Supplementary table 1a. Association between ABC threshold for defining low-risk patients and outcome (development cohort)

ABC-score threshold	Number (%) of classified low-risk patients	Mortality in classified low-risk patients
≤2	1,126 (42)	4 (0.4)
≤3	1,498 (56)	11 (0.7)
≤4	1,796 (67)	31 (1.7)

Supplementary table 1b. Association between ABC threshold for defining high-risk patients and outcome (development cohort)

ABC-score threshold	Number (%) of classified high-risk patients	Mortality in classified high-risk patients
≥7	791 (23)	160 (20)
≥8	519 (15)	129 (25)
≥9	310 (9.1)	86 (27)

Supplementary table 2. Characteristics and management of patients with high ABC score in relation to survival (development cohort):

	Patients alive at day 30 (n=176)	**Patients dying within 30-days (n=91)**
Age (years, mean, [95% CI])	73 [47-92]	71 [46-91]
Sex (male)	110 (63)	62 (68)
Comorbidity		
- Ischaemic heart disease	48 (27)	19 (21)
- Liver cirrhosis	61 (35)	28 (31)
- Renal failure	34 (19)	18 (20)
- Any malignancy	95 (54)	46 (51)
- ASA-score (mean, [95% CI])	3.5 [3-4]	3.6 [3-5]
Circulatory status (mean [95% CI])		
- Systolic blood pressure (mmHg)	120 [80-173]	110 [69-151]
- Pulse (beats/min)	91 [60-126]	98 [60-150]
Blood tests (median [95% CI])		
- Haemoglobin (g/L)	92 [47-146]	96 [45-141]
- Urea (mmol/L)	17 [3.9-44]	20 [6.1-42]
- Albumin (g/L)	30 [21-40]	27 [16-41]
- Creatinine (µmol/L)	146 [48-345]	191 [54-424]
Findings at endoscopy:		
- Normal findings	7 (3.9)	3 (3.3)
- Erosive disease	24(14)	11(12)
- Gastric/duodenal ulcer	37 (21)	13 (14)
- Variceal bleeding	20 (11)	14 (15)
- Upper GI-cancer	15 (8.5)	4 (4.4)
- Not endoscoped	37 (21)	39 (43)
Treatment		
- Number of transfusions (mean, [95% CI])	2.6 [0-8]	3.1 [0-10]
- Endoscopic treatment	67 (39)	27 (30)
- Surgery/embolisation	4 (2.3)	4 (2.2)

Numbers represent ratios (%). ASA: American Society of Anesthesiologists; CI: Confidence interval

Supplementary table 3: Mortality rates according to ABC score in upper and lower gastrointestinal bleeding (validation cohorts)

ABC score	UGIB (n=4,019)	LGIB (n=2,336)
0	0/103 (0)	0/377 (0)
1	2/414 (0·5)	1/260 (0·4)
2	4/358 (1·1)	3/377 (0·8)
3	8/488 (1·6)	3/253 (1·2)
4	16/458 (3·5)	8/154 (5·2)
5	25/436 (5·7)	8/163 (4·9)
6	35/367 (9·5)	7/72 (9·7)
7	31/271 (11)	5/55 (9·1)
8	43/209 (21)	5/36 (14)
9	24/136 (18)	1/9 (11)
10	32/93 (34)	4/9 (44)
11	13/36 (36)	0/1 (0)
12	13/27 (48)	0/1 (0)
13	3/14 (21)	-
14	1/3 (33)	-

Numbers represent ratios (%). Noted mortality rates reflect 30-day mortality in patients with UGIB and in-hospital mortality in patients with LGIB (see methods). Data are based on patients included in the validation cohorts.

Supplementary table 4: Frequencies of ABC score components in classified low-, medium- and high-risk patients in the UGIB validation cohort (n=4,019)

	Low risk patients (ABC ≤3)	**Medium risk patients (ABC 4-7)**	**High risk patients (ABC≥8)**
Age, years, mean [95% CI]	60 [27-84]	72 [47-89]	75 [49-90]
Blood tests			
- Urea > 10 mmol/L	1,008 (74)	1,347 (88)	490 (94)
- Albumin < 30 g/L	72 (5.3)	599 (39)	399 (77)
- Creatinine, µmol/L, mean [95% CI]	78 [53-115]	124 [53-309]	181 [53-486]
Comorbidity			
- Altered mental status	21 (1.5)	221 (14)	276 (53)
- Liver cirrhosis	72 (5.3)	440 (29)	239 (46)
- Disseminated malignancy	0 (0)	40 (2.6)	55 (11)
- ASA-score, mean [95%CI]	1.7 [1-3]	2.5 [1-4]	3.2 [2-4]

Numbers represent ratios (%). ASA: American Society of Anesthesiologists; CI: Confidence interval

Supplementary table 5: Outcomes in classified medium-risk patients using ABC score

Cohort	**Development (n=3,012)**	**Validation (n=4,019)**	**Validation (n=2,336)**
Bleeding site	UGIB	UGIB	LGIB
No (%) classified medium-risk patients	904 (34)	1,538 (45)	453 (25)
Mortality in classified medium-risk patients; n(%)*	84 (9.3)	107 (7.0)	28 (6.3)

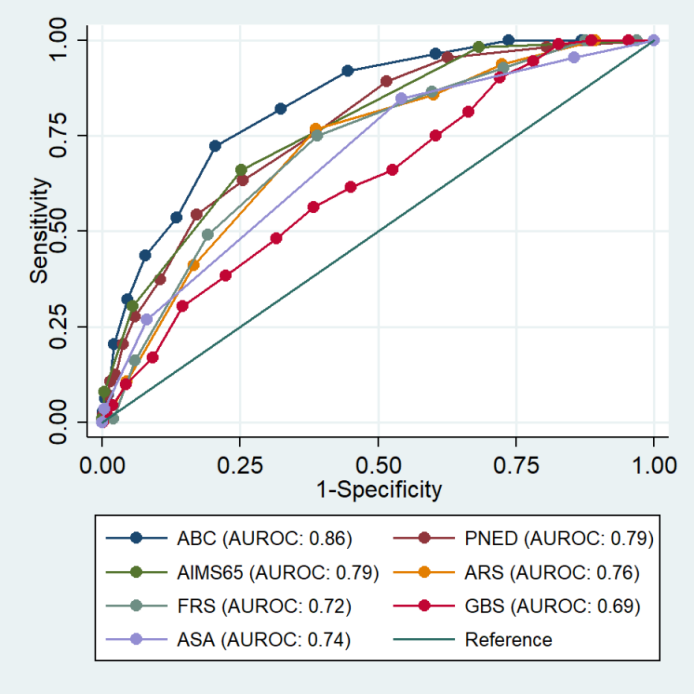
LGIB: Lower gastrointestinal bleeding; UGIB: Upper gastrointestinal bleeding. *Noted mortality rates reflect 30-day mortality in patients with UGIB and in-hospital mortality in patients with LGIB (see methods).

Supplementary table 6: Discriminative abilities for GBS in predicting mortality in LGIB (n=2,336)

Risk score	GBS
Mean score [95% CI]	4.1 [0-11]
AUROC [95% CI]	0.74 [0.67-0.81]
Sensitivity (low-risk)	0.33
Specificity (low-risk)	0.93
PPV (low-risk)	0.996
NPV (low-risk)	0.029
No (%) classified low-risk patients	702 (32)
Mortality in classified low-risk patients; n(%)*	3 (0.4)
Sensitivity (high-risk)	0.91
Specificity (high-risk)	0.46
PPV (high-risk)	0.037
NPV (high-risk)	0.996
No (%) classified high-risk patients	847 (55)
Mortality in classified high-risk patients; n(%)*	31 (3.7)

AUROC: Area under receiver operating characteristics curves; CI: confidence interval; LGIB: Lower gastrointestinal bleeding; NPV: Negative predictive values; PPV: Positive predictive values. *Noted mortality rates reflect in-hospital mortality (see methods).

Supplementary figure 1: Comparison of risk scores in prediction of 30-day mortality in UGIB (development cohort)



ARS: Admission Rockall score; ASA: American Society of Anesthesiologists score. AUROC: Area under receiving operator characteristics curves; GBS: Glasgow Blatchford score; FRS: Full Rockall score; PNED: Progetto Nazionale Emorragia Digestiva

Appendix 1: Overview of existing risk scores evaluated in study

1 a) Full Rockall score (FRS)[4]
1 b) Admission Rockall score (ARS)[4] excludes parameters marked with *

	0	1	2	3
Age (yrs)	<60	60-79	≥80	-
Shock	No shock (SBP≥100mmHg and pulse <100bpm)	Pulse >100bpm	SBP <100mmHg	-
Co-morbidity	No major comorbidity	-	Cardiac failure, Ischaemic heart disease, Any major comorbidity	Renal failure, Liver failure, Metastatic cancer
Diagnosis *	Mallory Weiss tear, no lesion, no stigmata	All other diagnoses	Malignancy of upper GI tract	-
Major Stigmata *	None or dark spot only	-	Blood in upper GI tract, adherent clot, visible or spurting vessel	-

SBP: Systolic blood pressure

1 c) Glasgow Blatchford Score (GBS)[7]

Admission Criteria	Score
Haemoglobin (g/dl)	
Male	
12 - <13	1
10 - <12	3
<10	6
Female	
10 - <12	1
<10	6
Urea (mmol/L)	
6.5 - <8	2
8.0 – 10	3
10 - <25	4
≥ 25	6
Systolic Blood pressure (mmHg)	
100 – 109	1
90 -99	2
<90	3
Pulse (bpm)	
≥ 100 bpm	1
Melaena	1
Syncope	2
Cardiac failure	2
Liver failure	2

1 d) AIMS65[5]

Admission Criteria	**Score**
Albumin <30g/l	1
INR >1.5	1
Mental State: GCS <14	1
Systolic Blood Pressure <90mmHg	1
Age >65yrs	1

INR: International Normalised Ratio
GCS: Glasgow Coma Scale

1 e) Progetto Nazionale Emorragia Digestive score (PNED)[6]

Score	**1**	**2**	**3**	**4**
Risk factors	ASA 3, Time to admission <8hrs	Hb ≤7g/dL, Age ≥80yrs, Renal failure	Rebleeding, ASA 4, Neoplasia, Liver cirrhosis	Failure of endoscopic therapy

ASA: American Society of Anesthesiologists score

Appendix 2: Definitions

Bleeding related definitions

Bleeding-related mortality: Death due to uncontrolled bleeding, or due to complications from, or within 72 hours of, haemostatic intervention (endoscopic therapy, surgery, arterial embolisation). Haemostatic intervention: treatment with endoscopic therapy, arterial embolisation, or surgery. Hospital-based intervention: treatment with blood transfusion, endoscopic treatment, surgery, arterial embolisation, or death during follow-up. Rebleeding: defined according to the criteria suggested by Laine and colleagues.*

Comorbidities

Altered mental status: Glasgow Coma Scale of ≤14, or a designation of disorientation, lethargy, stupor, or coma by a physician. Cardiac failure: known history, or clinical and echocardiographic evidence, of cardiac failure. Ischaemic heart disease: previous myocardial infarction, angina pectoris, or significant atherosclerosis on coronary angiography. Liver cirrhosis: known history, or clinical and laboratory/radiological evidence, of liver cirrhosis. Liver failure: known history, or clinical and laboratory/radiological/endoscopic evidence, of liver failure. Renal failure: patients on dialysis or with significant uraemia.

Medical treatment

Low-dose aspirin: dosages ≤ 325mg. Other antithrombotics: included adenosine diphosphate (ADP) receptor inhibitors, vitamin K-antagonists, heparins, thrombin inhibitors, and factor Xa inhibitors.

*** Reference**

Laine L, Spiegel B, Rostom A, et al. Methodology for randomized trials of patients with nonvariceal upper gastrointestinal bleeding: recommendations from an international consensus conference. *Am J Gastroenterol* 2010; **105**: 540–50.

Appendix 3: Data collection

Part a

Data were collected at each site by a dedicated research nurse, doctor, or medical student. We included data describing patients' characteristics (age, sex, comorbidities, American Society of Anesthesiologists (ASA) score, altered mental status), medication use (low-dose aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs), other antithrombotics), bleeding characteristics (symptoms, systolic blood pressure, pulse), detail regarding time of hospitalisation (time from development of symptoms to presentation to hospital, out-of-hours and weekend admission), blood tests (haemoglobin, urea, albumin, creatinine, international normalised ratio (INR)) measured at presentation to hospital, findings at endoscopy (normal, erosive disease, peptic ulcer bleeding, variceal bleeding, cancer, other), interventions (blood transfusion, endoscopic treatment, surgery, arterial embolisation), and outcome (need for hospital-based intervention, rebleeding within seven days, mortality).

Part b and c

Data were collected at each site by a dedicated research nurse, doctor, or medical student. We included data describing patients' characteristics (age, sex, comorbidities), blood tests (urea, albumin, creatinine) measured at presentation to hospital, or on first recognition of bleeding in inpatients, risk scores (AIMS65, Oakland score in patients with LGIB), and mortality.

Appendix 4: General treatment of patients

General treatment of patients with UGIB

All patients were initially assessed in the local emergency department or acute assessment unit. Proton pump inhibitors (PPIs) were not routinely given to all admitted patients prior to endoscopy. The aim in each centre was to perform endoscopy within 24 hours in all admitted patients. High dose PPIs by intravenous bolus followed by infusion was administered to patients with high-risk ulcer stigmata who required endoscopic therapy and to other selected patients depending on clinical judgement. Patients with suspected variceal bleeding received intravenous vasopressors and antibiotics prior to endoscopy. The endoscopic practice for patients with high-risk stigmata of non-variceal bleeding was to administer injection therapy, thermal contact and/or clips, but not adrenaline alone. Band ligation or injection of tissue glue +/- transjugular intrahepatic portosystemic shunt was performed in cases of oesophageal or gastric variceal bleeding respectively. Red cell transfusion was administered at a haemoglobin threshold of 7-8g/dL, or as guided by the clinician in patients with severe bleeding.

General treatment of patients with LGIB

Patients presenting with LGIB were admitted via emergency departments or surgical assessment units. During triage, patients underwent digital rectal examination. Risk scores were not routinely calculated as part of the initial assessment. Most hospitals did not have GI bleeding protocols that included LGIB so treatment decisions were at the clinicians' discretion. The source of bleeding was determined using flexible sigmoidoscopy, colonoscopy, computed tomography (CT) scan of the abdomen/pelvis or CT angiography. Red cell scan, capsule endoscopy and push enteroscopy were used at the clinician's discretion. Red cell transfusion was generally administered at a haemoglobin threshold of 7-9g/dL depending on cardiac status, severity of bleeding and clinical judgement. Antiplatelet therapy was either not withheld or continued after a brief interruption to allow haemostasis. Haemostasis was delivered when required via endoscopy or mesenteric embolisation. All hospitals provided access to emergency surgery.

Appendix 5: Covariates and mandatory variables used in logistic regression analysis

The following covariates were included as candidate variables in the regression models: age (continuous variable; measured in years), sex (male/female), ASA-score (categorical variable), previous surgery for peptic ulcer (yes/no), presence of ischaemic heart disease (yes/no), presence of cardiac failure (yes/no), presence of renal failure (yes/no), presence of liver cirrhosis (yes/no), presence of liver failure (yes/no), presence of any malignancy (yes/no), presence of disseminated malignancy (yes/no), presence of any major comorbidity (yes/no; see definitions), presentation with coffee ground vomiting (yes/no), presentation with haematemesis of fresh blood (yes/no), presentation with melaena (yes/no), presentation with haematochezia (yes/no), presentation with syncope (yes/no), altered mental status at presentation (yes/no; see definitions), time from development of symptoms to presentation to hospital (continuous variable; measured in hours), use of low-dose aspirin (yes/no; see definitions), use of NSAIDs (yes/no), use of other antithrombotics (yes/no; see definitions), systolic blood pressure at time of presentation to hospital (continuous variable; measured in mmHg), pulse at time of presentation to hospital (continuous variable; measured in beats/min), haemoglobin (continuous variable; measured in g/L), creatinine (continuous variable; measured in µmol/L), albumin (continuous variable; measured in g/L), urea (continuous variable; measured in mmol/L), and time from presentation to hospital to performance of endoscopy (continuous variable; measured in hours).

Thirty-day mortality (yes/no) was included as a mandatory variable in the model.