis. *Gastroenterology* 2001;120(4):946-54. [PMID: 11231948]

291. Freitas DS, Sofia C, Pontes JM, et al. Octreotide in acute bleeding esophageal varices: a prospective randomized study. *Hepatogastroenterology* 2000;47(35):1310-4. [PMID: 11100339]

292. Enns RA, Gagnon YM, Rioux KP, Levy AR. Cost-effectiveness in Canada of intravenous proton pump inhibitors for all patients presenting with acute upper gastrointestinal bleeding. *Aliment Pharmacol Ther* 2003;17(2):225-33. [PMID: 12534407]

293. Zuberi BF, Baloch Q. Comparison of endoscopic variceal sclerotherapy alone and in combination with octreotide in controlling acute variceal hemorrhage and early rebleeding in patients with low-risk cirrhosis. *Am J Gastroenterol* 2000;95(3):768-71. [PMID: 10710072]

294. Avgerinos A, Nevens F, Raptis S, Fevery J. Early administration of somatostatin and efficacy of sclerotherapy in acute oesophageal variceal bleeds: the European Acute Bleeding Oesophageal Variceal Episodes (ABOVE) randomised trial. *Lancet* 1997;350(9090):1495-9. [PMID: 9388396]

295. Baik SK, Jeong PH, Ji SW, et al. Acute hemodynamic effects of octreotide and terlipressin in patients with cirrhosis: a randomized comparison. *Am J Gastroenterol* 2005;100(3):631-5. [PMID: 15743362]

296. Villanueva C, Planella M, Aracil C, et al. Hemodynamic effects of terlipressin and high somatostatin dose during acute variceal bleeding in nonresponders to the usual somatostatin dose. *Am J Gastroenterol* 2005;100(3):624-30. [PMID: 15743361]

297. Ioannou GN, Doust J, Rockey DC. Systematic review: terlipressin in acute oesophageal variceal haemorrhage. *Aliment Pharmacol Ther* 2003;17(1):53-64. [PMID: 12492732]

298. Levacher S, Letoumelin P, Pateron D, et al. Early administration of terlipressin plus glyceryl trinitrate to control active upper gastrointestinal bleeding in cirrhotic patients. *Lancet* 1995;346(8979):865-8. [PMID: 7564670]

299. D'Amico G, Traina M, Vizzini G, et al; Liver Study Group of V. Cervello Hospital. Terlipressin or vasopressin plus transdermal nitroglycerin in a treatment strategy for digestive bleeding in cirrhosis. A randomized clinical trial. *J Hepatol* 1994;20(2):206-12. [PMID: 8006401]

300. Silvain C, Carpentier S, Sautereau D, et al. Terlipressin plus transdermal nitroglycerin vs. octreotide in the control of acute bleeding from esophageal varices: a multicenter randomized trial. *Hepatology* 1993;18(1):61-5. [PMID: 8325622]

301. Hwang SJ, Lin HC, Chang CF, et al. A randomized controlled trial comparing octreotide and vasopressin in the control of acute esophageal variceal bleeding. *J Hepatol* 1992;16(3):320-5. [PMID: 1487608]

302. Stump DL, Hardin TC. The use of vasopressin in the treatment of upper gastrointestinal haemorrhage. *Drugs* 1990;39(1):38-53. [PMID: 2178911]

303. Westaby D, Hayes PC, Gimson AE, et al. Controlled clinical trial of injection sclerotherapy for active variceal bleeding. *Hepatology* 1989;9(2):274-7. [PMID: 2492252]

304. Gimson AE, Westaby D, Hegarty J, et al. A randomized trial of vasopressin and vasopressin plus nitroglycerin in the control of acute variceal hemorrhage. *Hepatology* 1986;6(3):410-3. [PMID: 3086204]

305. Attwell AR, Chen YK. Endoscopic ligation in the treatment of variceal bleeding. *Tech Gastrointest Endosc* 2005;7(1):18-25. [EMBASE: 2005033432]

306. de la Peña J, Rivero M, Sanchez E, et al. Variceal ligation compared with endoscopic sclerotherapy for variceal hemorrhage: prospective randomized trial. *Gastrointest Endosc* 1999;49(4 Pt 1):417-23. [PMID: 10202052]

307. Lo GH, Lai KH, Cheng JS, et al. Emergency banding ligation versus sclerotherapy for the control of active bleeding from esophageal varices. *Hepatology* 1997;25(5):1101-4. [PMID: 9141424]

308. Laine L, Cook D. Endoscopic ligation compared with sclerotherapy for treatment of esophageal variceal bleeding. A meta-analysis. *Ann Intern Med* 1995;123(4):280-7. [PMID: 7611595]

309. Farooq FT, Wong RCK. Injection sclerotherapy for the management of esophageal and gastric varices. *Tech Gastrointest Endosc* 2005;7(1):8-17. [EMBASE: 2005033431]

310. Zargar SA, Yattoo GN, Javid G, et al. Fifteen-year follow up of endoscopic injection sclerotherapy in children with extrahepatic portal venous obstruction. *J Gastroenterol Hepatol* 2004;19(2):139-45. [PMID: 14731122]

311. Meirelles-Santos JO, Carvalho AF Jr, Callejas-Neto F, et al. Absolute ethanol and 5% ethanolamine oleate are comparable for sclerotherapy of esophageal varices. *Gastrointest Endosc* 2000;51(5):573-6. [PMID: 10805844]

312. Hartigan PM, Gebhard RL, Gregory PB; Veterans Affairs Cooperative Variceal Sclerotherapy Group. Sclerotherapy for actively bleeding esophageal varices in male alcoholics with cirrhosis. *Gastrointest Endosc* 1997;46(1):1-7. [PMID: 9260697]

313. Cipolletta L, Bianco MA, Rotondano G, et al. Argon plasma coagulation prevents variceal recurrence after band ligation of esophageal varices: Preliminary results of a prospective randomized trial. *Gastrointest Endosc* 2002;56(4):467-71. [PMID: 12297759]

314. Nakamura S, Mitsunaga A, Murata Y, et al. Endoscopic induction of mucosal fibrosis by argon plasma coagulation (APC) for esophageal varices: A prospective randomized trial of ligation plus APC vs. ligation alone. *Endoscopy* 2001;33(3):210-5. [PMID: 11293751]

315. Feretis C, Dimopoulos C, Benakis P, et al. N-butyl-2-cyanoacrylate (Histoacryl) plus sclerotherapy versus sclerotherapy alone in the treatment of bleeding esophageal varices: a randomized prospective study. *Endoscopy* 1995;27(5):355-7. [PMID: 7588348]

316. Thakeb F, Salama Z, Salama H, et al. The value of combined use of N-butyl-2-cyanoacrylate and ethanolamine oleate in the management of bleeding esophagogastric varices. *Endoscopy* 1995;27(5):358-64. [PMID: 7588349]

317. Schwartz DC, Lucey MR, McDermott JC, Rikkers LF. Variceal bleeding refractory to endoscopic management: Indications and use of balloon tamponade, interventional radiology, and surgical treatment. *Tech Gastrointest Endosc* 2005;7(1):49-58. [EMBASE: 2005033437]

318. Lin TC, Bilir BM, Powis ME. Endoscopic placement of Sengstaken-Blakemore tube. *J Clin Gastroenterol* 2000;31(1):29-32. [PMID: 10914772]

319. Garcia-Compean D, Blanc P, Bories JM, et al. Treatment of active gastroesophageal variceal bleeding with terlipressin or hemostatic balloon in patients with cirrhosis. A randomized controlled trial. *Arch Med Res* 1997;28(2):241-5. [PMID: 9204616]

320. Avgerinos A, Armonis A. Balloon tamponade technique and efficacy in variceal haemorrhage. *Scand J Gastroenterol* 1994;Suppl 207:11-6. [PMID: 7701261]

321. Panés J, Terés J, Bosch J, Rodés J. Efficacy of balloon tamponade in treatment of bleeding gastric and esophageal varices. Results in 151 consecutive episodes. *Dig Dis Sci* 1988;33(4):454-9. [PMID: 3280273]

322. Ryan BM, Stockbrugger RW, Ryan JM. A pathophysiologic, gastroenterologic, and radiologic approach to the management of gastric varices. *Gastroenterology* 2004;126(4):1175-89. [PMID: 15057756]

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

323. Sarin SK. Long-term follow-up of gastric variceal sclerotherapy: an eleven-year experience. *Gastrointest Endosc* 1997;46(1):8-14. [PMID: 9260698]

324. Greenwald BD, Caldwell SH, Hespenheide EE, et al. N-2-butyl-cyanoacrylate for bleeding gastric varices: a United States pilot study and cost analysis. *Am J Gastroenterol* 2003;98(9):1982-8. [PMID: 14499775]

325. Sarin SK, Jain AK, Jain M, Gupta R. A randomized controlled trial of cyanoacrylate versus alcohol injection in patients with isolated fundic varices. *Am J Gastroenterol* 2002;97(4):1010-5. [PMID: 12003381]

326. Iwase H, Maeda O, Shimada M, Tsuzuki T, Peek RM Jr, Nishio Y, Ando T, Ina K, Kusugami K. Endoscopic ablation with cyanoacrylate glue for isolated gastric variceal bleeding. *Gastrointest Endosc* 2001;53(6): 585-92. [PMID: 11323583]

327. Lo GH, Lai KH, Cheng JS, et al. A prospective, randomized trial of butyl cyanoacrylate injection versus band ligation in the management of bleeding gastric varices. *Hepatology* 2001;33(5):1060-4. [PMID: 11343232]

328. Datta D, Vlavianos P, Alisa A, Westaby D. Use of fibrin glue (beriplast) in the management of bleeding gastric varices. *Endoscopy* 2003;35(8):675-8. [PMID: 12929063]

329. Heneghan MA, Byrne A, Harrison PM. An open pilot study of the effects of a human fibrin glue for endoscopic treatment of patients with acute bleeding from gastric varices. *Gastrointest Endosc* 2002;56(3):422-6. [PMID: 12196788]

330. Harada T, Yoshida T, Shigemitsu T, et al. Therapeutic results of endoscopic variceal ligation for acute bleeding of oesophageal and gastric varices. *J Gastroenterol Hepatol* 1997;12(4):331-5. [PMID: 9195375]

331. Takeuchi M, Nakai Y, Syu A, et al. Endoscopic ligation of gastric varices [letter]. *Lancet* 1996;348(9033):1038. [PMID: 8855892]

332. Yoshida T, Harada T, Shigemitsu T, et al. Endoscopic management of gastric varices using a detachable snare and simultaneous endoscopic sclerotherapy and O-ring ligation. *J Gastroenterol Hepatol* 1999;14(7):730-5. [PMID: 10440220]

333. Greenwald B. The Minnesota tube: its use and care in bleeding esophageal and gastric varices. *Gastroenterol Nurs* 2004;27(5):212-7. [PMID: 15502514]

334. Minocha A, Richards RJ. Sengstaken-Blakemore tube for control of massive bleeding from gastric varices in hiatal hernia. *J Clin Gastroenterol* 1992;14(1):36-8. [PMID: 1556405]

335. Orloff MJ, Orloff MS, Girard B, Orloff SL. Bleeding esophagogastric varices from extrahepatic portal hypertension: 40 years' experience with portal-systemic shunt. *J Am Coll Surg* 2002;194(6):717-28. [PMID: 12081062]

336. Khaitiyar JS, Luthra SK, Prasad N, et al. Transjugular intrahepatic portosystemic shunt versus distal splenorenal shunt—a comparative study. *Hepatogastroenterology* 2000;47(32):492-7. [PMID: 10791220]

337. Rosemurgy AS, Serafini FM, Zweibel BR, et al. Transjugular intrahepatic portosystemic shunt vs. small-diameter prosthetic H-graft portacaval shunt: extended follow-up of an expanded randomized prospective trial. *J Gastrointest Surg* 2000;4(6):589-97. [PMID: 11307093]

338. Jenkins RL, Gedaly R, Pomposelli JJ, et al. Distal splenorenal shunt: role, indications, and utility in the era of liver transplantation. *Arch Surg* 1999;134(4):416-20. [PMID: 10199316]

339. Evans S, Stovroff M, Heiss K, Ricketts R. Selective distal splenorenal shunts for intractable variceal bleeding in pediatric portal hypertension. *J Pediatr Surg* 1995;30(8):1115-8. [PMID: 7472961]

340. Mathur SK, Shah SR, Soonawala ZF, et al. Transabdominal extensive oesophagogastric devascularization with gastro-oesophageal stapling in the management of acute variceal bleeding. *Br J Surg* 1997;84(3):413-7. [PMID: 9117327]

341. Boyer TD, Haskal ZJ; American Association for the Study of Liver Diseases. The role of transjugular intrahepatic portosystemic shunt in the management of portal hypertension. *Hepatology* 2005;41(2):386-400. [PMID: 15660434]

342. Tripathi D, Therapondos G, Jackson E, et al. The role of the transjugular intrahepatic portosystemic stent shunt (TIPSS) in the management of bleeding gastric varices: clinical and haemodynamic correlations. *Gut* 2002;51(2):270-4. [PMID: 12117893]

343. Barange K, Peron JM, Imani K, et al. Transjugular intrahepatic portosystemic shunt in the treatment of refractory bleeding from ruptured gastric varices. *Hepatology* 1999;30(5):1139-43. [PMID: 10534333]

344. Sanyal AJ, Freedman AM, Luketic VA, et al. Transjugular intrahepatic portosystemic shunts for patients with active variceal hemorrhage unresponsive to sclerotherapy. *Gastroenterology* 1996;111(1):138-46. [PMID: 8698192]

345. Sugimori K, Morimoto M, Shirato K, et al. Retrograde transvenous obliteration of gastric varices associated with large collateral veins or a large gastrorenal shunt. *J Vasc Interv Radiol* 2005;16(1):113-8. [PMID: 15640418]

346. Ninoi T, Nishida N, Kaminou T, et al. Balloon-occluded retrograde transvenous obliteration of gastric varices with gastrorenal shunt: long-term follow-up in 78 patients. *AJR Am J Roentgenol* 2005;184(4):1340-6. [PMID: 15788621]

347. Akazawa Y, Murata I, Yamao T, et al. Successful management of bleeding duodenal varices by endoscopic variceal ligation and balloon-occluded retrograde transvenous obliteration. *Gastrointest Endosc* 2003;58(5):794-7. [PMID: 14595327]

348. Fukuda T, Hirota S, Sugimura K. Long-term results of balloon-occluded retrograde transvenous obliteration for the treatment of gastric varices and hepatic encephalopathy. *J Vasc Interv Radiol* 2001;12(3):327-36. [PMID: 11287510]

349. Ninoi T, Nakamura K, Kaminou T, et al. TIPS versus transcatheter sclerotherapy for gastric varices. *AJR Am J Roentgenol* 2004;183(2):369-76. [PMID: 15269027]

350. Kiyosue H, Matsumoto S, Yamada Y, et al. Transportal intravariceal sclerotherapy with Nbutyl-2-cyanoacrylate for gastric varices. *J Vasc Interv Radiol* 2004;15(5):505-9. [PMID: 15126663]

351. de la Peña J, Brullet E, Sanchez-Hernández E, et al. Variceal ligation plus nadolol compared with ligation for prophylaxis of variceal rebleeding: A multicenter trial. *Hepatology* 2005;41(3):572-8. [PMID: 15726659]

352. Sauer P, Hansmann J, Richter GM, et al. Endoscopic variceal ligation plus propranolol vs. transjugular intrahepatic portosystemic stent shunt: a long-term randomized trial. *Endoscopy* 2002;34(9):690-7. [PMID: 12195325]

353. Lo GH, Chen WC, Chen MH, et al. Banding ligation versus nadolol and isosorbide mononitrate for the prevention of esophageal variceal rebleeding. *Gastroenterology* 2002;123(3):728-34. [PMID: 12198699]

354. Krige JE, Bornman PC, Goldberg PA, Terblanche J. Variceal rebleeding and recurrence after endoscopic injection sclerotherapy: a prospective evaluation in 204 patients. *Arch Surg* 2000;135(11):1315-22. [PMID: 11074888]

355. Bernard B, Lebrec D, Mathurin P, et al. Propranolol and sclerotherapy in the prevention of gastrointestinal rebleeding in patients with cirrhosis: a meta-analysis. *J Hepatol* 1997;26(2):312-24. [PMID: 9059952]

356. Sauer P, Theilmann L, Stremmel W, et al. Transjugular intrahepatic portosystemic stent shunt versus sclerotherapy plus propranolol for variceal rebleeding. *Gastroenterology* 1997;113(5):1623-31. [PMID: 9352865]

357. Bernard B, Lebrec D, Mathurin P, et al. Beta-adrenergic antagonists in the prevention of gastrointestinal rebleeding in patients with cirrhosis: a meta-analysis. *Hepatology* 1997;25(1):63-70. [PMID: 8985266]

358. Evrard S, Dumonceau JM, Delhaye M, et al. Endoscopic histoacryl obliteration vs. propranolol in the prevention of esophagogastric variceal rebleeding: a randomized trial. *Endoscopy* 2003;35(9):729-35. [PMID: 12929019]

359. Gournay J, Masliah C, Martin T, et al. Isosorbide mononitrate and propranolol compared with propranolol alone for the prevention of variceal rebleeding. *Hepatology* 2000;31(6):1239-45. [PMID: 10827148]

360. Villanueva C, Miñana J, Ortiz J, et al. Endoscopic ligation compared with combined treatment with nadolol and isosorbide mononitrate to prevent recurrent variceal bleeding. *N Engl J Med* 2001;345(9):647-55. [PMID: 11547718]

361. Lo GH, Lai KH, Cheng JS, et al. Endoscopic variceal ligation plus nadolol and sucralfate compared with ligation alone for the prevention of variceal rebleeding: a prospective, randomized trial. *Hepatology* 2000;32(3):461-5. [PMID: 10960435]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

362. Garg PK, Joshi YK, Tandon RK. Comparison of endoscopic variceal sclerotherapy with sequential endoscopic band ligation plus low-dose sclerotherapy for secondary prophylaxis of variceal hemorrhage: a prospective randomized study. *Gastrointest Endosc* 1999;50(3):369-73. [PMID: 10462658]

363. Lo GH, Lai KH, Cheng JS, et al. The additive effect of sclerotherapy to patients receiving repeated endoscopic variceal ligation: a prospective, randomized trial. *Hepatology* 1998;28(2):391-5. [PMID: 9696002]

364. Hou MC, Lin HC, Liu TT, et al. Antibiotic prophylaxis after endoscopic therapy prevents rebleeding in acute variceal hemorrhage: a randomized trial. *Hepatology* 2004;39(3):746-53. [PMID: 14999693]

365. Hirota WK, Petersen K, Baron TH, et al; Standards of Practice Committee of the American Society for Gastrointestinal Endoscopy. Guidelines for antibiotic prophylaxis for GI endoscopy. *Gastrointest Endosc* 2003;58(4):475-82. [PMID: 14520276]

366. Pomier-Layrargues G, Villeneuve JP, Deschenes M, et al. Transjugular intrahepatic portosystemic shunt (TIPS) versus endoscopic variceal ligation in the prevention of variceal rebleeding in patients with cirrhosis: a randomised trial. *Gut* 2001;48(3):390-6. [PMID: 11171831]

367. García-Villarreal L, Martínez-Lagares F, Sierra A, et al. Transjugular intrahepatic portosystemic shunt versus endoscopic sclerotherapy for the prevention of variceal rebleeding after recent variceal hemorrhage. *Hepatology* 1999;29(1):27-32. [PMID: 9862845]

368. Tesdal IK, Filser T, Weiss C, et al. Transjugular intrahepatic portosystemic shunts: adjunctive embolotherapy of gastroesophageal collateral vessels in the prevention of variceal rebleeding. *Radiology* 2005;236(1):360-7. [PMID: 15955858]

369. Park CH, Min SW, Sohn YH, et al. A prospective, randomized trial of endoscopic band ligation vs. epinephrine injection for actively bleeding Mallory-Weiss syndrome. *Gastrointest Endosc* 2004;60(1):22-7. [PMID: 15229420]

370. Chung IK, Kim EJ, Hwang KY, et al. Evaluation of endoscopic hemostasis in upper gastrointestinal bleeding related to Mallory-Weiss syndrome. *Endoscopy* 2002;34(6):474-9. [PMID: 12048631]

371. Gunay K, Cabioglu N, Barbaros U, et al. Endoscopic ligation for patients with active bleeding Mallory-Weiss tears. *Surg Endosc* 2001;15(11):1305-7. [PMID: 11727139]

372. Terada R, Ito S, Akama F, et al. Mallory-Weiss syndrome with severe bleeding: treatment by endoscopic ligation. *Am J Emerg Med* 2000;18(7):812-5. [PMID: 11103735]

373. Huang SP, Wang HP, Lee YC, et al. Endoscopic hemoclip placement and epinephrine injection for Mallory-Weiss syndrome with active bleeding. *Gastrointest Endosc* 2002;55(7):842-6. [PMID: 12024138]

374. Llach J, Elizalde JI, Guevara MC, et al. Endoscopic injection therapy in bleeding Mallory-Weiss syndrome: a randomized controlled trial. *Gastrointest Endosc* 2001;54(6):679-81. [PMID: 11726841]

375. Peng YC, Tung CF, Chow WK, et al. Efficacy of endoscopic isotonic saline-epinephrine injection for the management of active Mallory-Weiss tears. *J Clin Gastroenterol* 2001;32(2):119-22. [PMID: 11205645]

376. Yamaguchi Y, Yamato T, Katsumi N, et al. Endoscopic hemoclipping for upper GI bleeding due to Mallory-Weiss syndrome. *Gastrointest Endosc* 2001;53(4):427-30. [PMID: 11275881]

377. Laine L. Multipolar electrocoagulation in the treatment of active upper gastrointestinal tract hemorrhage. A prospective controlled trial. *N Engl J Med* 1987;316(26):1613-7. [PMID: 3295547]

378. Welch GH, McArdle CS, Anderson JR. Balloon tamponade for the control of Mallory-Weiss haemorrhage in patients with coagulation defects. *Br J Surg* 1987;74(7):610-1. [PMID: 3304520]

379. Park CH, Joo YE, Kim HS, et al. A prospective, randomized trial of endoscopic band ligation versus endoscopic hemoclip placement for bleeding gastric Dieulafoy's lesions. *Endoscopy* 2004;36(8):677-81. [PMID: 15280971]

380. Mumtaz R, Shaukat M, Ramirez FC. Outcomes of endoscopic treatment of gastroduodenal Dieulafoy's lesion with rubber band ligation and thermal/injection therapy. *J Clin Gastroenterol* 2003;36(4):310-4. [PMID: 12642736]

381. Nikolaidis N, Zezos P, Giouleme O, et al. Endoscopic band ligation of Dieulafoy-like lesions in the upper gastrointestinal tract. *Endoscopy* 2001;33(9):754-60. [PMID: 11558028]

382. Chung IK, Kim EJ, Lee MS, et al. Bleeding Dieulafoy's lesions and the choice of endoscopic method: comparing the hemostatic efficacy of mechanical and injection methods. *Gastrointest Endosc* 2000;52(6):721-4. [PMID: 11115902]

383. Sone Y, Kumada T, Toyoda H, et al. Endoscopic management and follow up of Dieulafoy lesion in the upper gastrointestinal tract. *Endoscopy* 2005;37(5):449-53. [PMID: 15844024]

384. Katsinelos P, Paroutoglou G, Mimidis K, et al. Endoscopic treatment and follow-up of gastrointestinal Dieulafoy's lesions. *World J Gastroenterol* 2005;11(38):6022-6. [PMID: 16273618]

385. Cheng CL, Liu NJ, Lee CS, et al. Endoscopic management of Dieulafoy lesions in acute nonvariceal upper gastrointestinal bleeding. *Dig Dis Sci* 2004;49(7-8):1139-44. [PMID: 15387335]

386. Norton ID, Petersen BT, Sorbi D, et al. Management and long-term prognosis of Dieulafoy lesion. *Gastrointest Endosc* 1999;50(6):762-7. [PMID: 10570333]

387. Ho KM. Use of Sengstaken-Blakemore tube to stop massive upper gastrointestinal bleeding from Dieulafoy's lesion in the lower oesophagus. *Anaesth Intensive Care* 2004;32(5):711-4. [PMID: 15535501]

388. Gretz JE, Achem SR. The watermelon stomach: clinical presentation, diagnosis, and treatment. *Am J Gastroenterol* 1998;93(6):890-5. [PMID: 9647013]

389. Roman S, Saurin JC, Dumortier J, et al. Tolerance and efficacy of argon plasma coagulation for controlling bleeding in patients with typical and atypical manifestations of watermelon stomach. *Endoscopy* 2003;35(12):1024-8. [PMID: 14648415]

390. Yusoff I, Brennan F, Ormonde D, Laurence B. Argon plasma coagulation for treatment of watermelon stomach. *Endoscopy* 2002;34(5):407-10. [PMID: 11972274]

391. Kwan V, Bourke MJ, Williams SJ, et al. Argon plasma coagulation in the management of symptomatic gastrointestinal vascular lesions: experience in 100 consecutive patients with long-term follow-up. *Am J Gastroenterol* 2006;101(1):58-63. [PMID: 16405534]

392. Mathou NG, Lovat LB, Thorpe SM, Bown SG. Nd:YAG laser induces long-term remission in transfusion-dependent patients with watermelon stomach. *Lasers Med Sci* 2004;18(4):213-8. [PMID: 15042426]

393. Pavey DA, Craig PI. Endoscopic therapy for upper-GI vascular ectasias. *Gastrointest Endosc* 2004;59(2):233-8. [PMID: 14745397]

394. Olmos JA, Marcolongo M, Pogorelsky V, et al. Argon plasma coagulation for prevention of recurrent bleeding from GI angiodysplasias. *Gastrointest Endosc* 2004;60(6):881-6. [PMID: 15605001]

395. Inouye P, Marcon N, Pugash RA, et al. Embolization of a duodenal arteriovenous malformation in hereditary hemorrhagic telangiectasia: case report and review of the literature. *Can J Gastroenterol* 2003;17(11):661-5. [PMID: 14631462]

396. Pedrazzani C, Catalano F, Festini M, et al. Endoscopic ablation of Barrett's esophagus using high power setting argon plasma coagulation: a prospective study. *World J Gastroenterol* 2005;11(12):1872-5. [PMID: 15793884]

397. Ackroyd R, Tam W, Schoeman M, et al. Prospective randomized controlled trial of argon plasma coagulation ablation vs. endoscopic surveillance of patients with Barrett's esophagus after antireflux surgery. *Gastrointest Endosc* 2004;59(1):1-7. [PMID: 14722539]

398. Claydon PE, Ackroyd R. Argon plasma coagulation ablation of Barrett's oesophagus. *Scand J Gastroenterol* 2005;40(6):617-28. [PMID: 16036520]

399. Dulai GS, Jensen DM, Cortina G, et al. Randomized trial of argon plasma coagulation vs. multipolar electrocoagulation for ablation of Barrett's esophagus. *Gastrointest Endosc* 2005;61(2):232-40. [PMID: 15729231]

400. Pech O, Gossner L, May A, et al. Long-term results of photodynamic therapy with 5-aminolevulinic acid for superficial Barrett's cancer and high-grade intraepithelial neoplasia. *Gastrointest Endosc* 2005;62(1):24-30. [PMID: 15990815]

401. Behrens A, May A, Gossner L, et al. Curative treatment for high-grade intraepithelial neoplasia in Barrett's esophagus. *Endoscopy* 2005;37(10):999-1005. [PMID: 16189774]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

402. Karkos CD, Vlachou PA, Hayes PD, et al. Temporary endovascular control of a bleeding aortoenteric fistula by transcatheter coil embolization. *J Vasc Interv Radiol* 2005;16(6):867-71. [PMID: 15947052]

403. Loftus IM, Thompson MM, Fishwick G, et al. Technique for rapid control of bleeding from an aortoenteric fistula. *Br J Surg* 1997;84(8):1114. [PMID: 9278655]

404. Finch L, Heathcock RB, Quigley T, et al. Emergent treatment of a primary aortoenteric fistula with N-butyl 2-cyanoacrylate and endovascular stent. *J Vasc Interv Radiol* 2002;13(8):841-3. [PMID: 12171988]

405. Burks JA Jr, Faries PL, Gravereaux EC, et al. Endovascular repair of bleeding aortoenteric fistulas: a 5-year experience. *J Vasc Surg* 2001;34(6):1055-9. [PMID: 11743560]

406. Defreyne L, Vanlangenhove P, De Vos M, et al. Embolization as a first approach with endoscopically unmanageable acute nonvariceal gastrointestinal hemorrhage. *Radiology* 2001;218(3):739-48. [PMID: 11230648]

407. Dwivedi M, Misra SP. Blue rubber bleb nevus syndrome causing upper GI hemorrhage: a novel management approach and review. *Gastrointest Endosc* 2002;55(7):943-6. [PMID: 12024162]

408. Dieckmann K, Maurage C, Faure N, et al. Combined laser-steroid therapy in blue rubber bleb nevus syndrome: case report and review of the literature. *Eur J Pediatr Surg* 1994;4(6):372-4. [PMID: 7748841]

409. Shahed M, Hagenmuller F, Rosch T, et al. A 19-year-old female with blue rubber bleb nevus syndrome. Endoscopic laser photocoagulation and surgical resection of gastrointestinal angiomata. *Endoscopy* 1990;22(1):54-6. [PMID: 2307133]

410. Fishman SJ, Smithers CJ, Folkman J, et al. Blue rubber bleb nevus syndrome: surgical eradication of gastrointestinal bleeding. *Ann Surg* 2005;241(3):523-8. [PMID: 15729077]

411. Teixeira MG, Perini MV, Marques CF, et al. Blue rubber bleb nevus syndrome: case report. *Rev Hosp Clin Fac Med Sao Paulo* 2003;58(2):109-12. [PMID: 12845364]

## Lower GI Bleeding

412. Savides TJ, Jensen DM. Evaluation and endoscopic treatment of severe lower gastrointestinal bleeding. *Tech Gastrointest Endosc* 2003;5(4): 148-54. [EMBASE: 2004046663]

413. Tamagno G, Mioni R, De Carlo E, et al. Effects of a somatostatin analogue in occult gastrointestinal bleeding: a case report. *Dig Liver Dis* 2004;36(12):843-6. [PMID: 15646433]

414. Bowers M, McNulty O, Mayne E. Octreotide in the treatment of gastrointestinal bleeding caused by angiodysplasia in two patients with von Willebrand's disease. *Br J Haematol* 2000;108(3):524-7. [PMID: 10759709]

415. Rossini FP, Arrigoni A, Pennazio M. Octreotide in the treatment of bleeding due to angiodysplasia of the small intestine. *Am J Gastroenterol* 1993;88(9):1424-7. [PMID: 8362842]

416. Beejay U, Marcon NE. Endoscopic treatment of lower gastrointestinal bleeding. *Curr Opin Gastroenterol* 2002;18(1):87-93. [EMBASE: 2002014734] [PMID: 17031236]

417. Bloomfeld RS, Rockey DC, Shetzline MA. Endoscopic therapy of acute diverticular hemorrhage. *Am J Gastroenterol* 2001;96(8):2367-72. [PMID: 11513176]

418. Prakash C, Chokshi H, Walden DT, Aliperti G. Endoscopic hemostasis in acute diverticular bleeding. *Endoscopy* 1999;31(6):460-3. [PMID: 10494686]

419. Savides TJ, Jensen DM. Therapeutic endoscopy for nonvariceal gastrointestinal bleeding. *Gastroenterol Clin North Am* 2000;29(2):465-87. [PMID: 10836190]

420. Savides TJ, Jensen DM. Colonoscopic hemostasis for recurrent diverticular hemorrhage associated with a visible vessel: a report of three cases. *Gastrointest Endosc* 1994;40(1):70-3. [PMID: 8163141]

421. Gostout CJ, Bowyer BA, Ahlquist DA, et al. Mucosal vascular malformations of the gastrointestinal tract: clinical observations and results of endoscopic neodymium: yttrium-aluminum-garnet laser therapy. *Mayo Clin Proc* 1988;63(10):993-1003. [PMID: 3262793]

422. Ramirez FC, Johnson DA, Zierer ST, et al. Successful endoscopic hemostasis of bleeding colonic diverticula with epinephrine injection. *Gastrointest Endosc* 1996;43(2 Pt 1):167-70. [PMID: 8635718]

423. Kim YI, Marcon NE. Injection therapy for colonic diverticular bleeding. A case study. *J Clin Gastroenterol* 1993;17(1):46-8. [PMID: 8409298]

424. Vandervoort J, Montes H, Soetikno RM, et al. Use of endoscopic band ligation in the treatment of ongoing rectal bleeding. *Gastrointest Endosc* 1999;49(3 Pt 1):392-4. [PMID: 10049429]

425. Simpson PW, Nguyen MH, Lim JK, Soetikno RM. Use of endoclips in the treatment of massive colonic diverticular bleeding. *Gastrointest Endosc* 2004;59(3):433-7. [PMID: 14997150]

426. Binmoeller KF, Thonke F, Soehendra N. Endoscopic hemoclip treatment for gastrointestinal bleeding. *Endoscopy* 1993;25(2):167-70. [PMID: 8491134]

427. Urita Y, Kondo E, Muto M, et al. Combined endoscopic clipping and injection sclerotherapy for esophageal varices. *Gastrointest Endosc* 1996;43(2 Pt 1):140-3. [PMID: 8635709]

428. Khanna A, Ognibene SJ, Koniaris LG. Embolization as first-line therapy for diverticulosis-related massive lower gastrointestinal bleeding: evidence from a meta-analysis. *J Gastrointest Surg* 2005;9(3):343-52. [PMID: 15749594]

429. Kuo WT, Lee DE, Saad WE, et al. Superselective microcoil embolization for the treatment of lower gastrointestinal hemorrhage. *J Vasc Interv Radiol* 2003;14(12):1503-9. [PMID: 14654483]

430. Favalli NM, De Franceschi L, Bassetto AM, et al. Selective intra-arterial terlipressin infusion stops acute lower gastrointestinal bleeding: a case report and review of the literature. *Eur J Gastroenterol Hepatol* 2004;16(10):1059-61. [PMID: 15371933]

431. Darcy M. Treatment of lower gastrointestinal bleeding: vasopressin infusion versus embolization. *J Vasc Interv Radiol* 2003;14(5):535-43. [PMID: 12761306]

432. Schwandner O, Farke S, Fischer F, et al. Laparoscopic colectomy for recurrent and complicated diverticulitis: a prospective study of 396 patients. *Langenbecks Arch Surg* 2004;389(2):97-103. [PMID: 14985985]

433. Franklin ME Jr, Dorman JP, Jacobs M, Plasencia G. Is laparoscopic surgery applicable to complicated colonic diverticular disease? *Surg Endosc* 1997;11(10):1021-5. [PMID: 9381341]

434. Krevsky B. Detection and treatment of angiodysplasia. *Gastrointest Endosc Clin N Am* 1997;7(3):509-24. [PMID: 9177150]

435. Morris AJ, Mokhashi M, Straiton M, et al. Push enteroscopy and heater probe therapy for small bowel bleeding. *Gastrointest Endosc* 1996;44(4):394-7. [PMID: 8905356]

436. Santos JC Jr, Aprilli F, Guimaraes AS, Rocha JJ. Angiodysplasia of the colon: endoscopic diagnosis and treatment. *Br J Surg* 1988;75(3):256-8. [PMID: 3258173]

437. Junquera F, Brullet E, Campo R, et al. Usefulness of endoscopic band ligation for bleeding small bowel vascular lesions. *Gastrointest Endosc* 2003;58(2):274-9. [PMID: 12872104]

438. Dunne KA, Hill J, Dillon JF. Treatment of chronic transfusion-dependent gastric antral vascular ectasia (watermelon stomach) with thalidomide. *Eur J Gastroenterol Hepatol* 2006;18(4):455-6. [PMID: 16538122]

439. Funaki B. Superselective embolization of lower gastrointestinal hemorrhage: a new paradigm. *Abdom Imaging* 2004;29(4):434-8. [PMID: 15024510]

440. Evangelista PT, Hallisey MJ. Transcatheter embolization for acute lower gastrointestinal hemorrhage. *J Vasc Interv Radiol* 2000;11(5):601-6. [PMID: 10834491]

441. Fukuda A, Kajiyama T, Arakawa H, et al. Retroflexed endoscopic multiple band ligation of symptomatic internal hemorrhoids. *Gastrointest Endosc* 2004;59(3):380-4. [PMID: 14997135]

442. Armstrong DN. Multiple hemorrhoidal ligation: a prospective, randomized trial evaluating a new technique. *Dis Colon Rectum* 2003;46(2):179-86. [PMID: 12576891]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

443. Kanellos I, Goulimaris I, Christoforidis E, et al. A comparison of the simultaneous application of sclerotherapy and rubber band ligation, with sclerotherapy and rubber band ligation applied separately, for the treatment of haemorrhoids: a prospective randomized trial. *Colorectal Dis* 2003;5(2):133-8. [PMID: 12780901]

444. Bikhchandani J, Agarwal PN, Kant R, Malik VK. Randomized controlled trial to compare the early and mid-term results of stapled versus open hemorrhoidectomy. *Am J Surg* 2005;189(1):56-60. [PMID: 15701493]

445. Peng BC, Jayne DG, Ho YH. Randomized trial of rubber band ligation vs. stapled hemorrhoidectomy for prolapsed piles. *Dis Colon Rectum* 2003;46(3):291-7. [PMID: 12626901]

446. Shanmugam V, Thaha M, Rabindranath K, et al. Rubber band ligation versus excisional haemorrhoidectomy for haemorrhoids. *Cochrane Database Syst Rev* 2005;(3):CD005034. [PMID: 16034963]

447. Quah HM, Seow-Choen F. Prospective, randomized trial comparing diathermy excision and diathermy coagulation for symptomatic, prolapsed hemorrhoids. *Dis Colon Rectum* 2004;47(3):367-70. [PMID: 14991499]

448. Jensen DM, Jutabha R, Machicado GA, et al. Prospective randomized comparative study of bipolar electrocoagulation versus heater probe for treatment of chronically bleeding internal hemorrhoids. *Gastrointest Endosc* 1997;46(5):435-43. [PMID: 9402118]

449. Randall GM, Jensen DM, Machicado GA, et al. Prospective randomized comparative study of bipolar versus direct current electrocoagulation for treatment of bleeding internal hemorrhoids. *Gastrointest Endosc* 1994;40(4):403-10. [PMID: 7926528]

450. Kwok SY, Chung CC, Tsui KK, Li MK. A double-blind, randomized trial comparing Ligasure™ and Harmonic Scalpel™ hemorrhoidectomy. *Dis Colon Rectum* 2005;48(2):344-8. [PMID: 15616753]

451. Franklin EJ, Seetharam S, Lowney J, Horgan PG. Randomized, clinical trial of Ligasure vs conventional diathermy in hemorrhoidectomy. *Dis Colon Rectum* 2003;46(10):1380-3. [PMID: 14530679]

452. Armstrong DN, Frankum C, Schertzer ME, et al. Harmonic scalpel hemorrhoidectomy: five hundred consecutive cases. *Dis Colon Rectum* 2002;45(3):354-9. [PMID: 12068194]

453. Chung CC, Ha JP, Tai YP, et al. Double-blind, randomized trial comparing Harmonic Scalpel hemorrhoidectomy, bipolar scissors hemorrhoidectomy, and scissors excision: ligation technique. *Dis Colon Rectum* 2002;45(6):789-94. [PMID: 12072632]

454. Gupta PJ. Randomized trial comparing in-situ radiofrequency ablation and Milligan-Morgan hemorrhoidectomy in prolapsing hemorrhoids. *J Nippon Med Sch* 2003;70(5):393-400. [PMID: 14578939]

455. de Parades V, Etienney I, Bauer P, et al. Formalin application in the treatment of chronic radiation-induced hemorrhagic proctitis—an effective but not risk-free procedure: a prospective study of 33 patients. *Dis Colon Rectum* 2005;48(8):1535-41. [PMID: 15933799]

456. Counter SF, Froese DP, Hart MJ. Prospective evaluation of formalin therapy for radiation proctitis. *Am J Surg* 1999;177(5):396-8. [PMID: 10365878]

457. Saclarides TJ, King DG, Franklin JL, Doolas A. Formalin instillation for refractory radiation-induced hemorrhagic proctitis. Report of 16 patients. *Dis Colon Rectum* 1996;39(2):196-9. [PMID: 8620787]

458. Venkatesh KS, Ramanujam P. Endoscopic therapy for radiation proctitis-induced hemorrhage in patients with prostatic carcinoma using argon plasma coagulator application. *Surg Endosc* 2002;16(4):707-10. [PMID: 11972221]

459. Tjandra JJ, Sengupta S. Argon plasma coagulation is an effective treatment for refractory hemorrhagic radiation proctitis. *Dis Colon Rectum* 2001;44(12):1759-65. [PMID: 11742157]

460. Silva RA, Correia AJ, Dias LM, et al. Argon plasma coagulation therapy for hemorrhagic radiation proctosigmoiditis. *Gastrointest Endosc* 1999;50(2):221-4. [PMID: 10425416]

461. Jensen DM, Machicado GA, Cheng S, et al. A randomized prospective study of endoscopic bipolar electrocoagulation and heater probe treatment of chronic rectal bleeding from radiation telangiectasia. *Gastrointest Endosc* 1997;45(1):20-5. [PMID: 9013165]

462. Taylor JG, Disario JA, Bjorkman DJ. KTP laser therapy for bleeding from chronic radiation proctopathy. *Gastrointest Endosc* 2000;52(3):353-7. [PMID: 10968849]

463. Babb RR. Radiation proctitis: a review. *Am J Gastroenterol* 1996;91(7):1309-11. [PMID: 8677984]

464. Pricolo VE, Shellito PC. Surgery for radiation injury to the large intestine. Variables influencing outcome. *Dis Colon Rectum* 1994;37(7):675-84. [PMID: 8026234]

465. Kantsevoy SV, Cruz-Correa MR, Vaughn CA, et al. Endoscopic cryotherapy for the treatment of bleeding mucosal vascular lesions of the GI tract: a pilot study. *Gastrointest Endosc* 2003;57(3):403-6. [PMID: 12612530]

466. Schafer TW, Binmoeller KF. Argon plasma coagulation for the treatment of colonic varices. *Endoscopy* 2002;34(8):661-3. [PMID: 12173089]

467. Firoozi B, Gamagaris Z, Weinshel EH, Bini EJ. Endoscopic band ligation of bleeding rectal varices. *Dig Dis Sci* 2002;47(7):1502-5. [PMID: 12141807]

468. Levine J, Tahiri A, Banerjee B. Endoscopic ligation of bleeding rectal varices. *Gastrointest Endosc* 1993;39(2):188-90. [PMID: 8495844]

469. Chen WC, Hou MC, Lin HC, et al. An endoscopic injection with N-butyl-2-cyanoacrylate used for colonic variceal bleeding: a case report and review of the literature. *Am J Gastroenterol* 2000;95(2):540-2. [PMID: 10685765]

470. Shibata D, Brophy DP, Gordon FD, et al. Transjugular intrahepatic portosystemic shunt for treatment of bleeding ectopic varices with portal hypertension. *Dis Colon Rectum* 1999;42(12):1581-5. [PMID: 10613477]

471. Sorbi D, Norton I, Conio M, et al. Postpolypectomy lower GI bleeding: descriptive analysis. *Gastrointest Endosc* 2000;51(6):690-6. [PMID: 10840301]

472. Rosen L, Bub DS, Reed JF 3rd, Nastasee SA. Hemorrhage following colonoscopic polypectomy. *Dis Colon Rectum* 1993;36(12):1126-31. [PMID: 8253009]

473. Rex DK, Lewis BS, Waye JD. Colonoscopy and endoscopic therapy for delayed postpolypectomy hemorrhage. *Gastrointest Endosc* 1992;38(2):127-9. [PMID: 1568607]

474. Mizuta Y, Yamakawa M, Isomoto H, et al. Successful endoscopic band ligation for treatment of postpolypectomy hemorrhage. *Dig Endosc* 2000;12(4):362-5. [ISSN: 0915-5635]

475. Witte JT. Band ligation for colonic bleeding: modification of multiband ligating devices for use with a colonoscope. *Gastrointest Endosc* 2000;52(6):762-5. [PMID: 11115913]

476. Parra-Blanco A, Kaminaga N, Kojima T, et al. Hemoclipping for postpolypectomy and postbiopsy colonic bleeding. *Gastrointest Endosc* 2000;51(1):37-41. [PMID: 10625793]

477. Uno Y, Satoh K, Tuji K, et al. Endoscopic ligation by means of clip and detachable snare for management of colonic postpolypectomy hemorrhage. *Gastrointest Endosc* 1999;49(1):113-5. [PMID: 9869736]

478. Silva RA, Mesquita N, Dinis-Ribeiro M, et al. Fibrin glue for postpolypectomy hemorrhage [letter]. *J Clin Gastroenterol* 2003;37(2):193. [PMID: 12869897]

479. Hui AJ, Wong RM, Ching JY, et al. Risk of colonoscopic polypectomy bleeding with anticoagulants and antiplatelet agents: analysis of 1657 cases. *Gastrointest Endosc* 2004;59(1):44-8. [PMID: 14722546]

480. Mulcahy HE, Fairclough PD. Ultrathin endoscopy in the assessment and treatment of upper and lower gastrointestinal tract strictures. *Gastrointest Endosc* 1998;48(6):618-20. [PMID: 9852453]

481. Horton KM, Fishman EK. CT angiography of the GI tract. *Gastrointest Endosc* 2002;55(7 Suppl):S37-41. [PMID: 12024120]

482. Marmo R, Rotondano G, Piscopo R, et al. Capsule endoscopy versus enteroclysis in the detection of small-bowel involvement in Crohn's disease: a prospective trial. *Clin Gastroenterol Hepatol* 2005;3(8):772-6. [PMID: 16234005]

483. Argüelles-Arias F, Caunedo A, Romero J, et al. The value of capsule endoscopy in pediatric patients with a suspicion of Crohn's disease. *Endoscopy* 2004;36(10):869-73. [PMID: 15452782]

484. Buchman AL, Miller FH, Wallin A, et al. Videocapsule endoscopy versus barium contrast studies for the diagnosis of Crohn's disease recurrence involving the small intestine. *Am J Gastroenterol* 2004;99(11):2171-7. [PMID: 15554999]

485. Sans M, Llach J, Bordas JM, et al. Life-threatening hemorrhage: an unusual form of presentation of Crohn's disease treated with endoscopic injection sclerotherapy [letter]. *Endoscopy* 1998;30(7):S83-4. [PMID: 9826159]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

486. Veneri D, Franchini M. Successful treatment of intestinal hemorrhage in a Jehovah's Witness patient. *Am J Hematol* 2005;79(4):344-5. [PMID: 16044447]

487. Mallant-Hent RCh, van Bodegraven AA, Meuwissen SG, Manoliu RA. Alternative approach to massive gastrointestinal bleeding in ulcerative colitis: highly selective transcatheter embolization. *Eur J Gastroenterol Hepatol* 2003;15(2):189-93. [PMID: 12560765]

488. Tsujikawa T, Nezu R, Andoh A, et al. Inflixmab as a possible treatment for the hemorrhagic type of Crohn's disease. *J Gastroenterol* 2004;39(3):284-7. [PMID: 15065007]

489. Belaiche J, Louis E. Severe lower gastrointestinal bleeding in Crohn's disease: successful control with infliximab [letter]. *Am J Gastroenterol* 2002;97(12):3210-1. [PMID: 12492221]

490. Marohn MR, Hanly EJ, McKenna KJ, Varin CR. Laparoscopic total abdominal colectomy in the acute setting. *J Gastrointest Surg* 2005;9(7):881-6. [PMID: 16137578]

491. Berg DF, Bahadursingh AM, Kaminski DL, Longo WE. Acute surgical emergencies in inflammatory bowel disease. *Am J Surg* 2002;184(1):45-51. [PMID: 12135718]

492. Cima RR, Pemberton JH. Surgical management of inflammatory bowel disease. *Curr Treat Options Gastroenterol* 2001;4(3):215-25. [PMID: 11469979]

493. Gimeno-Garcia AZ, Parra-Blanco A, Nicolas-Perez D, et al. Management of colonic Dieulafoy lesions with endoscopic mechanical techniques: report of two cases. *Dis Colon Rectum* 2004;47(9):1539-43. [PMID: 15486754]

494. Swaniker F, Soldes O, Hirschl RB. The utility of technetium 99m pertechnetate scintigraphy in the evaluation of patients with Meckel's diverticulum. *J Pediatr Surg* 1999;34(5):760-4. [PMID: 10359178]

495. Mylonaki M, MacLean D, Fritscher-Ravens A, Swain P. Wireless capsule endoscopic detection of Meckel's diverticulum after nondiagnostic surgery. *Endoscopy* 2002;34(12):1018-20. [PMID: 12471550]

496. Lee KH, Yeung CK, Tam YH, et al. Laparoscopy for definitive diagnosis and treatment of gastrointestinal bleeding of obscure origin in children. *J Pediatr Surg* 2000;35(9):1291-3. [PMID: 10999681]

497. Sanders LE. Laparoscopic treatment of Meckel's diverticulum. Obstruction and bleeding managed with minimal morbidity. *Surg Endosc* 1995;9(6):724-7. [PMID: 7482174]

## Avoid Iatrogenic Anemia

498. Fowler RA, Berenson M. Blood conservation in the intensive care unit. *Crit Care Med* 2003;31(12 Suppl):S715-20. [PMID: 14724470]

499. Civetta JM, Hudson-Civetta JA. Maintaining quality of care while reducing charges in the ICU. Ten ways. *Ann Surg* 1985;202(4):524-32. [PMID: 4051601]

500. Andrews T, Waterman H, Hillier V. Blood gas analysis: a study of blood loss in intensive care. *J Adv Nurs* 1999;30(4):851-7. [PMID: 10520097]

501. Barie PS, Hydo LJ. Learning to not know: results of a program for ancillary cost reduction in surgical critical care. *J Trauma* 1996;41(4):714-20. [PMID: 8858034]

502. Dale JC, Pruett SK. Phlebotomy—a minimalist approach. *Mayo Clin Proc* 1993;68(3):249-55. [PMID: 8474266]

503. Rudisill T. Smaller tubes reduce the volume of blood drawn. *Crit Care Nurse* 2002;22(3):96, 95. [PMID: 12092299]

504. Muñoz M, Romero A, Gómez JF, et al. Utility of point-of-care haemoglobin measurement in the HemoCue-B haemoglobin for the initial diagnosis of anaemia. *Clin Lab Haematol* 2005;27(2):99-104. [PMID: 15784124]

505. Paniccia R, Fedi S, Carbonetto F, et al. Evaluation of a new point-of-care celite-activated clotting time analyzer in different clinical settings: the i-STAT celite-activated clotting time test. *Anesthesiology* 2003;99(1):54-9. [PMID: 12826842]

## Anemia Management

506. Thomas JM, Wong CJ, Scheuermann KW, et al. Clinical Strategies for Managing Hemorrhage and Anemia Without Blood Transfusion in the ICU [poster presentation]. The 7th World Congress of Intensive and Critical Care Medicine; 1997 Jun 29–Jul 3; Ottawa, Canada. Updated 2004. Reprints available from Hospital Information Services for Jehovah's Witnesses. E-mail: his@jw.org.

507. Schälte G, Janz H, Busse J, et al. Life-threatening postoperative blood loss in a Jehovah's Witness, treated with high-dose erythropoietin. *Br J Anaesth* 2005;94(4):442-4. [PMID: 15653706]

508. Price S, Pepper JR, Jaggar SI. Recombinant human erythropoietin use in a critically ill Jehovah's Witness after cardiac surgery. *Anesth Analg* 2005;101(2):325-7. [PMID: 16037136]

509. Atabek U, Alvarez R, Pello MJ, et al. Erythropoietin accelerates hematocrit recovery in post-surgical anemia. *Am Surg* 1995;61(1):74-7. [PMID: 7832387]

510. Koenig HM, Levine EA, Resnick DJ, Meyer WJ. Use of recombinant human erythropoietin in a Jehovah's Witness. *J Clin Anesth* 1993;5(3):244-7. [PMID: 8318245]

511. Smith SN, Milov DE. Use of erythropoietin in Jehovah's Witness children following acute gastrointestinal blood loss. *J Fla Med Assoc* 1993;80(2):103-5. [PMID: 8455008]

512. Corwin HL, Gettinger A, Rodriguez RM, et al. Efficacy of recombinant human erythropoietin in the critically ill patient: a randomized, double-blind, placebo-controlled trial. *Crit Care Med* 1999;27(11):2346-50. [PMID: 10579246]

513. Ladas SD, Polymeros D, Pagonis T, et al. Does recombinant human erythropoietin accelerate correction of post-ulcer-bleeding anaemia? A pilot study. *World J Gastroenterol* 2004;10(4):586-9. [PMID: 14966922]

514. Eckardt KU. Anaemia of critical illness—implications for understanding and treating rHuEPO resistance. *Nephrol Dial Transplant* 2002;17 Suppl 5:48-55. [PMID: 12091608]

515. Lambertini D, Catalano C, Fabbian F, et al. Increasing erythropoietin dose overcomes inadequate erythropoietin response secondary to cardiac hemolysis [letter]. *Nephron* 2000;85(4):358-9. [PMID: 10940751]

516. Christodoulou DK, Tsianos EV. Anemia in inflammatory bowel disease —the role of recombinant human erythropoietin. *Eur J Intern Med* 2000;11(4):222-7. [PMID: 10967511]

517. Nordström D, Lindroth Y, Marsal L, et al. Availability of iron and degree of inflammation modifies the response to recombinant human erythropoietin when treating anemia of chronic disease in patients with rheumatoid arthritis. *Rheumatol Int* 1997;17(2):67-73. [PMID: 9266623]

518. Strachan J, Fleming L, Dick J, et al. Poor response to erythropoietin [letter]. *BMJ* 1995;311(7005):633. [PMID: 7663282]

519. Hashem B, Dillard TA. A 44-year-old Jehovah's Witness with life-threatening anemia from uterine bleeding. *Chest* 2004;125(3):1151-4. [PMID: 15006982]

520. Gabriel A, Kozek S, Chiari A, et al. High-dose recombinant human erythropoietin stimulates reticulocyte production in patients with multiple organ dysfunction syndrome. *J Trauma* 1998;44(2):361-7. [PMID: 9498512]

521. Major A, Mathez-Loic F, Rohling R, et al. The effect of intravenous iron on the reticulocyte response to recombinant human erythropoietin. *Br J Haematol* 1997;98(2):292-4. [PMID: 9266922]

522. McMorrow J, Farmer S, Towler S, et al. 'Haemoglobin of 2—what do we do?' Optimising perioperative care of severely anaemic patients who decline blood products, with emphasis on anaemia prevention [abstract]. 34th Annual Meeting of the Australasian Society of Blood Transfusion; 2000 July 25-28; Perth, Australia. *Transfus Med* 2001;11(3):231. [ISSN: 0958-7578]

523. Busuttil D, Copplestone A. Management of blood loss in Jehovah's Witnesses. *BMJ* 1995;311(7013):1115-6. [PMID: 7580701]

524. DeMeester SR, Marsh EE, Gerkin TM, Rodriguez JL. Immediate use of recombinant erythropoietin in a Jehovah's Witness following major blunt trauma. *Contemp Surg* 1994;45(4):228-32. [ISSN: 0045-8341]

525. Pousada L, Fiorito J, Smyth C. Erythropoietin and anemia of gastrointestinal bleeding in a Jehovah's Witness [letter]. *Ann Intern Med* 1990;112(7):552. [PMID: 2316946]

526. Koutroubakis IE, Karmiris K, Makreas S, et al. Effectiveness of darbepoetin-alfa in combination with intravenous iron sucrose in patients with inflammatory bowel disease and refractory anaemia: a pilot study. *Eur J Gastroenterol Hepatol* 2006;18(4):421-5. [PMID: 16538115]

527. Ifudu O. Patient characteristics determining rHuEPO dose requirements. *Nephrol Dial Transplant* 2002;17 Suppl 5:38-41. [PMID: 12091606]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

528. Drüeke T. Hyporesponsiveness to recombinant human erythropoietin. *Nephrol Dial Transplant* 2001;16 Suppl 7:25-8. [PMID: 11590253]

529. Vesey DA, Cheung C, Pat B, et al. Erythropoietin protects against ischaemic acute renal injury. *Nephrol Dial Transplant* 2004;19(2):348-55. [PMID: 14736958]

530. Parsa CJ, Matsumoto A, Kim J, et al. A novel protective effect of erythropoietin in the infarcted heart. *J Clin Invest* 2003;112(7):999-1007. [PMID: 14523037]

531. Bennett CL, Luminari S, Nissenson AR, et al. Pure red-cell aplasia and epoetin therapy. *N Engl J Med* 2004;351(14):1403-8. [PMID: 15459301]

532. Rodriguez RM, Corwin HL, Gettinger A, et al. Nutritional deficiencies and blunted erythropoietin response as causes of the anemia of critical illness. *J Crit Care* 2001;16(1):36-41. [PMID: 11230723]

533. Schröder O, Mickisch O, Seidler U, et al. Intravenous iron sucrose versus oral iron supplementation for the treatment of iron deficiency anemia in patients with inflammatory bowel disease—a randomized, controlled, open-label, multicenter study. *Am J Gastroenterol* 2005;100(11):2503-9. [PMID: 16279906]

534. Gasche C, Lomer MC, Cavill I, Weiss G. Iron, anaemia, and inflammatory bowel diseases. *Gut* 2004;53(8):1190-7. [PMID: 15247190]

535. Gasché C, Dejaco C, Waldhoer T, et al. Intravenous iron and erythropoietin for anemia associated with Crohn's disease. A randomized, controlled trial. *Ann Intern Med* 1997;126(10):782-7. [PMID: 9148651]

536. Barton JC, Barton EH, Bertoli LF, et al. Intravenous iron dextran therapy in patients with iron deficiency and normal renal function who failed to respond to or did not tolerate oral iron supplementation. *Am J Med* 2000;109(1):27-32. [PMID: 10936475]

537. Auerbach M, Witt D, Toler W, et al. Clinical use of the total dose intravenous infusion of iron dextran. *J Lab Clin Med* 1988;111(5):566-70. [PMID: 3361236]

538. Mays T, Mays T. Intravenous iron-dextran therapy in the treatment of anemia occurring in surgical, gynecologic and obstetric patients. *Surg Gynecol Obstet* 1976;143(3):381-4. [PMID: 959957]

## Tolerance of Anemia

539. Bracey AW, Radovancevic R, Riggs SA, et al. Lowering the hemoglobin threshold for transfusion in coronary artery bypass procedures: effect on patient outcome. *Transfusion* 1999;39(10):1070-7. [PMID: 10532600]

540. Dupuis JF, Nguyen DT. Anesthetic management of the patient who refuses blood transfusions. *Int Anesthesiol Clin* 1998;36(3):117-31. [PMID: 10812420]

541. Bush RL, Pevec WC, Holcroft JW. A prospective, randomized trial limiting perioperative red blood cell transfusions in vascular patients. *Am J Surg* 1997;174(2):143-8. [PMID: 9293831]

542. Johnson RG, Thurer RL, Kruskall MS, et al. Comparison of two transfusion strategies after elective operations for myocardial revascularization. *J Thorac Cardiovasc Surg* 1992;104(2):307-14. [PMID: 1495291]

543. Alexiu O, Mircea N, Balaban M, Furtunescu B. Gastro-intestinal haemorrhage from peptic ulcer. An evaluation of bloodless transfusion and early surgery. *Anaesthesia* 1975;30(5):609-15. [PMID: 1081350]

544. Shapiro MJ, Gettinger A, Corwin HL, et al. Anemia and blood transfusion in trauma patients admitted to the intensive care unit. *J Trauma* 2003;55(2):269-74. [PMID: 12913636]

545. Crosby E, Ferguson D, Hume HA, et al; Expert Working Group. Guidelines for red blood cell and plasma transfusion for adults and children. *CMAJ* 1997;156(11 Suppl):S1-24. [ISI: XC079]

546. Fortune JB, Feustel PJ, Saifi J, et al. Influence of hematocrit on cardiopulmonary function after acute hemorrhage. *J Trauma* 1987;27(3):243-9. [PMID: 3560265]

547. Tuman KJ. Tissue oxygen delivery: the physiology of anemia. *Anesthesiol Clin North Am* 1990;8(3):451-69. [EMBASE: 1990303631] [ISSN: 0889-8537]

548. Fullarton GM, Boyd EJ, Crean GP, et al. Inhibition of gastric secretion and motility by simulated upper gastrointestinal haemorrhage: a response to facilitate haemostasis? *Gut* 1989;30(2):156-60. [PMID: 2495237]

549. Henriksson AE, Nilsson TK, Svensson JO. Time course of clotting and fibrinolytic markers in acute upper gastrointestinal bleeding: relation to diagnosis and blood transfusion treatment. *Blood Coagul Fibrinolysis* 1993;4(6):877-80. [PMID: 7511945]

550. Henriksson AE, Svensson JO. Upper gastrointestinal bleeding. With special reference to blood transfusion. *Eur J Surg* 1991;157(3):193-6. [PMID: 1678629]

551. Offner PJ. Age of blood: does it make a difference? *Crit Care* 2004;8 Suppl 2:S24-6. [PMID: 15196318]

552. Högman CF, Meryman HT. Storage parameters affecting red blood cell survival and function after transfusion. *Transfus Med Rev* 1999;13(4):275-96. [PMID: 10553271]

553. Hébert PC, Hu LQ, Biro GP. Review of physiologic mechanisms in response to anemia. *CMAJ* 1997;156(11 Suppl):S27-40. [ISI: XC077]

554. Shorr AF, Jackson WL. Transfusion practice and nosocomial infection: assessing the evidence. *Curr Opin Crit Care* 2005;11(5):468-72. [PMID: 16175034]

555. Centers for Disease Control and Prevention (CDC). Fatal bacterial infections associated with platelet transfusions—United States, 2004. *MMWR Morb Mortal Wkly Rep* 2005;54(7):168-70. [PMID: 15729217]

556. Offner PJ, Moore EE, Biffl WL, et al. Increased rate of infection associated with transfusion of old blood after severe injury. *Arch Surg* 2002;137(6):711-7. [PMID: 12049543]

557. Chang H, Hall GA, Geerts WH, et al. Allogeneic red blood cell transfusion is an independent risk factor for the development of postoperative bacterial infection. *Vox Sang* 2000;78(1):13-8. [PMID: 10729806]

558. Vamvakas EC, Carven JH. Allogeneic blood transfusion, hospital charges, and length of hospitalization: a study of 487 consecutive patients undergoing colorectal cancer resection. *Arch Pathol Lab Med* 1998;122(2):145-51. [PMID: 9499357]

559. Hanazaki K, Kajikawa S, Shimozawa N, et al. Perioperative blood transfusion and survival following curative hepatic resection for hepatocellular carcinoma. *Hepatogastroenterology* 2005;52(62):524-9. [PMID: 15816471]

560. Sakamoto Y, Kosuge T, Shimada K, et al. Prognostic factors of surgical resection in middle and distal bile duct cancer: an analysis of 55 patients concerning the significance of ductal and radial margins. *Surgery* 2005;137(4):396-402. [PMID: 15800484]

561. Hyung WJ, Noh SH, Shin DW, et al. Adverse effects of perioperative transfusion on patients with stage III and IV gastric cancer. *Ann Surg Oncol* 2002;9(1):5-12. [PMID: 11829431]

562. Dresner SM, Lamb PJ, Shenfine J, et al. Prognostic significance of peri-operative blood transfusion following radical resection for oesophageal carcinoma. *Eur J Surg Oncol* 2000;26(5):492-7. [PMID: 11016472]

563. Okano T, Ohwada S, Sato Y, et al. Blood transfusions impair anastomotic wound healing, reduce luminol-dependent chemiluminescence, and increase interleukin-8. *Hepatogastroenterology* 2001;48(42):1669-74. [PMID: 11813598]

564. Massicotte L, Sassine MP, Lenis S, et al. Survival rate changes with transfusion of blood products during liver transplantation. *Can J Anaesth* 2005;52(2):148-55. [PMID: 15684254]

565. Ramos E, Dalmau A, Sabate A, et al. Intraoperative red blood cell transfusion in liver transplantation: Influence on patient outcome, prediction of requirements, and measures to reduce them. *Liver Transpl* 2003;9(12):1320-7. [PMID: 14625833]

566. Vincent JL, Baron JF, Reinhart K, et al. Anemia and blood transfusion in critically ill patients. *JAMA* 2002;288(12):1499-507. [PMID: 12243637]

567. Chiarugi M, Buccianti P, Disarli M, et al. Effect of blood transfusions on disease-free interval after rectal cancer surgery. *Hepatogastroenterology* 2000;47(34):1002-5. [PMID: 11020864]

568. Lee H, Hawker FH, Selby W, et al. Intensive care treatment of patients with bleeding esophageal varices: results, predictors of mortality, and predictors of the adult respiratory distress syndrome. *Crit Care Med* 1992;20(11):1555-63. [PMID: 1424699]

569. Bender JS, Wiencek RG, Bouwman DL. Morbidity and mortality following total abdominal colectomy for massive lower gastrointestinal bleeding. *Am Surg* 1991;57(8):536-40. [PMID: 1928995]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

chh-E 180517


© 2006, 2017 Watch Tower Bible and Tract Society of Pennsylvania. E-mail: his@jw.org