A Risk Scoring System to Predict Outcome of Non-Variceal Upper Gastrointestinal Bleeding in Thai Patients

DUANGPORN THONG-NGAM, M.D.*,
SATCHAPAN ISARASENA, M.D.***,
PINIT KULLAVANIJAYA, MBChB. FRCP.***
PISIT TANGKIJVANICH, M.D.**,
NUSON KLADCHAREON, MBChB. MRCP***,

Abstract

The purpose of this study was to determine the predictors for poor outcome in patients with upper gastrointestinal bleeding (UGIB) by constructing a risk-scoring system based on retrospective data analysis and validating the scoring system prospectively. In the first phase of the study, 264 patients with acute non-variceal UGIB were retrospectively reviewed, and likely predictors of poor outcome, including major re-bleeding, need for emergency surgery to control bleeding and hospital death, were ranked into a risk scoring system. In the second phase, this scoring system was prospectively validated in 107 patients. The characteristics of the retrospective and the prospective groups were not significantly different. Four predictors of outcome were found to be significant, namely concurrent illnesses, the presence of at least one disease (score 1), heart rate above 110 beat/min (score 1), blood transfusion over 6 units (score 2) and the presence of visible vessels on endoscopic examination (score 1). Patients with a total score of less than 2 had good outcome whereas scores of 2 or more were associated with a poor outcome. The accuracy of the test was 82.5 per cent. The positive and negative predictive values were 46.3 per cent and 92.7 per cent respectively. The likelihood ratio was 4.5. It is concluded that the risk scoring system constructed in this study represents a good predictor of poor clinical outcome in patients presenting with non-variceal UGIB.

Key word : Risk Scoring System, Predictors, Gastrointestinal Bleeding

* Gastroenterology Unit, Department of Physiology,
** Department of Biochemistry,
*** Department of Internal Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

Upper gastrointestinal bleeding (UGIB) remains a common medical emergency in Thailand and worldwide. In spite of improvements in diagnostic accuracy and major advances in management, the overall mortality associated with this serious condition has remained unchanged at approximately 2-15 per cent[1-4]. The continuing high mortality is probably not related to the severity of UGIB per se but to an increasing proportion of the elderly population and a higher incidence of associated medical illnesses, including congestive heart failure, chronic obstructive lung disease and chronic liver disease. In addition, exposure to nonsteroidal anti-inflammatory drugs (NSAIDs) contributes substantially the increase risk of UGIB and perforation[5].

Prior to the widespread use of endoscopy, the predictors for poor outcome of UGIB could only be performed by clinical assessment[1,2,6-8]. To date, it is generally accepted that the combination of both clinical and endoscopic assessments are more reliable predictors[9-12]. Endoscopy provides information regarding the source of hemorrhage, allows the clinician to prognosticate the likelihood of rebleeding and can be used as a therapeutic modality. Many scoring systems, using both clinical and endoscopic features, have been proposed for determining the outcome in these patients. However, most of them were based on retrospective data and had not been evaluated prospectively[12,13].

The purpose of our study was to construct a simple numerical risk scoring system from retrospective data analysis and to test this score models prospectively in patients with non-variceal UGIB. This scoring system was designed to identify patients with the greatest risk from UGIB, in whom early aggressive treatment would be beneficial.

MATERIAL AND METHOD

Phase 1 (Development phase):

The case records of 264 patients attending King Chulalongkorn Memorial Hospital between February 1996 and February1997 with acute UGIB were analyzed. All received optimal supportive treatment and endoscopic examinations were performed within 72 hours after the admission. Clinical data were collected to determine the likely predictors of poor clinical outcome, including major rebleeding (persistence of hematemesis or blood per NG tube, presence of melena associated with reduction of Hct >5 per cent, hemodynamic instability, and continuous requirement of blood transfusion to maintain Hct > 30%), emergency surgery to control bleeding, and hospital death. Exclusion criteria included ages below fifteen, acquired immunodeficiency syndrome (AIDS), pregnancy, patients on anticoagulant therapy, and patients with UGIB from malignancy. The data collected incorporated patients' details including demographic characteristics, place of residence, duration of bleeding before admission, symptom of presentation, history of smoking, history of NSAIDs used, alcoholic drinking, previous surgery, previous UGIB, concurrent illness, hemodynamic data, hematocrit level, unit of blood replacement and endoscopic findings such as etiology of bleeding, size, location and number of the ulcers, stigmata of recent hemorrhage, CLO test® as well as type of endoscopic therapy. Finally, the complications, length of hospital stay and final outcome were all recorded. The data analyzed from this phase were used to identify independent prognostic factors and were ranked into a risk scoring system.

The term of concurrent illness was defined as follows: cardiac disease (dysrrhythmia, acute myocardial infarction, ischemic chest pain, congestive heart failure), hepatic disease (acute alcoholic hepatitis, cirrhosis), pulmonary disease (acute respiratory failure, pneumonia, obstructive lung disease), renal disease (serum creatinine > 4 mg/dl, dialysis therapy), neurologic disease (delirium, dementia, stroke within 6 months), malignancy (known solid tumor), sepsis and major surgery within 30 days.

Phase 2 (Validation phase):

The risk score was validated prospectively in a second population of 107 cases attending King Chulalongkorn Memorial Hospital between May 1997 and December 1997.

Statistic Analysis

The demographic data were analyzed by descriptive analysis. Statistic analysis for quantitative analysis was unpaired t - test. Statistical significance was defined as $p < 0.05$. Logistic multiple regression was employed using SPSS for window. Forward stepwise to identify independent predictors of poor outcome. Based on the logistic multiple regression analysis in phase 1, the independent predictors were weighted. A weighted 'risk score' was calculated for each patient who was then classified into the good or the poor outcome groups. Such classification was then further evaluated

prospectively in a group of 107 patients enrolled in phase 2. Finally, the accuracy and the predictive value of the scoring system were analyzed.

RESULTS

The causes of UGIB of 371 patients in phase 1 and 2 studies are shown in Table 1. The most common causes were gastric ulcers (GU, 48.6%) and duodenal ulcers (DU, 19.9%). In 10 cases (2.7%), no abnormalities could be detected by endoscopic examination. There were 262 male patients (70.6%) and 109 female patients (29.4%). The mean age was 54.92 ± 17.23 years (range 15 – 89 years). Female patients were significantly older than male patients, and GU in females was more common than in males. There were 59 patients who had poor clinical outcome including major rebleeding in 7.0 per cent, emergency surgery in 2.7 per cent and hospital death in 6.2 per cent. (Table 2). However, the unfavorable clinical outcome was not different between the males and the females. Furthermore, the basic data and clinical features in both phases were not significantly different (Table 3). The association of *H. pylori* was more common in DU than in GU (CLO® test positive in GU 40.2% *vs* in DU 57.9%).

Comparing the clinical data between the good outcome group and the poor outcome group was shown as follows: number of patients who had concurrent illnesses (35.6% *vs* 50%, respectively), systolic blood pressure at presentation (118.97± 23.46 mmHg *vs* 109.17±27.07 mmHg, respectively), number of patients who had a heart rate of more than 110 beats/min (18.34% *vs* 43.08%, respectively), total blood transfusion requirement (1.82±1.88 *vs* 6.76±6.08 units, respectively), size

Table 1. Causes of non-variceal UGIB in 371 patients.

Causes of bleeding	Number	Persentage
Gastric ulcer (GU)	180	48.6
Duodenal ulcer (DU)	74	19.9
Both GU, DU	23	6.2
Esophagitis, Mallory Weiss tear	25	6.7
erosion, gastritis	53	14.3
angiodysplasia	6	1.6
normal	10	2.7

Table 2. The clinical outcome of 371 patients in this study.

Outcome	Number	Persentage
Good outcome	312	84.1
Poor outcome	59	15.9
- Major rebleeding	26	7.0
- Required surgical treatment	10	2.7
- Hospital death	23	6.2
Total	371	100.0

Table 3. Characteristic data on study enrollment of 371 patients, comparing between phase 1 and phase 2.

	Phase 1 (n = 264)	Phase 2 (n = 107)	*P-value*
age (mean ± SD)	55.65±17.21	53.13±17.23	NS*
sex (F/ M)	71/193	38/69	NS
systolic BP (mm.Hg)	117.27±24.36	118.56±25.61	NS
HR (rates/min)	96.43±17.37	97.27±18.18	NS
Hct (%)	28.29±14.43	28.09±15.04	NS
onset before to hospital (h)	27.9±19.93	31.42±22.39	NS
total blood replacement (unit)	2.63±3.51	2.37±4.32	NS
time to endoscopy (h)	29.40±21.58	30.87±21.34	NS
cause GU/DU	116/43	45/22	NS
stigmata of visible VSS (%)	37 (14%)	16 (14.9 %)	NS
poor outcome (%)	17.4	11.2	NS
length of hospital stay (days)	6.92±8.10	6.76±7.00	NS

* not significant

Table 4. Factors related to outcome in 264 patients in phase 1.

	Good outcome (n = 218)	Poor outcome (n = 46)	*p-value*
age (mean±SD)	55.18 ±17.08	57.87±17.88	NS
sex F/ M	63 / 155	8 / 38	NS
concurrent illness ≥ 1 disease	74 (35.6%)	23 (50%)	0.000
BP systolic (mm.Hg)	118.97±23.46	109.17±27.07	0.013
HR ≥ 110 /min	40 (18.34%)	20 (43.08%)	0.000
Hct (%)	28.69±14.33	26.39±14.88	NS
total blood replacement (unit)	1.82±1.88	6.76±6.08	0.000
onset before admission (h)	28.72±20.1	24.03±18.85	NS
time to endoscopy (h)	29.05±21.66	31.09±21.35	NS
size of lesion (cm.)	1.39±1.13	1.86±1.55	0.045
amount of lesion	1.99±1.69	1.69±1.21	NS
stigmata of visible VSS	22 (9.9%)	15 (32.6%)	0.000
Cause GU / DU	92/32	24/11	NS

* not significant

Table 5. Four predictors that ranked into the scoring system.

Predictors	Score 0	Score 1	Score 2	95% CI
Heart rate (beat/min)	< 110	≥ 110		(-0.382,-0.102)
Concurrent illness	0	≥ 1 disease		(-0.289,-0.104)
Total blood replacement (unit)	< 6		≥ 6	(-0.602,-0.388)
Stigmata of recent bleeding	clean base, pigment spot, adherent clot	visible vessel, active bleeding		(-0.333,-0.117)

Table 6. The sensitivity, specificity and accuracy of the scoring system.

		Finally outcome of patients	
		poor outcome (n)	good outcome (n)
Risk scoring System	poor outcome (n)	38	44
	good outcome (n)	21	268
Sensitivity	64.4%		
Specificity	85.9%		
Accuracy	82.5%		
Positive predictive value	46.3%		
Negative predictive value	92.7%		

of the lesion (1.39±1.13 *vs* 1.86±1.55 cm., respectively), and number of patients who had the presence of a visible vessel on the ulcer base (9.9% *vs* 32.6%, respectively). All data compared between these groups were statistically significant. The factors were not associated with poor outcome ($p \geq 0.05$), namely age, gender, mean heart rate, hematocrit level, duration before admission, number of the lesions and cause of bleeding (Table 4).

By logistic multiple regression analysis, four variables were independently associated with poor clinical outcome. These included both clinical

factors such as a heart rate of more than 110 beat/min, concurrent illnesses, total blood replacement of more than 6 units and endoscopic factors such as the presence of visible vessels. These independent predictors were weighted and then ranked into a scoring system as shown in Table 5.

By adding up the points of all risk factors, the overall scores were analysed to find the best number that could predict the clinical outcome using the receiver operating characteristic curve (ROC). Patients with a score of less than 2 points were assigned to the low-risk group. On the other hand, patients with a score of 2 or more were assigned to the high-risk group. The sensitivity and specificity of the test were 64.4 per cent and 85.9 per cent respectively. The accuracy of the scoring system was 82.5 per cent. The positive and negative predictive values were 46.3 per cent and 92.7 per cent. The likelihood ratio was 4.5 (Table 6).

DISCUSSION

Whenever a patient presents with UGIB, risk assessment and resuscitation should proceed simultaneously. Risk assessment of several clinical factors should be performed rapidly after the patient's admission. Such precise assessment aids in rational decision making regarding treatment. A number of studies have examined risk factors for poor outcome in patients with UGIB[14-17]. Other studies have focused on the outcome prediction based on clinical variables at presentation and before endoscopy[18,19]. Our scoring system has been developed with a view to simplificity and ease of variable acquisition to be used in the everyday management of patients with UGIB.

In general, the etiology of UGIB can be divided into two main groups, namely variceal and non-variceal bleeding. In most studies, bleeding from esophageal varices has been deliberately excluded since the long-term course and therapeutic consequences are different from those of non-variceal bleeding. A previous retrospective study from our hospital demonstrated that non-variceal bleeding accounted for the majority of UGIB cases, mainly from peptic ulcer disease and gastritis. Factors associated with increased mortality were advanced age, shock, sepsis, NSAIDs usage, severe blood loss, associated medical illnesses and surgical treatment. The overall mortality was 6.7 per cent, which was comparable to that from Western countries[20].

In our study, the mean age of female patients was significantly higher than that of male patients. Moreover, gastric ulcer was more common in females. This may be associated with NSAIDs usage in elderly females. However, the poor outcome between sexes or etiologic causes of UGIB were not significantly different. Some 15.9 per cent of the patients in our study were found to have a poor outcome, either major rebleeding episodes, emergency surgery to overcome bleeding, or hospital death. As previously mentioned, the combination of both clinical and endoscopic parameters were better than either one alone in the prediction of clinical outcome. The clinical predictors demonstrated in this study were concurrent illness and pulse rate above 110 beat/min. Thus, it could imply that tachycardia was a more sensitive sign than the systemic blood pressure in the assessment of hemodynamic changes of the patients. However, the most profound influence on poor outcome in our study was the amount of total blood replacement required to restore the vital signs.

Another predictor was the presence of recent bleeding stigmata consisting of non-bleeding visible vessels or active bleeding during endoscopic examination. In fact, patients with active bleeding or non-bleeding visible vessels increase substantially the risk of re-bleeding and hospital mortality. In randomized prospective studies, endoscopic therapy has been shown to improve the outcome in these patients compared with medical treatment alone[21]. In contrast to previous studies, our data demonstrated that advanced age seemed to have no influence upon the outcome of bleeding. However, it has also been suggested that it is not age itself, but rather the presence of concomitant diseases that has to be considered as the determining critical factor[14,22]. Furthermore, symptom duration before admission did not increase the likelihood of poor prognosis, but this could reflect our selection of cases who bled within 72 hours before admission only.

The testing of the scoring system in prospective cases allowed us to confirm the general applicability of the predictors based upon current standards of treatment. Our scoring system has been shown to reliably differentiate between the low- and the high-risk groups, with accuracy as high as 82.5 per cent. Since the negative predictive value is above 92.7 per cent and the likelihood ratio if test positive is 4.5. Therefore, this scoring system could help to determine whether ongoing hospi-

talization is needed in high-risk cases or early discharge in low-risk cases. Such precise decisions could enhance the ability to predict the outcome with substantial cost savings.

In conclusion, the scoring system to predict poor clinical outcome in this study has been shown to be of much value in the management of patients with non-variceal UGIB. This scoring system is based on the combination of clinical variables at presentation and the endoscopic findings of major stigmata of bleeding performed within 72 hours. Nonetheless, this scoring system needs to be validated in more prospective studies before these data can be used for clinical purposes.

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ระบบการให้คะแนนความเสี่ยงในการพยากรณ์ผลลัพธ์ของภาวะเลือดออกจาก ทางเดินอาหารส่วนต้น ที่ไม่ใช่จากเส้นเลือดขอดในคนไทย

ดวงพร ทองงาม, พ.บ., พิสิฐ ตั้งกิจวานิชย์, พ.บ.**,*
*สัจพันธ์ อิศรเสนา, พ.บ.***, นุสนธ์ กลัดเจริญ, พ.บ.***, พินิจ กุลละวณิชย์, พ.บ.****

การศึกษานี้จัดทำขึ้นเพื่อต้องการหาว่ามีตัวพยากรณ์ใดบ้างที่สามารถบอกถึงผลลัพธ์ที่ไม่ดีในผู้ป่วยเลือดออกจากทางเดินอาหารส่วนต้นที่ไม่ใช่จากเส้นเลือดขอด โดยในขั้นแรกเป็นการศึกษาย้อนหลัง จัดเก็บข้อมูลในผู้ป่วย 264 ราย ที่มาด้วยเลือดออกจากการเดินอาหารส่วนต้นภายใน 3 วันเพื่อหาตัวพยากรณ์ถึงผลลัพธ์ที่ไม่ดี ได้แก่ การมีเลือดออกซ้ำ, ถูกผ่าตัดด่วนเพื่อหยุดเลือดที่ออก, เสียชีวิตในโรงพยาบาล นำตัวทำนายเหล่านี้มาจัดทำเป็นระบบการให้คะแนน คำนวณหาน้ำหนักของแต่ละตัวพยากรณ์ จัดแบ่งผู้ป่วยเป็นกลุ่มเสี่ยงน้อยและเสี่ยงมากต่อการเกิดผลลัพธ์ไม่ดี ขั้นที่สองเป็นการศึกษาไปข้างหน้าเพื่อทดสอบความถูกต้องของระบบการให้คะแนนนี้ โดยนำมาใช้ในผู้ป่วยใหม่ 107 รายเพื่อวิเคราะห์ถึงค่าความ-สามารถในการพยากรณ์ของระบบนี้

ผลการศึกษาสามารถวิเคราะห์หาตัวพยากรณ์ได้ 4 ปัจจัย คือ อัตราการเต้นหัวใจ $\geq$ 110 ครั้ง/นาที (คิดเป็น 1 คะแนน), มีโรคประจำตัว $\geq$ 1 โรค (คิดเป็น 1 คะแนน), จำนวนเลือดที่ได้รับทดแทน $\geq$ 6 ยูนิต (คิดเป็น 2 คะแนน) และลักษณะก้นแผลจากการส่องกล้องพบเป็น visible vessel หรือ active bleeding (คิดเป็น 1คะแนน) เมื่อรวมคะแนนที่ได้ทั้งหมด ถ้าน้อยกว่า 2 คะแนนจัดเป็นกลุ่มเสี่ยงน้อยจะได้ผลลัพธ์ที่ดี ถ้ามากกว่าหรือเท่ากับ 2 คะแนนจัดเป็นกลุ่มเสี่ยงมากคือ ได้ผลลัพธ์ไม่ดี โดยมีความถูกต้องแม่นยำ 82.5% ค่าการพยากรณ์ในทางบวกเท่ากับ 46.3% ค่าการพยากรณ์ในทางลบเท่ากับ 92.7% ดังนั้นระบบการให้คะแนนความเสี่ยงนี้อาจใช้เป็นแนวทางในการแบ่งกลุ่มผู้ป่วยเพื่อการรักษาที่เหมาะสมต่อไป

คำสำคัญ : ระบบการให้คะแนน, ตัวพยากรณ์, เลือดออกจากทางเดินอาหารส่วนต้น

* ระบบทางเดินอาหาร, ภาควิชาสรีรวิทยา,
** ภาควิชาชีวเคมี,
*** ภาควิชาอายุรศาสตร์, คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย, กรุงเทพ ฯ 10330