CHAPTER 146

Non-variceal upper gastrointestinal bleeding

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KEY POINTS

- A multidisciplinary team should handle the management of patients with non-variceal upper gastrointestinal bleeding (NVUGIB)
- Critical to initial management of patients with NVUGIB is adequate resuscitation and risk stratification
- The majority of NVUGIB patients (80%) will stop bleeding spontaneously while the remainder will continue to bleed or experience recurrent bleeding
- Pre-endoscopic therapy with a proton pump inhibitor (PPI) downstages the stigmata of bleeding in an ulcer but does not decrease mortality, rebleeding, or the need for surgery
- Early endoscopy (within 24 hours of presentation) with endoscopic hemostasis, if indicated, represents standard of care in patients with NVUGIB
- PPIs should be used acutely in the management of patients with NVUGIB
- There is no added benefit from routine second-look endoscopy
- In the case of failed endoscopic therapy, a second endoscopy is warranted and if bleeding cannot be stopped, angiography with percutaneous embolization can be attempted as well as surgery
- The duration of long-term PPI dose depends on the underlying cause of the bleeding episode and secondary prophylaxis needs to be considered where appropriate

Introduction

Non-variceal upper gastrointestinal bleeding (NVUGIB) is a common entity with significant morbidity and mortality; it also carries a substantial cost to the healthcare system. This chapter addresses the different acute management aspects when caring for patients with NVUGIB. The scope of the review does not allow us to address issues of secondary prevention, but the reader is referred to excellent recent reviews and consensus recommendations.

Epidemiology

The yearly incidence of NVUGIB ranges from 48 to 160 cases per 100 000 adults [1], with a mortality ranging from 10% to 14% [2,3]. The majority of NVUGIB episodes are from non-variceal causes (80–90%), with the commonest cause being **peptic ulcer disease (PUD)** (66%) of the upper gastrointestinal tract [3]; other causes include Mallory–Weiss tears, erosive gastritis or duodenitis, esophagitis, malignancy, angiodysplasia, and iatrogenic complications.

The annual incidence of NVUGIB has decreased [2] but not the incidence of PUD [1], perhaps due to the increasing use of non-steroidal anti-inflammatory drugs (NSAIDs), including low-dose aspirin (ASA).

Initial management

NVUGIB management requires a multidisciplinary team, starting with appropriate resuscitation (with the insertion of two large-bore intravenous lines) and monitoring of vital signs, including hemodynamic instability. Blood samples should be drawn for serum hemoglobin (Hb), coagulation parameters (INR, PTT), electrolytes, liver enzymes, serum creatinine, and urea, as well as blood type and cross-matching. Insertion of a nasogastric tube (NGT) can help risk stratification and also assist in gastric cleansing prior to endoscopic examination. Prokinetic agents such as erythromycin and metoclopramide can be administered prior to endoscopy to patients suspected of having blood or clots in the stomach. These agents decrease the need for repeat endoscopy to visualize the bleeding lesion [2].

Support with blood products

The need for blood transfusion should be based on the risk of developing complications from tissue hypoxia rather than targeting a fixed Hb level. Blood transfusions are rarely needed with an Hb >100 g/L and almost always indicated at a level <60 g/L (keeping in mind ongoing re-equilibration).

Risk stratification

The majority of patients with NVUGIB (80%) will stop bleeding spontaneously without recurrence. The highest morbidity and mortality is in the remaining 20% who experience continued or recurrent bleeding.

Clinical predictors of rebleeding are listed in Table 146.1 and predictors of increased mortality in Table 146.2. Two commonly implemented scores for patients with upper gastrointestinal bleeding are the Blatchford (Table 146.3) and Rockall (Table 146.4) scores.

Textbook of Clinical Gastroenterology and Hepatology, Second Edition. Edited by C. J. Hawkey, Jaime Bosch, Joel E. Richter, Guadalupe Garcia-Tsao, Francis K. L. Chan.

Table 146.1 Predictors of persistent or recurrent bleeding in patients with upper gastrointestinal bleeding

Risk factor	Odds ratio for increased risk (95% CI)
Clinical factors	
Age:	
>65 years	1.3
≥70 years	2.30
Shock (systolic blood pressure <100 mmHg)	1.2–3.65
Health status (ASA class 1 vs 2–5)	1.94–7.63
Co-morbid illness	1.6–7.63
Erratic mental status	3.21 (1.53–6.74)
Ongoing bleeding	3.14 (2.40–4.12)
Transfusion requirement	NA
Laboratory factors	
Initial hemoglobin ≤100 g/L or hematocrit <0.3	0.8–2.99
Coagulopathy (prolonged partial thromboplastin time)	1.96 (1.46–2.64)
Presentation of bleeding:	
Melena	1.6 (1.1–2.4)
Red blood on rectal examination	3.76 (2.26–6.26)
Blood in gastric aspirate or stomach	1.1–11.5
Hematemesis	1.2–5.7
Endoscopic factors	
Active bleeding on endoscopy	2.5–6.48
Endoscopic high-risk stigmata	1.91–4.81
Clot	1.72–1.9
Ulcer size ≥2 cm	2.29–3.54
Diagnosis of gastric or duodenal ulcer	2.7 (1.2–4.9)
Ulcer location	
High on lesser curvature	2.79
Superior wall	13.9
Posterior wall	9.2

ASA, American Society of Anesthesiologists; NA, not available.
Adapted with permission from Barkun A, Bardou M, Marshall JK. Consensus recommendations for anaging patients with nonvariceal upper gastrointestinal bleeding. *Ann Intern Med* 2003;139:843–857.

Table 146.2 Predictors of mortality in patients with upper gastrointestinal bleeding

Risk factor	Odds ratio for increased risk (95% CI)
Clinical factors	
Age:	
60–69 years	3.5 (1.5–4.7)
≥75 years	4.5–12.7
>80 years	5.7 (2.9–10.2)
Shock or low blood pressure	1.18–6.4
ASA classification	2.6–9.52
Co-morbid conditions (0 vs ≥1)	1.19–12.1
Continued bleeding or rebleeding	5.29–76.23
Presentation of bleeding	
Blood in the gastric aspirate	0.43–18.9
Hematemesis	2.0 (1.1–3.5)
Red blood on rectal examination	2.95 (1.29–6.76)
Onset of bleeding while hospitalized for other causes	2.77 (1.64–4.66)
Laboratory factors	
Elevated urea level	5.5–18
Serum creatinine level >150 μmol/L	14.8 (2.6–83.5)
Elevated serum aminotransferase levels	4.2–20.2
Sepsis	5.4 (1.5–19.6)
Endoscopic factors	
Major stigmata of recent hemorrhage	NA

ASA, American Society of Anesthesiologists; NA, not available.
Adapted with permission from Barkun A, Bardou M, Marshall JK. Consensus recommendations for anaging patients with nonvariceal upper gastrointestinal bleeding. *Ann Intern Med* 2003;139:843–857.

Endoscopic findings associated with increased rebleeding and mortality include active bleeding, a non-bleeding visible vessel or adherent clot, ulcer size (>2 cm), etiology (e.g., ulcer, cancer, varices), and site of bleeding (posterior lesser gastric curvature or posterior duodenal bulb.

Preendoscopic pharmacotherapy

Pre-endoscopic use of a proton pump inhibitor (PPI) results in a reduction of high-risk stigmata seen at endoscopy and of the need for endoscopic therapy; however, its benefits are probably marginal as it does not result in significant improvements in mortality, rebleeding or surgery [4]. Pre-endoscopic PPI use should therefore never replace the more important role of adequate resuscitation and early endoscopy. The cost-effectiveness of pre-endoscopy PPI is optimized if implemented in particular clinical settings, including when patients are most likely to be bleeding from non-variceal sources or to be harboring a high-risk endoscopic lesion, and if the endoscopy may be delayed. Moreover, data are most robust for an 80-mg bolus of a PPI followed by 8 mg/hour prior to the endoscopy.

Endoscopic therapy

Guidelines recommend that an **early endoscopy** be performed (within 24 hours of presentation); it is the cornerstone of management. Indeed, early endoscopy allows for appropriate risk stratification, and safe discharge for patients found to be at low risk, while also improving outcomes for those classified as high risk for rebleeding. It has been shown to improve rebleeding, surgery, transfusion requirements, and shorten length of stay [2]. Observational data have suggested that early endoscopy may improve mortality. Delays in endoscopy may be appropriate in exceptional circumstances [2], such as in acute coronary artery syndromes or suspected perforation; patients with a very low Blatchford score might be considered for outpatient investigation with a subsequent later endoscopy.

There is no proven advantage for very early or urgent endoscopy (<12 hours) over endoscopy within the first 24 hours. Predictors of patients with active bleeding who may benefit from very early endoscopy (<12 hours) include fresh blood in the NGT aspirate, uncorrectable hemodynamic instability, hemoglobin <80 g/L, and a white blood cell count >12 000 cells/μL.

Table 146.3 The Blatchford risk score

Admission risk marker	Score*
Blood urea (mmol/L)	
≥6.5–<8.0	2
≥8.0–<10.0	3
≥10.0–<25.0	4
≥25	6
Hemoglobin (g/L) for men	
≥120–<130	1
≥100–<120	3
<100	6
Hemoglobin (g/L) for women	
≥100–<120	1
<100	6
Systolic blood pressure (mmHg)	
100–109	1
90–99	2
<90	3
Other markers	
Pulse ≥100/minute	1
Presentation with melena	1
Presentation with syncope	2
Hepatic disease	2
Cardiac failure	2

*Scores of ≥6 are associated with a >50% risk of needing an intervention.
Adapted with permission from Blatchford O, Murray WR, Blatchford M. A risk score to predict need for treatment for upper-gastrointestinal haemorrhage. *Lancet.* 2000;356:1318–1321.

Correction of coagulopathy for patients on anticoagulants

Using data from the Registry of patients with Upper Gastrointestinal Bleeding undergoing Endoscopy (RUGBE), a large national cohort that included 1869 patients with NVUGIB, INR ≥1.5 at presentation was a predictor of increased mortality but not rebleeding [2]. Another study found that correcting the INR value to <1.8 as part of an intense, more general resuscitation approach resulted in a reduction in mortality and myocardial infarctions. On the other hand, a cohort study that looked at urgent endoscopy and correcting an initial INR between 1.5 and 6 to a level of 1.5–2.5 with fresh frozen plasma found no differences in complications, rebleeding, surgery or mortality compared to controls. In patients on anticoagulants, correction of coagulopathy is thus recommended but should not delay endoscopy as long as the INR is not supratherapeutic [2].

Findings on esophagogastroduodenoscopy: who should receive endoscopic hemostatic therapy?

Patients found to have **low-risk stigmata** [clean base ulcer (Figure 146.1) or a non-protuberant dot in an ulcer bed] do not require endoscopic therapy due to the very low risk of rebleeding compared to the natural history of **high-risk stigmata** (Table 146.5) [spurting bleed (Figure 146.2), oozing bleed, or a non-bleeding visible vessel (Figure 146.3)]. Meta-analyses [5,6] have shown improvements in rebleeding, surgery, and mortality when considering any type of endoscopic therapy compared to none amongst patients with high-risk lesions.

Endoscopic hemostatic modalities

Injection

Epinephrine (adrenaline) injection therapy reduces the risk of rebleeding in patients with high-risk stigmata when compared to medical therapy alone.

Table 146.4. The Rockall score

	Score*			
Variable	**0**	**1**	**2**	**3**
Age (years)	<60	60–79	≥80	
Shock	No shock (pulse <100, SBP ≥100)	Tachycardia (pulse ≥100, SBP ≥100)	Hypotension (pulse ≥100, SBP <100)	
Co-morbidity	No major co-morbidity		Cardiac failure, ischemic heart disease, any major co-morbidity	Renal failure, liver failure, disseminated malignancy
Diagnosis	Mallory–Weiss tear, no lesion identified and no stigmata of recent hemorrhage	All other diagnoses	Malignancy of the upper gastrointestinal tract	
Stigmata of recent hemorrhage	None or dark spot only		Blood in the upper gastrointestinal tract, adherent clot, visible or spurting vessel	

*A score <3 carries a favorable prognosis, while that of >8 carries a high risk of mortality.
SBP, systolic blood pressure.
Adapted from Rockall TA, Logan RF, Devlin HB, *et al.* Risk assessment after acute upper gastrointestinal haemorrhage. *Gut.* 1996;38:316–321, with permission from BMJ Publishing Group Ltd.

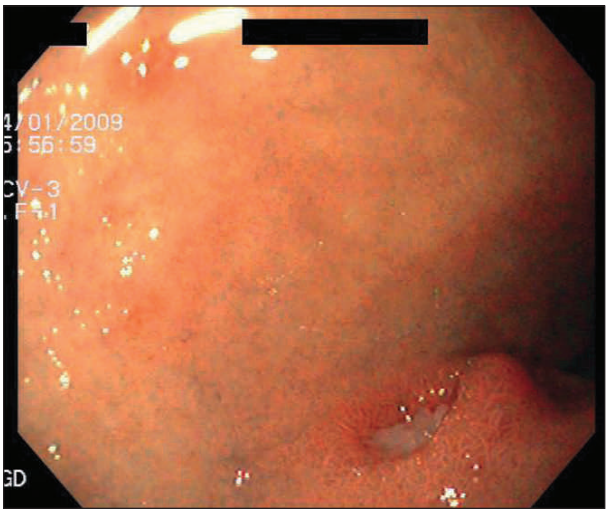

Figure 146.1 Clean base ulcer (Forrest Classification III).

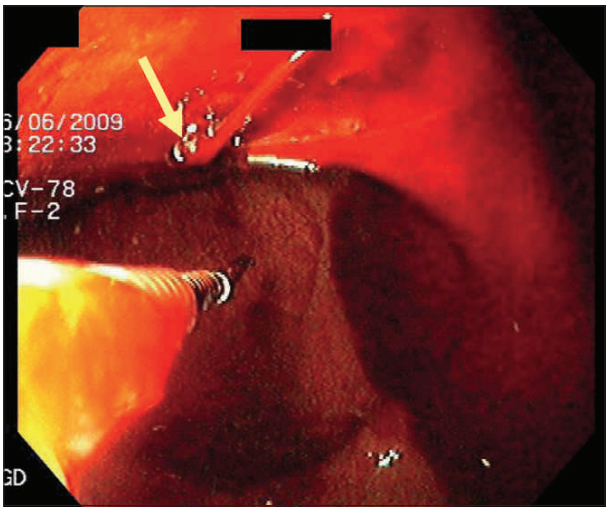

Figure 146.2 Attempt at endoscopic hemostatic therapy using a clip for a spurting vessel (arrow) (Forrest Classification Ia: Spurting bleed).

Table 146.5 Forrest classification

Forrest classification	Rebleeding rate (%)
Ia: Spurting bleed	80–90
Ib: Oozing bleed	10–30
IIa: Non-bleeding visible vessel (NBVV)	50–60
IIb: Adherent clot	25–35
IIc: Flat pigmented spot	0–8
III: Clean base ulcer	0–12

Adapted with permission from Forrest JA, Finlayson ND, Shearman DJ. Endoscopy in gastrointestinal bleeding. *Lancet.* 1974;2:394–397.

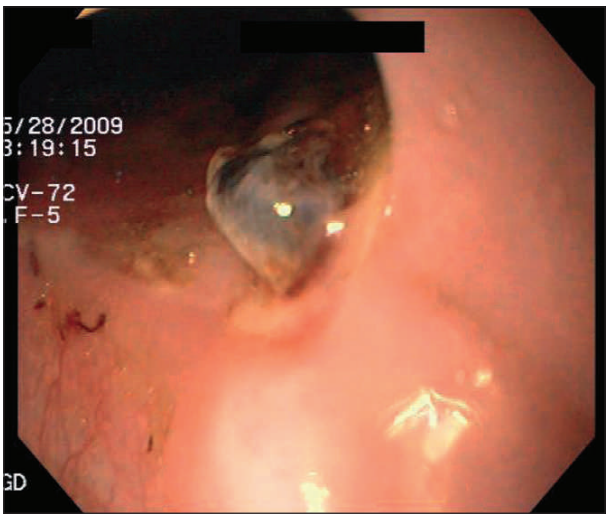

Figure 146.3 Visible vessel [Forrest Classification IIa: non-bleeding visible vessel (NBVV)].

Meta-analyses have found no added benefit of using any solution over another; these have included diluted epinephrine, distilled water, cyanoacrylate, epinephrine in combination with ethanolamine or polidocanol, thrombin, sodium tetradecyl sulfate, ethanol, hypertonic saline (3% NaCl), and 50% glucose–water solution. Trials suggest that larger volumes of injectate should be used – approximately 20 mL; use of larger volumes (30 mL or more) may result in more complications [6]. Injection of a second injectate with alcohol, thrombin or fibrin glue in addition to epinephrine is superior to epinephrine alone (See Video 146.1) [5,6].

Thermal coaptive therapy

All thermal contact devices aim to seal off the bleeding vessel using thermal energy while applying coaptive force (See Video 146.1). They include the heater probe, the multipolar probe, and the Gold probe™. Two meta-analyses have found that all thermal coaptive endoscopic techniques are equally effective. The argon plasma coagulator (APC) uses a non-contact method of electrocoagulation through a jet of ionized argon gas. This technology is not inferior to heater probe or injection therapy, perhaps because most bleeding vessels are of limited diameter.

Clips

Clips have varying lengths, number of prongs, and release systems. Clips have been found to be superior to pharmacotherapy as a sole therapeutic strategy [6].

Combination therapy

Injection may precede thermal therapy or follow the application of clips (See Video 146.1).

Comparative efficacy

Monotherapy with a thermal device has been found to be more effective than epinephrine injection alone or pharmacotherapy alone for patients with high-risk stigmata. Clips are also superior to injection of epinephrine alone.

When injection of epinephrine is coupled with a second endoscopic hemostatic modality for high-risk stigmata, the risk is reduced of rebleeding (OR 0.51; 95% CI 0.39–0.66), surgery (OR 0.63; 95% CI 0.45–0.89), and mortality (OR 0.50; 95% CI 0.30–0.89) compared to injection therapy alone; however, combination therapy is not superior to the use of thermal coaptive therapy or clips as a sole hemostatic technique. The combination of clips with injection therapy is also superior to injection therapy alone, but not to clips alone.

Management of patients with adherent clots

We define an adherent clot as a clot in which it is unclear where to apply endoscopic hemostasis because the hematin material covers the ulcer base too diffusely. Such a finding warrants **targeted irrigation** in an attempt at dislodgement, using a water pump (usually for 2–5 minutes), with appropriate treatment of the underlying lesion. If the clot cannot be removed, the endoscopist can then apply **endoscopic hemostatic therapy** by first injecting diluted epinephrine around the lesion and guillotining the clot with a cold snare, trying to preserve the pedicle of the clot. Once the clot has been removed, management is dictated according to the underlying endoscopic finding. Alternately, these patients may be managed solely with a high-dose intravenous PPI bolus and infusion, as discussed below.

Pharmacological therapy

Somatostatin and octreotide

Contemporary meta-analyses have failed to show any beneficial effects attributable to the use of somatostatin or octreotide compared to other pharmacotherapies or endoscopic therapy. Although the evidence for the use of these agents is not compelling, they may be used in patients with uncontrolled upper gastrointestinal bleeding before or after endoscopy while awaiting further management.

Tranexamic acid

Tranexamic acid inhibits plasminogen activators, which accounts for its effects as an antifibrinolytic drug. An older meta-analysis assessing the use tranexamic acid in NVUGIB included data that antedate the endoscopic therapy era. It is not current routine clinical practice to use this medication in NVUGIB.

Biological rationale for acid suppression in patients with upper gastrointestinal bleeding

Acid has been shown to inhibit platelet aggregation and even favors platelet disaggregation; it is also known to facilitate clot lysis through the activation of pepsin, while acid suppression may prevent fibrinolysis. Following endoscopic therapy for a high-risk lesion, approximately 72 hours are required for most lesions to evolve into a low-risk ulcer stigma. This finding is corroborated by most clinical trials that have shown that peptic ulcer rebleeding occurs predominantly during the first 72 hours following endoscopic therapy. It has thus been hypothesized that acid suppression may stabilize intraluminal clot during this high-risk period, and result in a subsequent improvement in outcomes. Interestingly, PPIs also exhibit anti-inflammatory properties of unclear clinical relevance, but these may play a role in downstaging high-risk bleeding ulcer lesions when PPIs are used while awaiting endoscopy, as discussed above.

Histamine 2-receptor antagonists

Recent meta-analyses have found no improvement in outcomes when H_2-receptor antagonists (H_2RAs) were compared to other pharmacological therapies or endoscopic treatment. Meta-analyses have also noted that PPIs are more effective than H_2RAs in decreasing the incidence of persistent or recurrent NVUGIB, as well as decreasing the need for surgery. This lack of effect may relate to the development of tachyphylaxis with the H_2RAs that can occur as early as a few days into treatment. H_2RAs are thus not recommended in the management of NVUGIB.

Proton pump inhibitors

PPI therapy in the management of NVUGIB has become **standard of care**, and strong evidence exists for their use. Indeed, a Cochrane meta-analysis found that the use of PPIs with or without endoscopic therapy decreased the rate of rebleeding (OR 0.45, 95% CI 0.36–0.57) and surgery (OR 0.56,–95% CI 0.45–0.70) when compared to placebo or H_2RAs [7]. A decrease in mortality was also noted in the subgroup of patients with high-risk lesions who had initially undergone successful endoscopic hemostasis (OR 0.53, 95% CI 0.31–0.91). Improvements in outcomes have also been noted in studies conducted specifically in Asian patients.

Optimum dosage

Despite all the trials completed to date, the optimal intravenous dose remains unknown. The most studied regimen with highest quality data is the 80-mg bolus followed by 8 mg/hour for 72 hours (80 + 8) regimen, which is the dosing favored by consensus recommendations. Some authors have suggested that lower doses may be as efficacious; however, study design and statistical limitations have questioned the validity of these findings. The role of high-dose oral PPIs in the acute management of patients with bleeding ulcers has remained more controversial, most probably due to heterogeneous study methodologies yielding discordant results, at least in part because of racial differences in gastric acid physiology, pharmacogenomics, *Helicobacter pylori* carriage rates, patient age, and acuity of illness. High-dose oral PPIs or lower intravenous doses may be used in NVUGIB, especially where high-dose intravenous PPIs are not available.

Long-term therapy

After the patient is discharged from hospital or after completion of 72 hours of high-dose intravenous PPI, they should be kept on a maintenance dose of a single oral daily dose of the PPI for a duration dependent on the underlying cause (esophagitis, or NSAID or ASA prolonged use).

Although the side effect profiles for PPIs are favorable, there have been concern regarding the increased incidence of *Clostridium difficile* infection, pneumonia, and osteoporosis-related fractures in patients on long-term therapy with PPIs; this remains a controversial issue, but the benefits associated with their use in the acute and secondary prevention setting of NVUGIB as well as in ulcer healing likely outweigh these risks. PPI discontinuation in settings in which the underlying bleeding cause has been eliminated, as is the case following confirmed eradication of *H. pylori*, should be considered.

Routine second-look endoscopy

Routine second-look endoscopy refers to the performance of a preplanned second endoscopy within 16–24 hours after the initial endoscopic evaluation and hemostatic therapy in the absence of clinical evidence of rebleeding. A recent meta-analysis demonstrated that routine second-look endoscopy decreases rebleeding, and surgery, but not mortality [2]. The clinical applicability of these conclusions, however, is brought into question due to study heterogeneity in the choice of patients, endoscopic hemostatic modalities, and pharmacotherapy in controls. Recent consensus recommendations state that there is **no added benefit** from routine second-look endoscopy when compared to high-dose PPI [2]. Selective use of second-look endoscopy in a selected patient population might, however, be of benefit.

Acute management of patients on aspirin with bleeding ulcers

Recent randomized clinical trial data amongst patients presenting with an acute ulcer bleed while on ASA, in addition to observational studies of patients non-adherent to ASA prescribed for secondary prophylaxis, have informed recommendations in this important patient population. The indication for ASA in patients with acute ulcer bleeding should be reviewed, and the risks of cardiac and cerebrovascular adverse events should be weighed against those of early re-introduction of ASA. Current recommendations suggest that treating physicians should base their decision on such considerations, but in many patients ASA may be reintroduced as early as 5 days after the onset of bleeding. Secondary prophylaxis, including searching for and eradicating *H. pylori*, and PPI secondary prophylaxis are beyond the scope of this review.

Failed endoscopic therapy

Repeat endoscopy in the case of rebleeding

In the case of repeated NVUGIB, a second attempt at endoscopic hemostatic therapy is indicated in most patients. Indeed, the only randomized controlled trial comparing repeat endoscopic therapy to surgery after an initial unsuccessful attempt at endoscopic hemostasis found that repeat endoscopic therapy resulted in a decreased need for surgery and lower complication rates, without an associated increase in mortality.

Percutaneous embolization

When endoscopic therapy has failed, an increasingly used alternative to surgery is percutaneous or transcatheter arterial embolization using coils, cyanoacrylate glue, gelatin sponges, or polyvinyl alcohol. The aim of the intervention is to occlude the feeding vessel to the lesion. This intervention is especially warranted in patients who are found to be high risk for surgical intervention. Success rates range from 52% to 98%, with recurrent bleeding in 10–20% of patients, and a low complication rate. Risks specific to this procedure include bowel, gastric, hepatic, and splenic ischemia, as well as secondary duodenal stenosis; these complications have become uncommon due to highly targeted interventions by radiologist that may be assisted by the prior placement of endoscopic clips near the bleeding lesion. Furthermore, comparative cohort trials suggest similar outcomes when comparing a percutaneous intervention to surgery.

Surgery

From the Canadian RUGBE cohort, 14.1% of patients developed rebleeding after endoscopic hemostatic therapy, with 6.5% requiring surgery to control bleeding [3]. Similar proportions have been found in other cohort studies [8]. Amongst patients at high risk of rebleeding, up to 27% may require surgery, although as discussed above, a greater number of patients are now rather being referred for percutaneous intervention. Nonetheless, early surgical consultation in patients who fail initial endoscopic therapy and those who are at high risk of rebleeding is indicated.

Care after endoscopy

After the patient has been assessed clinically and at early endoscopy, patients with adequate social and family support, and easy access to hospital can be discharged home if they meet the following criteria: aged under 60 years of age, no severe co-morbidity, no hemodynamic instability, hemoglobin level over 80 g/L, normal coagulation parameters, bleeding had started in an outpatient setting, and endoscopy has demonstrated a clean base ulcer. This strategy does not result in more adverse outcomes and permits cost savings, but of course needs to be individualized according to practice setting. All other patients (except perhaps highly selected very low-risk patients with a very low Blatchord score) should be hospitalized, with high-risk patients having undergone endoscopic hemostasis requiring a 72-hour infusion and stay.

A summary of the recommendations from the 2010 International consensus on the management of patients with NVUGIB is given in Table 146.6.

Table 146.6 Recommendations from the 2010 International Consensus Recommendations on the management of patients with non-variceal upper gastrointestinal bleeding.

Pre-endoscopic management and risk assessment
1 Immediate evaluation and initiation of resuscitation
2 Use of prognostication scales for classification of patients into high or low risk for rebleeding and mortality
3 Placement of a nasogastric tube may assist in further prognosis of patient's risk of high-risk lesions
4 Blood transfusion for a hemoglobin level ≤ 70 g/L
5 Correct any coagulopathy, but do not delay endoscopy
6 Do not administer promotility agents routinely prior to endoscopy
7 Selected patients who are at a low risk of rebleeding based on clinical and endoscopic criteria may be discharged after endoscopy
8 Pre-endoscopic PPIs may be used prior to endoscopy with the intent of downstaging lesions and decreasing endoscopic therapy, but this should not delay endoscopy
Endoscopic management
1 Develop institution specific protocols for a multidisciplinary team management as well as ensuring access to an endoscopist trained in endoscopic hemostasis
2 Ensure availability of support staff who are trained to provide assistance in endoscopy
3 Early endoscopy within 24 hours of presentation
4 Low-risk stigmata (clean base ulcer or a non-protuberant pigmented dot in an ulcer bed) do not require endoscopic hemostatic therapy
5 When there is a clot in an ulcer bed, it should be irrigated off, and act on the underlying lesion as appropriate
6 When there is a clot that cannot be removed, the role of endoscopic hemostatic therapy is controversial, and the sole use of high-dose PPI might be sufficient
7 High-risk stigmata (active bleeding or a visible vessel in an ulcer bed) require endoscopic hemostatic therapy
8 Diluted epinephrine injection therapy is insufficient as a sole endoscopic hemostatic therapy modality and should be combined with a second method
9 All thermal coaptive therapy modalities are equally effective
10 Thermocoagulation, clips, and sclerosant injection can be used alone or in combination with epinephrine injection, and should only be used in patients with high-risk lesions
11 Routine second-look endoscopy is not recommended
12 In cases of rebleeding, a second attempt at endoscopic therapy is recommended
Pharmacotherapy
1 Histamine-2 receptor antagonists are not recommended in patients with acute ulcer bleeding
2 Somatostatin and octreotide are not routinely recommended in patients with acute ulcer bleeding
3 In patients with acute ulcer bleeding who have undergone successful endoscopic therapy, an intravenous bolus followed by a continuous infusion of PPI should be administered to decrease the rate of rebleeding as well as mortality
4 Patients should be discharged with a prescription of a single daily dose of PPI for a period of time appropriate for the underlying cause
Non-endoscopic and non-pharmacological inhospital management
1 After endoscopy, patients with low-risk lesions can be fed within 24 hours
2 Most patients with high-risk lesions should be hospitalized for at least 72 hours after endoscopic hemostatic therapy
3 In patients in whom endoscopic therapy fails, surgical consultation should be sought
4 Percutaneous embolization for patients with ulcer bleeding and failed endoscopic therapy can be considered as an alternative to surgery, when available
5 Patients with bleeding peptic ulcers should be tested for *H. pylori* and receive eradication therapy with subsequent confirmation of eradication
6 In the acute setting, a negative diagnostic test for *H. pylori* should be repeated

H. pylori, *Helicobacter pylori*; PPI,= proton pump inhibitor.
Adapted with permission from Barkun AN, Bardou M, Kuipers EJ, *et al*. International consensus recommendations on the management of patients with nonvariceal upper gastrointestinal bleeding. *Ann Intern Med*. 2010;152:101–113.

Conclusions

The acute management of patients with NVUGIB has evolved significantly over the past decade with adequate initial assessment, risk stratification, and appropriate resuscitation remaining critical aspects of care. Early endoscopy with contemporary methods of endoscopic hemostasis followed by high-dose intravenous PPI have improved outcomes of high-risk patients, and allowed lower-risk individuals to be managed more efficiently, in some cases avoiding admission when they fulfill a list of preset criteria. Ongoing research is needed to better identify optimal dosing thresholds and route of administration of acid suppression, while newer endoscopic hemostatic methods offer promise. The challenge remains to implement and disseminate best practice recommendations in the hope that they will yield the promised improvements in cost-effective care of patients with this common condition.

References

1. Lassen A, Hallas J, Schaffalitzky de Muckadell OB. Complicated and uncomplicated peptic ulcers in a Danish county 1993-2002: a population-based cohort study. *Am J Gastroenterol*. 2006;101: 945–953.
2. Barkun AN, Bardou M, Kuipers EJ, *et al*. International consensus recommendations on the management of patients with

nonvariceal upper gastrointestinal bleeding. *Ann Intern Med*. 2010;152:101–113.
3. Barkun A, Sabbah S, Enns R, *et al*. 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;99:1238–1246.
4. Leontiadis GI, Sreedharan A, Dorward S, *et al*. Systematic reviews of the clinical effectiveness and cost-effectiveness of proton pump inhibitors in acute upper gastrointestinal bleeding. *Health Technol Assess*. 2007;11:iii–iv, 1–164.
5. Laine L, McQuaid KR. Endoscopic therapy for bleeding ulcers: an evidence-based approach based on meta-analyses of randomized controlled trials. *Clin Gastroenterol Hepatol*. 2009;7:33–47; quiz 1–2.
6. Barkun AN, Martel M, Toubouti Y, *et al*. Endoscopic hemostasis in peptic ulcer bleeding for patients with high-risk lesions: a series of meta-analyses. *Gastrointest Endosc*. 2009;69:786–799.
7. Lau JY, Leung WK, Wu JC, *et al*. Omeprazole before endoscopy in patients with gastrointestinal bleeding. *N Engl J Med*. 2007;356:1631–1640.
8. Rockall TA, Logan RF, Devlin HB, *et al*. Risk assessment after acute upper gastrointestinal haemorrhage. *Gut*. 1996;38:316–321.