

The approach to patients with acute GI hemorrhage who cannot receive a blood transfusion CME

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Perhaps the greatest challenge a physician may face is when a patient refuses life-preserving recommendations. For the gastroenterologist, this may occur when a patient with ongoing GI hemorrhage refuses a potentially life-saving blood transfusion. This article reviews this infrequent, yet important topic, and is intended to offer recommendations to the gastroenterologist in terms of medical and endoscopic management when faced with this most difficult scenario.

CLINICAL CASE

A 47-year-old previously healthy woman presented with 1 day of melena. Upper-GI-tract bleeding from peptic ulcer disease was suspected, because she was taking potent non-steroidal anti-inflammatory drugs to treat acute low back strain. The patient was hypotensive and orthostatic. A nasogastric aspirate revealed bright red blood that cleared with 1 L of lavage. An initial hematocrit (HCT) was found to be 21% (reference range 36%-46%). A coagulation profile and platelet count were normal. The consulting gastroenterologist recommended admission to the medical intensive care unit (ICU) and transfusion of 2 units of packed red blood cells. However, the patient declined blood transfusion, stating that she was a Jehovah's Witness. She was resuscitated with normal saline solution but remained hemodynamically unstable. The gastroenterologist consulted with the critical care specialist and decided to perform an emergent EGD, with diagnostic and therapeutic intent. The EGD revealed a large duodenal ulcer with a nonbleeding visible vessel located on the posterior wall of the duodenal bulb. Dual combination endoscopic therapy was performed with epinephrine injection and endoclip application. The patient remained in the ICU for close monitoring, was treated with a high-dose proton pump inhibitor (PPI), and had an uneventful recovery. She was discharged to home 8 days later and remained well at a 3-month follow-up. Although the outcome of this patient was favorable, this case raises several important issues regarding the management of patients with ongoing GI hemorrhage who cannot receive a blood transfusion. What are the best medical practices

for replacing blood loss? What are the ethical and legal implications in such cases? When should an endoscopic examination be performed, and what type of therapy should be implemented? Although there are published studies to support some of the answers to these questions, other recommendations in this review are based on "expert opinion," and these will be so stated. Also, this review will focus primarily on upper-GI bleeding. However, some of the same management principles also apply to both mid intestinal (small bowel) and colonic bleeding.

BACKGROUND

One of the basic tenets of care when treating patients with significant acute blood loss is to provide a blood transfusion. Early on in training, medical house staff are taught the infamous "10/30" rule. That is, they are charged with ensuring that their patients' "tanks are filled," with a hemoglobin (Hb) and HCT of 10 g/dL and 30%, respectively. In 1988, the National Institutes of Health convened a consensus conference on perioperative red blood cell transfusions, partly in response to increasing concerns over transfusion-related blood-borne pathogens.¹ In their summary statement, they stated that no single criterion should be used as an indication for red cell component therapy and that multiple factors related to the patient's clinical status and oxygen delivery (DO₂) need to be considered.² Regardless, nearly all clinicians would transfuse a patient with evidence of ongoing hemorrhage and hemodynamic instability. However, as the above case illustrates, there are circumstances when the treating physician cannot transfuse their patients the blood they so urgently need. Most often, this situation can arise when a patient refuses a blood transfusion based on their religious beliefs, such as with a Jehovah's Witness. Less commonly, patients may refuse because of fear of acquiring a blood-borne disease or of having an adverse reaction to blood-product transfusion. Also, some patients are unable to be immediately transfused because of an unavailability of compatible blood.

DOES THE PATIENT REALLY NEED A BLOOD TRANSFUSION?

Of prime importance in managing these patients is deciding whether the patient actually requires a blood

See CME section; p. 933.

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transfusion. Although the exact level at which a blood transfusion should be given is uncertain, there is a general consensus that a blood Hb concentration greater than 7 to 8 g/dL is tolerated well by most patients and that the use of preemptive blood transfusion is unnecessary.² In fact, the central role of blood transfusion as a necessary and lifesaving intervention has come into question. Liberal versus restrictive transfusion strategies have shown that transfusion to higher levels of Hb is not necessarily better. A randomized, controlled trial that involved 838 patients who were normovolemic and critically ill demonstrated that a restrictive blood transfusion strategy (Hb level between 7 and 9 g/dL) was tolerated and as safe as a liberal transfusion strategy, with the exception of patients with ischemic cardiovascular disease.³ It is important to remember that these strategies and consensus statements should be considered as general guidelines and not as absolute rules. Ultimately, specific treatment needs to be individualized, taking into account the patient's age, comorbid diseases, and the rapidity and possible etiologies of GI bleeding. In addition, blood transfusion does have a small but real risk of possible life-threatening transfusion reactions and transmission of blood-borne agents.⁴ The physician should remember that the overriding physiologic principle that guides management should be for the patient to adequately oxygenate vital organs to meet the demands of the current illness. However, profound anemia is generally not well tolerated. In an important study of patients who are a Jehovah's Witness, in the postoperative period, the risk of death dramatically increased when the blood Hb fell below 7 g/dL (Table 1).⁵

PHYSICIAN ATTITUDES TOWARD PATIENTS WHO REFUSE BLOOD

Although this area has not been studied in great detail, it should be noted that it has generated a significant amount of apprehension among physicians. Eighty-four percent of physicians who responded to a pair of survey studies indicated that they had encountered at least 1 patient who was a Jehovah's Witness and who needed urgent procedures, eg, emergent surgery.⁶ Moreover, if faced with an exsanguinating patient who is a Jehovah's Witness, more than half of the physicians surveyed said they would transfuse against the patient's wishes, and 26% of them would not tell the patient what had been done.⁷

THE JEHOVAH'S WITNESS

In about 1874, a 22-year-old man from Pittsburgh, Pennsylvania, founded a small Bible study group that focused on the literal translation of the Bible. This group, who eventually called themselves "Jehovah's Witnesses," would one day evolve into a religious sect that presently numbers over 6 million members worldwide.⁸ Importantly, in 1945,

TABLE 1. Thirty-day mortality in patients with very low postoperative Hb levels who decline blood transfusion*

Hb (g/dL)	30-Day mortality (%)
7.1-8.0	0
5.1-7.0	9
3.1-5.0	30
≤3.0	64

*Adapted from Ref. 5.

the sect formally declared a ban of receiving blood transfusion.⁹ The Jehovah's Witness Church's decision was based on the literal interpretation of various biblical passages that forbade the consumption of blood, among them: "But flesh with the life thereof, [which is] the blood thereof, shall ye not eat."¹⁰ Since that indoctrination, patients and physicians have been placed in the predicament of attempting to uphold one's religious beliefs while at the same time providing appropriate, life-preserving medical care. There have been numerous discussions in the ethical, legal, and medical literature that debated this important topic. Although a thorough review of these issues is beyond the scope of this review, the gastroenterologist should have a fundamental understanding of these ideas and concepts.

LEGAL BACKGROUND

One of the fundamental principles of the physician-patient relationship is the idea of patient autonomy. That is, a patient of sound mind has the right to refuse medical care, even if that refusal results in direct harm to oneself. The right of a competent person to control his or her own body is an idea that has been recognized in common law and has consistently been upheld in the United States Supreme Court.¹¹ Alongside this guarantee is the tenet of informed consent that forbids the performance of a procedure or blood-product transfusion without the patient's permission. Therefore, the consulting physician does have the support of the U.S. legal system, when abiding by the patient's request of refusal of care, even if it results in direct patient harm. Such patient-physician discussions must be clearly documented in the medical record. Because neither U.S. state legislatures nor the U.S. Congress have passed laws that deal with the refusal of therapy, the legal basis for this principle stems from precedents of case law.¹²⁻¹⁴ It should be noted that U.S. courts have consistently upheld this right, even when it has resulted in the patient's death.^{15,16} The law is more ambiguous when it comes to a parent's refusal of a necessary procedure (or blood transfusion) on behalf of a child, or a pregnant woman on behalf of her unborn fetus, when such refusal clearly results in

harm to the child or fetus.¹⁷ Nevertheless, U.S. courts have argued that the individual state has the authority as “*parens patriae*” to act in the interest of a minor’s well being and that parental control can be restricted.¹⁸ It should be pointed out that physicians also have rights and can refuse to provide care for a patient who is a Jehovah’s Witness, if an alternative caregiver agrees to take the case, as long as the situation is not emergent. Also, in the year 2000, the Watchtower organization, the central governing body of the Jehovah’s Witness, formally rescinded its strict ban on blood transfusion. Rather, a person who receives a transfusion undergoes a process of self-imposed disbandment.¹⁹

PATIENTS WHO ARE NOT JEHOVAH’S WITNESS BUT WHO REFUSE BLOOD

Some patients refuse a blood transfusion for nonreligious reasons. These include fear of obtaining a blood-borne infection and potential adverse reactions to the blood products. It is the responsibility of the physician who recommends transfusion to counsel patients about the risks and benefits of transfusion. On the whole, blood transfusion is considered a very safe treatment modality and must be balanced against the risk of not transfusing. For those patients and physicians who wish to keep the risk for transfusion-associated infection to a minimum, the primary response should be to limit unnecessary transfusion.

FEAR OF INFECTION AND/OR ALLERGIC REACTION

Rarely, a patient may refuse blood on account of fearing a possible allergic reaction to blood products. It should be noted that most adverse reactions to a blood transfusion are of a benign nature. However, some reactions cause serious morbidity, and some may even be fatal. In general, transfusion reactions occur in about 2% of all transfusions.²⁰ The risk for a fatal hemolytic transfusion reaction is estimated to be about 1 in 100,000.²¹ The most common noninfectious²² and infectious²³ adverse effects are shown in Table 2. Other potentially communicable infectious agents that have become quite newsworthy is the West Nile virus, and the prion agent, which has been linked to Creutzfeldt–Jakob disease. Nevertheless, the rapid implementation of screening tests and other preventive strategies have improved the overall safety of blood transfusions.

BLOOD INCOMPATIBILITY

Other scenarios that gastroenterologists may encounter are when a patient consents for blood transfusion but the product is not readily available because of blood incompatibility. The standard method of cross-matching for a blood transfusion is by obtaining a sample of blood

TABLE 2. Types and incidence of adverse reactions from red cell transfusion*

	Approximate incidence per RBC unit
Noninfectious reaction	
Allergic	1%-3%
Congestive heart failure	1%
Alloimmunization	1% to RBC antigens; 10% to HLA
Circulatory overload	<1%
Febrile nonhemolytic	0.5%-6%
Delayed hemolytic reaction	0.009%-0.02%
Transfusion-related acute lung injury	0.0005%-0.02%
Graft versus host disease	0.002%-0.005%
Anaphylaxis	0.002%-0.005%
Acute hemolytic reaction	0.001%-0.003%
Iron overload	after > 100 RBC units
Infectious agent	
Bacterial	1 in 100,000-500,000
Hepatitis B virus	1 in 220,000
Hepatitis C virus	1 in 600,000
HIV	1 in 1,800,000

RBC, Red blood cells; HLA, human leukocyte antigen.

*Adapted from Refs. 22 and 23.

from the patient to determine the patient’s ABO and Rh types to avoid a major transfusion reaction. The patient’s sera are also screened for antibodies. Most commonly, alloantibodies will be detected from previous transfusions or exposure during pregnancy, autoantibodies from autoimmune hemolytic anemia, drug-induced hemolytic anemia, and ABO discrepancies. Also, patients with a history of excessive blood transfusions, commonly seen in patients with a long history of obscure GI-tract bleeding, will often have multiple antibodies, which makes timely cross-match and transfusion exceedingly difficult. The management of such situations involves careful discussion with the consulting physician, hematologist, and transfusion medicine specialist. Ultimately, the risk of a reaction and the benefit of transfusion must be carefully considered during each episode. However, the same “blood-conserving” principles of practice (as discussed below) should be applied until the safest possible blood is made available.

CLINICAL MANAGEMENT

Medical management

Although the following discussion will focus on acute upper-GI bleeding, the basic management principles also apply to colonic and mid intestinal (small-bowel) bleeding; however, the role of urgent endoscopy remains controversial in the latter 2 scenarios. The clinical management of patients with acute GI bleeding who refuse or cannot immediately receive a blood transfusion should be individualized. Not all patients will actually need blood products, and some patients who are Jehovah's Witness would accept blood if the situation were dire. It is critical for the physician to be acquainted with the patient's specific beliefs and attitudes. Moreover, the physician must carefully document, in layperson's terms, the risks (including the potential for death) of refusing a blood transfusion.

Several strategies can be implemented to preserve blood circulation, including minimization of iatrogenic blood loss, limiting metabolic demands, maximizing DO₂, and enhancing erythropoiesis. Once it has been established and meticulously documented that the patient who is acutely hemorrhaging refuses a blood transfusion, steps should be taken to minimize iatrogenic blood loss. Studies performed on adult patients in the ICU showed that mean blood loss was 41.5 mL/d.^{24,25} Aside from avoiding unnecessary phlebotomy, pediatric-sized sampling tubes (3-5 mL) should be used. This was shown to reduce the volume of blood drawn by about 45%. Alternatively, whole-blood microchemistry analyzers can be used at the bedside and require only 1 mL of blood to accurately determine blood gas, electrolytes, and HCT.^{26,27} Strategies to limit oxygen consumption and demand include adequate analgesia and sedation when necessary. In extreme cases, neuromuscular blockade and induced hypothermia may be necessary but would require the patient to be mechanically ventilated.²⁸ Hypothermia may have adverse effects on coagulation and shifts the oxygen dissociation curve to the left (thereby decreasing DO₂), so it must be balanced against the need to reduce overall metabolism. A specific strategy should be implemented in close consultation with an experienced critical care physician.

The fundamental physiologic factor to be considered in the patient who is acutely anemic is the degree to which DO₂ to the tissues is sustained. DO₂ is governed by the formula:

$$\text{DO}_2 = \text{cardiac output} \times \text{arterial oxygen content}$$

Arterial oxygen content consists of Hb-bound oxygen and, to a lesser extent, dissolved oxygen. In the resting state, DO₂ exceeds consumption 4-fold. This explains why patients who are acutely bleeding may not become symptomatic until they have lost a significant proportion of their blood volume. Maintaining an above-normal arterial oxygen content by maximizing saturation with supplemental oxygen will

TABLE 3. Checklist when managing patients who cannot receive a blood transfusion

Blood may not always be needed
Know your patients' attitudes and beliefs about blood transfusion
Carefully document patient refusal in the medical record
Consider alternatives to blood transfusion
Use pediatric phlebotomy tubes
Avoid unnecessary phlebotomy
Admit to the ICU for management
Multidisciplinary input from specialists
Urgent endoscopy (EGD)
Immediate high-dose IV PPI (bolus, then continuous infusion), before EGD
Immediate IV octreotide in all patients with suspected variceal hemorrhage, before EGD
Plan ahead for all possible medical and endoscopic outcomes

increase oxygen carriage to the tissues. Maintaining an adequate circulating blood volume will help sustain stroke volume and thereby cardiac output. This can be accomplished with the intravenous (IV) administration of either crystalloids or colloids. The essential physiologic difference between these 2 agents is that colloid solutions generate colloid osmotic pressure, whereas crystalloids do not. Crystalloids include normal saline solutions, hypertonic saline solution, or lactated Ringer's solution. The merits of each have been debated for many years.²⁹ Crystalloids are advantageous, because they are inexpensive and readily available. Colloids include synthetic agents such as dextran, hetastarch, or albumin. Colloids allow a smaller volume of resuscitation fluid but are expensive and may adversely impact on coagulation.³⁰

Pharmacologic management

A recent prospective randomized controlled trial showed that the early administration of high-dose IV omeprazole (80-mg IV bolus followed by 8 mg/h) before an endoscopy in patients ("all-comers") with acute upper-GI bleeding had a significantly reduced need for endoscopic therapy and shortened length of hospital stay but did not reduce blood transfusion requirements, rates of recurrent bleeding, the need for surgery, or death.³¹ In the subgroup of patients with peptic ulcer, there were significantly fewer ulcers with active bleeding and more with clean bases. Although the data are still limited, in our opinion, all patients with acute upper-GI bleeding who refuse or cannot receive blood transfusions should be immediately started on high-dose IV PPI (bolus followed by continuous IV infusion) at the time of the initial triage in the emergency department

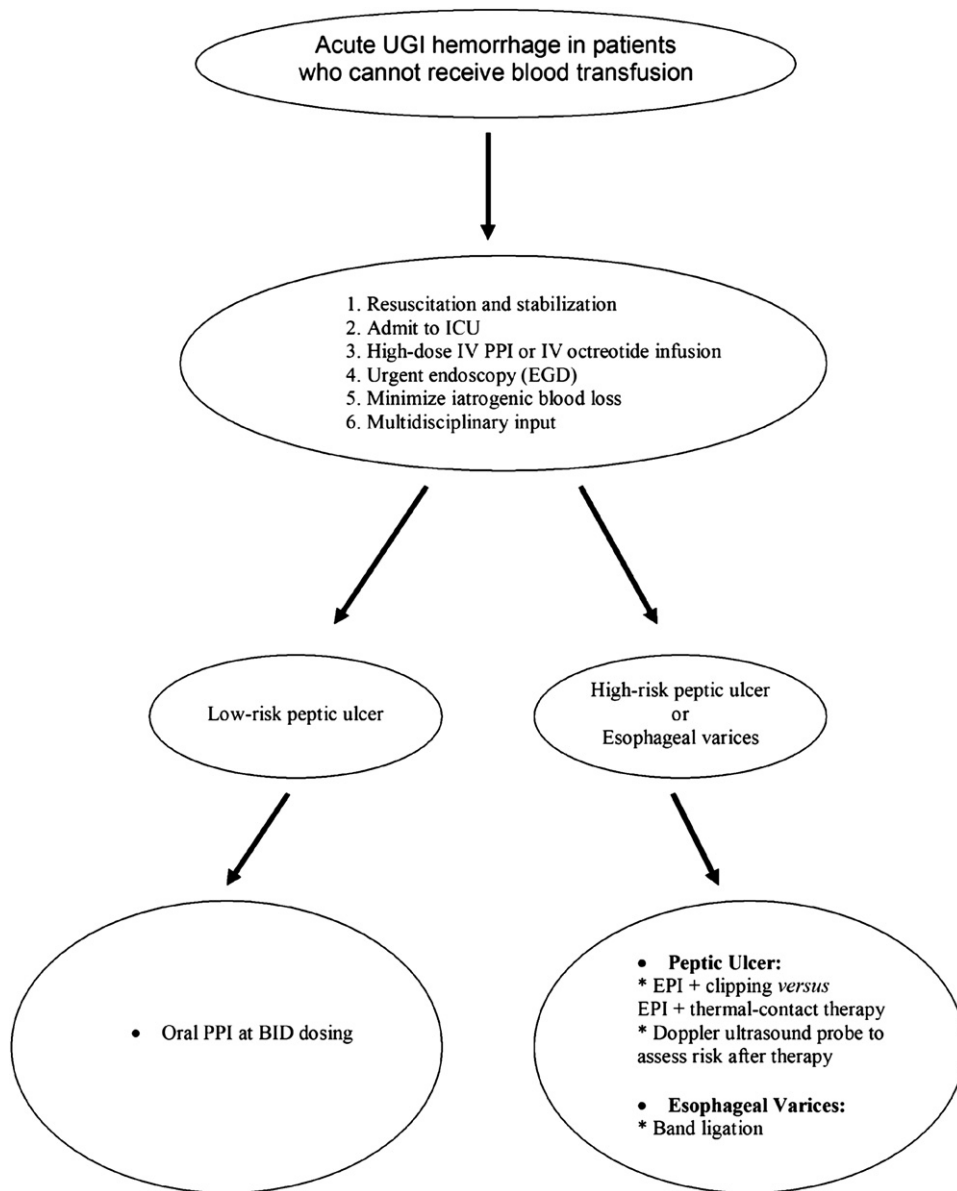


Figure 1. Algorithm for the management of acute UGI hemorrhage in patients who cannot receive a blood transfusion.

(before an EGD). In addition, all patients with suspected variceal bleeding should be started on IV octreotide (50- μ g IV bolus followed by 50 μ g/h), which has been shown to significantly decrease recurrent bleeding after endoscopic band ligation.³² Also, although not of immediate benefit, it is the responsibility of the consulting gastroenterologist to recommend the initiation of iron store replacement before discharge. If necessary, erythropoiesis can also be enhanced by the administration of recombinant human erythropoietin alpha.³³

Endoscopic management

This section will focus on the unique aspects of endoscopic therapy in patients who refuse a blood transfusion. Published data are limited, with only 1 small ($n = 15$), retrospective, case-control study (in abstract form), which

reported fewer attempts at therapeutic endoscopy, a greater likelihood to undergo surgery, and higher 30-day mortality in patients who were Jehovah's Witness.³⁴

Our recommendation is that such patients should be managed in the ICU, surgical consultation should be obtained, and an urgent EGD should be performed, with combination endoscopic therapy for high-risk nonvariceal bleeding lesions. Endoclips result in less tissue trauma than thermal hemostatic modalities and, theoretically, may be preferred in these patients. Also, if available, a through-the-scope endoscopic Doppler US (DopUS) probe can be used to determine the likelihood of recurrent bleeding when a bleeding ulcer is immediately examined after endoscopic therapy. Studies showed that ulcers that remain Doppler-positive immediately after endoscopic therapy are at significantly increased risk of recurrent bleeding;

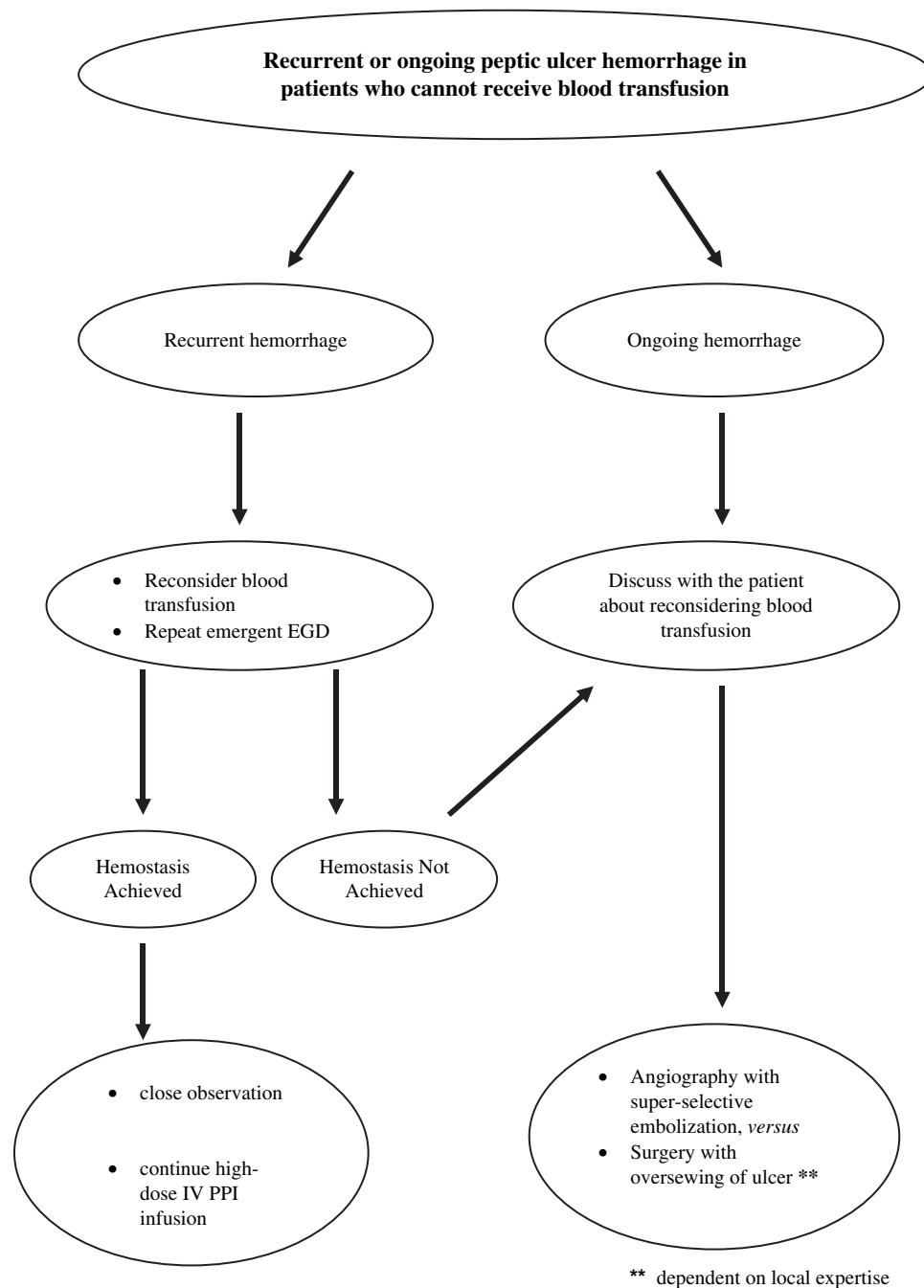


Figure 2. Algorithm for the management of recurrent or ongoing peptic ulcer hemorrhage in patients who cannot receive a blood transfusion.

a positive Doppler signal indicates persistent subsurface blood flow despite endoscopic treatment, which may have important implications on subsequent patient management.^{35,36} We recommend that DopUS be used to examine bleeding ulcers immediately after endoscopic therapy as an objective marker of risk for recurrent bleeding.

Recurrent or ongoing bleeding

Patients who experience recurrent or continuous bleeding should be asked to reconsider their decision about a blood transfusion, because some patients may change

their minds if their lives are in imminent danger. With patient permission, the families should also be involved in discussions concerning management. A checklist (Table 3) and algorithms (Figs. 1 and 2) are shown, which summarize the basic management approach when faced with these challenging cases.

Alternatives to blood transfusion: bloodless medicine

Gastroenterologists need to be aware that viable alternatives to conventional transfusion may soon exist.

Bloodless medicine has been an active area of research for the past 15 years. This has been spurred primarily by an increased need for blood transfusion coupled by a diminishing natural blood supply.³⁷ However, in practice, it is very difficult to obtain such products for clinical use. If urgently needed, a compassionate use request must be filed with the manufacturer, and appropriate Food and Drug Administration documents must be completed. The hospital institutional review board and/or an ethics committee must also approve its use. Because of these barriers, synthetic oxygen carriers will not have a major role in treating such patients in the near future.

CONCLUSIONS

Patients who experience acute GI hemorrhage and who refuse or who cannot receive blood transfusion pose particular challenges to physicians who are charged with their immediate care. Gastroenterologists must have a basic understanding of the proper medical, surgical, and endoscopic approaches to such patients. In many cases, these patients require multidisciplinary input from different subspecialists with expertise in endoscopic hemostasis, critical care medicine, hematology and transfusion medicine, general surgery, interventional radiology, and perhaps even medicolegal ethics.

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Abbreviations: DO₂, oxygen delivery; DopUS, Doppler US probe; Hb, hemoglobin; HCT, hematocrit; ICU, intensive care unit; IV, intravenous; PPI, proton pump inhibitor.

REFERENCES

- Weinberg PD, Hounshell J, Sherman LA, et al. Legal, financial, and public health consequences of HIV contamination of blood and blood products in the 1980s and 1990s. *Ann Intern Med* 2002;136:312-9.
- Consensus conference. Perioperative red blood cell transfusion. *JAMA* 1988;260:2700-3.
- Herbert PC, Wells G, Blajchman MA. A multicenter, randomized, controlled clinical trial of transfusion requirement in critical care. *Transfusion* requirements in Critical Care Investigators and the Canadian Critical Care Trials Group. *N Engl J Med* 1999;340:409-17.
- Goodnough LT. Risks of blood transfusion. *Anesthesiol Clin North America* 2005;23:241-52.
- Carson JL, Noveck H, Berlin JA, et al. Morbidity and mortality in patients with very low postoperative Hb levels who decline blood transfusion. *Transfusion* 2002;42:812-8.
- Weinberger M, Tierney WM, Greene JY, et al. The development of physician norms in the United States. The treatment of Jehovah's Witness patients. *Soc Sci Med* 1982;16:1719-23.
- Vincent JL. Transfusion in the exsanguinating Jehovah's Witness patient: the attitude of intensive-care doctors. *Eur J Anaesthesiol* 1991;8:297-300.
- 2007 Report of Jehovah's Witnesses Worldwide. Available at: http://www.watchtower.org/e/statistics/worldwide_report.htm. Accessed November 14, 2007.
- Immovable for the right to worship. *Watchtower* 1945;66:195-6.
- Genesis 9:4 (KJV).
- Cruzan v Missouri Department of Health*, 497 US 261 (1990).
- Spencer JD. The "Witnesses" could win. *Leg Aspects Med Pract* 1978;6:45-9.
- Bamberger DH. *Mercy Hospital, Inc. v. Jackson: a recurring dilemma for health care providers in the treatment of Jehovah's Witnesses*. *Maryland Law Rev* 1987;46:514.
- Hirsch HL, Phifer H. The interface of medicine, religion, and the law: religious objections to medical treatment. *Med Law* 1985;4:121-39.
- Randolph v. City of New York*, NY Supreme Ct App Div, First Dept, 117AD2d 44,501 NYS2d 837, aff'd as modified, 507 NE2d 298 (1987).
- Bean KW, Gilbert DE, Boggs BC. Survey of Illinois Law: health care. *South Ill Univ Law J* 1992;16:879.
- Gyamfi C, Gyamfi MM, Berkowitz RL. Ethical and medicolegal considerations in the obstetric care of a Jehovah's Witness. *Obstet Gynecol* 2003;102:173-80.
- Prince v. Com. of Mass.*, 321 U.S. 158 (1944).
- Watchtower Bible and Tract Society. Questions from readers. *Watchtower* 2000;15:29-31.
- Baker RJ, Moinichen SL, Nyhus LM. Transfusion reaction: a reappraisal of surgical incidence and significance. *Proc Inst Med Chic* 1969;27:214-5.
- Menitove JE. Current risk of transfusion-associated human immunodeficiency virus infection. *Arch Pathol Lab Med* 1990;114:330-4.
- Kuriyan M, Carson JL. Blood transfusion risks in the intensive care unit. *Crit Care Clin* 2004;20:237-53.
- Busch MP, Kleinmen SH, Nemo GJ. Current and emerging infectious risks of blood transfusions. *JAMA* 2003;289:959-62.
- Smoller BR, Kruskall MS. Phlebotomy for diagnostic laboratory tests in adults. Pattern of use and effect on transfusion requirements. *N Engl J Med* 1986;314:1233-5.
- Henry ML, Garner WL, Fabri PJ. Iatrogenic anemia. *Am J Surg* 1986;151:362-3.
- Harvey MA. Point-of-care laboratory testing in critical care. *Am J Crit Care* 1999;8:72-83.
- Kost GJ, Ehrmeyer SS, Chernow B, et al. The laboratory-clinical interface: point of care testing. *Chest* 1999;115:1140-54.
- Kulvatunyou N, Heard SO. Care of the injured Jehovah's Witness patient: case report and review of the literature. *J Clin Anesth* 2004;16:548-53.
- Virgilio RW, Rice CL, Smith DE, et al. *Surg* 1979;85:129-39.
- Jones SN, Whitten CW, Despotis GJ, et al. The influence of crystalloid and colloid replacement solutions in acute normovolemic hemodilution: a preliminary survey of hemostatic markers. *Anesth Analg* 2003;96:363-8.
- Lau JY, Leung WK, Wu JC, et al. Omeprazole before endoscopy in patients with gastrointestinal bleeding. *N Engl J Med* 2007;356:1631-40.
- Sung JJ, Chung SC, Yung MY, et al. Prospective randomized study of effect of octreotide on rebleeding from esophageal varices after endoscopic ligation. *Lancet* 1995;346:1666-9.
- Mann MC, Votto J, Kambe J, et al. Management if the severely anemic patient who refuses transfusion: lessons learned during the care of a Jehovah's Witness. *Ann Intern Med* 1992;117:1042-8.

34. Schwartz DC, Ringwala SN, Said A, et al. Acute Gastrointestinal hemorrhage in the Jehovah's Witness: a ten year study of outcomes [abstract]. *Gastroenterology* 2003;124:A508-9.
35. Wong RCK, Chak A, Kobayashi K, et al. Role of Doppler ultrasound in acute peptic ulcer hemorrhage: can it predict failure of endoscopic therapy? *Gastrointest Endosc* 2000;52:315-21.
36. Wong RCK. Endoscopic Doppler ultrasound probe for acute peptic ulcer hemorrhage [technological review]. *Gastrointest Endosc* 2004;60:804-12.
37. Sullivan MT, Cotten R, Read EJ, et al. Blood collection and transfusion in the United States in 2001. *Transfusion* 2007;47:385-94.

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