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A simple scoring system to assess the need for an endoscopic intervention in suspected upper gastrointestinal bleeding: A prospective cohort study

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ABSTRACT

Background: Assessment of the emergent endoscopy for upper gastrointestinal bleeding (UGIB) patients has important clinical implications. There is no validated criterion to triage.
Aims: To develop a simple score predicting an endoscopic intervention.
Methods: A prospective cohort study was conducted at a tertiary care centre. Primary outcome was the high-risk stigmata which were well-established endoscopic findings to determine the need for an endoscopic intervention. We created a simple score by multivariable logistic regression and compared with the Glasgow Blatchford Score (GBS). External validation was performed in a second cohort.
Results: 284 of consecutive 568 patients with suspected UGIB had the high-risk stigmata. Three variables were selected: "no daily use of proton pump inhibitors during one week before examination (+1 point)", "shock index (heart rate/systolic blood pressure) ≥ 1 (+1 point)" and "urea/creatinine ≥ 140 (blood urea nitrogen/creatinine ≥ 30) (+1 point)". The accumulating score (range 0–3) achieved an area under the receiver–operating characteristic curve (AUC) of 0.74 (95% confidence interval [CI], 0.70–0.78), which was superior to the GBS (AUC, 0.63; 95% CI, 0.59–0.68; $p < 0.001$). Validation in an external cohort demonstrated superiority to the GBS (AUC, 0.78 *vs.* 0.59; $p < 0.001$).
Conclusions: The simple score has greater accuracy than the GBS for assessing the need for an endoscopic intervention in cases of suspected UGIB. Further external validation should be performed to verify generalizability.

1. Introduction

Upper gastrointestinal bleeding (UGIB) continues to be a major emergency condition with an incidence of 48–160 cases per 100,000 adults yearly and a mortality rate ranging from 3.1% to 14% [1–3]. Guidelines recommend that patients with UGIB undergo an endoscopy within 24 h of hospital admission [1,4,5]. Although the percentage of endoscopies performed within 24 h of admission was increasing from 36% in 1989, it still persisted low levels as 54% in 2009 [6]. Performing an emergent endoscopy within 24 h for all UGIB patients is often difficult due to limited health-care resources. Therefore, more careful selection of patients for an emergent endoscopy is required.

There are several commonly cited scoring systems for assessing the risk of UGIB before endoscopy, the best option at present being the Glasgow Blatchford Score (GBS) used to predict composite outcome [7–9]. However, a national survey reported that the GBS was used only 11% because the GBS contains eight complicated variables

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making it impractical to apply to routine clinical practice [10]. Another established scoring system, the full Rockall score, is useful for identifying rebleeding and death, but requires endoscopic findings [11]. To the best of our knowledge there is no simple score just for predicting the need for an endoscopic intervention in patients with UGIB including variceal bleeding [9,12–14]. We therefore developed a novel scoring system to serve this purpose.

2. Materials and methods

2.1. Study design and patients

This study was divided into two phases. First, a simple score to assess the need for an endoscopic intervention was derived in a prospective, development cohort. In addition, we compared the simple score with GBS in this cohort. Secondly, the simple score was validated in a second, unrelated cohort.

The prospective development cohort study was conducted at the Tokyo Metropolitan Tama Medical Center between 2008 and 2011 with the approval of Institutional Review Board. Informed consent included an opt-out clause. The Tokyo Metropolitan Tama Medical Center, a public acute-care hospital, serves a population of about 4 million. The centre has a policy of performing an emergent endoscopy within 12 h of first clinical examination for all suspected cases of UGIB. All consecutive patients 16 years of age or older with suspected UGIB based on the presence of hematemesis, coffee ground emesis, nasogastric lavage with blood or coffee grounds in the initial examination, or melena or tarry or black stool as determined by rectal examination or history were enrolled. Patients with iatrogenic bleeding following endoscopic procedures were excluded. Patients were administered in a 20 mg intravenous bolus injection of omeprazole at the first clinical examination as standard treatment.

The simple score was subsequently validated in second (retrospective) cohort from Keio University hospital, a tertiary university hospital in central Tokyo [15]. The use of proton pump inhibitors (PPIs) was not fixed as standard treatment. We did not use antibiotics and/or vasoactive drugs for cirrhotic patients before endoscopy in both cohorts.

2.2. Outcome and clinical details

The primary outcome, the presence of high-risk stigmata defined in accordance with international consensus statements, are endoscopy findings to determine the need for an endoscopic intervention (Table 1) [1,4,5,16–19]. Patients who received interventional radiology or surgery to treat UGIB, or eventually died due to UGIB were counted as having high-risk stigmata according to the protocol. The endoscopic findings were evaluated during regular faculty meetings and the presence of high-risk stigmata was assessed by independent judging endoscopists. Clinical information that might bias their judgments was concealed and high-risk stigmata were identified solely on the basis of the endoscopic findings. The cause of death was defined by the judging endoscopists based on the patients' medical records. A secondary outcome was the use of endoscopic intervention such as argon plasma coagulation, electrocautery, clips, band ligation or injections of normal or hypertonic saline solution, dilute epinephrine, or sclerosants.

Twenty-one variables that were found in previous studies to show the high-risk of UGIB were assessed [7,11,19–26]. A blood sample was obtained from the subjects upon arrival to the emergency department and vital signs were measured repeatedly until the emergent endoscopy was performed. The lowest systolic blood pressure (SBP) and corresponding heart rate (HR) were recorded; this could include vital signs obtained prior to the emergency department arrival, for instance from the ambulance attendant or another hospital.

Table 1
The criteria of high-risk stigmata.

In the cases of peptic ulcers
Spurting, gushing or oozing bleeding (Ia or Ib in the Forrest classification)
Non-bleeding visible vessel (IIa in the Forrest classification)
In the cases of esophageal or gastric varices
Current bleeding
Evidence of recent bleeding (red or white plug, etc.)
In the case of other diseases:
Spurting or gushing bleeding but not oozing bleeding which resolved spontaneously
Non-bleeding visible vessel

2.3. Statistical analysis

The scoring system was constructed using methods similar to those employed to develop the Rockall and the GBS [7,11]. Multivariable logistic regression analysis using forward stepwise selection was used to identify independent predictors of the need for an endoscopic intervention. When continuous variables were selected, they were converted into dichotomous variables based on receiver–operating characteristic (ROC) curve analysis. The scoring systems were made using all combinations of the dichotomous variables. The accuracy of each model version was assessed by the area under the receiver–operating characteristic curve (AUC), sensitivity and specificity. We chose the simplest scoring system which provided high sensitivity ($\geq$95%) for practical use. The AUC of new simple score was compared with that of GBS and full Rockall score using Delong's test [27]. Finally, continuous net reclassification improvement (NRI) and integrated discrimination improvement (IDI) were calculated to assess the improvement [28]. A two-sided p-value of <0.05 was considered statistically significant. All analyses were done using R version 3.0.4 (the R Foundation or Statistical Computing, Vienna, Austria)

3. Results

3.1. Patient characteristics

Five hundred sixty eight consecutive patients presenting with symptoms of an UGIB were enrolled. Of these, 563 (99.1%) underwent an emergent endoscopy. Five patients were unable to undergo an endoscopy because they presented unstable vital signs. 538 (94.7%) patients received an emergent endoscopy within 12 h after their first clinical examination (median 3 h, interquartile range, 2–5 h) and 272 of the 563 patients who underwent endoscopy had high-risk stigmata. Three patients underwent interventional radiology or surgery for uncontrollable bleeding within 10 days. Of the 10 deceased patients, 9 patients died due to bleeding and 1 died due to terminal cholangiocarcinoma. Finally 284 (50.0%) of 568 patients were defined that the endoscopic intervention was required while 567 (99.8%) patients were monitored for at least 28 days after their first clinical examination. The demographic characteristics are shown in Table 2.

3.2. Development of the simple score

Of 21 variables that had been identified from previous studies, 15 were confirmed to predict the high-risk of stigmata [7,11,20–26,29,30] (Table 3). Seven out of 21 variables remained significant in stepwise multivariable analysis: 'no daily use of PPI during one week before examination', 'serum levels of urea/creatinine (Urea/Cr) [blood urea nitrogen/creatinine