

Rockall risk score in predicting 30 days non-variceal upper gastrointestinal rebleeding in a Malaysian population

Henry Tan Chor Lip, MD^{1,2}, Heah Hsin Tak, MMed Surg¹, Tan Jih Huei, MRCS^{1,2}, Premaa Supramaniam, BSc³, Sarojah A/P Arulanantham, MMed Surg¹

¹Department of Surgery, Hospital Sultan Ismail, Malaysia, ²Clinical Research Centre, Hospital Sultan Ismail, Malaysia, ³Clinical Research Centre, Hospital Sultanah Aminah, Malaysia

ABSTRACT

Objective: The aim of this study was to determine the usefulness of Rockall score in predicting outcomes of 30 days rebleeding, mortality and need for surgical intervention of bleeding gastric and duodenal ulcers.

Methods: This is a retrospective cohort study of all the emergency endoscopies performed in Hospital Sultan Ismail from January 2009 to October 2014 for indications of upper gastrointestinal bleeding (UGIB). Data was extracted from hospital's electronic database and only non-variceal bleeds were included. Rockall score was calculated and outcomes of 30 days rebleeding, mortality and need for surgery was recorded. For each outcome, calibration was done using the Goodness-of-fit tests and discriminative ability was reflected by area under the receiver operating characteristic curve (AUROC).

Results: A total of 1323 patients were included with a male preponderance of 64%. The overall rates of rebleeding were 11.2%, mortality rate of 8.7% and need for surgery was 2%. Low AUROC values for rebleeding (0.63), mortality (0.58) and surgery (0.67) showed poor discriminative ability of Rockall score. The Goodness-of-fit test also revealed that the scoring system was poorly calibrated in outcomes of rebleeding ($p < 0.001$), mortality ($p = 0.001$) and surgery ($p = 0.038$) with p -value < 0.05 . Patients with high risk (scores ≥ 8) displayed highest rebleeding and mortality rates of 20% respectively in comparison to the moderate (score 3-7) and low (score ≤ 2) risk groups.

Conclusion: Rockall Score has a poor discriminative ability and is poorly calibrated for rebleeding, mortality and need for surgery in upper gastrointestinal bleeding. However, it is the best tool we have now to stratify patients into risk groups.

KEY WORDS:

Rockall score, non-variceal gastrointestinal bleeding, rebleeding, mortality, surgery

INTRODUCTION

Upper gastrointestinal bleeding (UGIB) is a common surgical emergency that has an incidence of 100 per 100,000 population yearly in the United Kingdom.^{1,2} In Malaysia, it has been reported that we have an incidence of 72 UGIB cases per 100,000 adults per year.³

Despite medical advancements in the management of UGIB and the introduction of proton pump inhibitors (PPIs), UGIB mortality still stubbornly remains at 10%. It was also reported that the rates can even go up to as high as 18.7% in well-equipped tertiary centres.^{4,5}

UGIB is defined as any bleeding proximal to the ligament of Treitz.⁶ Non-variceal bleed is a subset of UGIB and its severity may vary from individual patients. Some patients may have insignificant bleeding whereas fatality has been reported in others.⁷

Hence, prognostic risk scores were created to stratify patients into high, moderate and low risk for mortality and rebleeding. Rockall risk score is widely used and validated for the management of UGIB (Table I).⁸ It can be divided into the pre-endoscopic risk stratification which involves the parameters of age, systolic blood pressure and co-morbidities. Whereas, the complete Rockall score takes into consideration ulcer risk, and stigmata of recent haemorrhage.⁹

Despite modernization of endoscopes, a wide range of modalities to secure bleeders and multiple choices of PPIs, 20% of UGIB patients will develop rebleeding after the first haemostatic endoscopy. Patients who develop rebleeding will have a ten times higher mortality rate, and it is an important predictor of mortality.^{1,3}

Risk scores to identify patients at high risk of rebleeding is important. Patients at high risk of rebleeding should be monitored closely in high dependency unit (HDU) or intensive care unit (ICU), to detect early signs of rebleeding. Early detection and intervention may improve clinical prognosis for such patients identified to have high risk of rebleeding.¹⁰

There have been conflicting results for Rockall risk score as a scoring system to accurately stratify patients at high risk of rebleeding. According to Rockall's original audit of four thousand patients, which showed that the risk of rebleeding increases with increasing Rockall scores.^{4,9} However a Canadian study conducted by Enns et al. showed that Rockall score is inadequate to identify patients at high risk of rebleeding.⁴ Another study done by Vreeburg et al. in an Amsterdam population also found negative results of Rockall score which was poorly calibrated and does not predict the outcome for rebleeding.¹¹

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Corresponding Author: Tan Jih Huei, Department of General Surgery, Hospital Sultan Ismail, Jalan Persiaran Mutiara Emas Utama, 81100 Johor Bahru, Johor, Malaysia

Email: huei_87@hotmail.com

Table I: Rockwell's numerical risk scoring system

Variable	Score			
	0	1	2	3
Age Shock	<60 Years No shock', systolic BP ≥100, pulse<100	60-79 Years Tachycardia', systolic BP ≥100, pulse ≥100	≥80 Years Hypotension', systolic BP <100 Cardiac failure, IHD, any major comorbidity	Renal failure, liver failure, disseminated malignancy
Comorbidity Diagnosis	No major comorbidity Mallory-Weiss tear, no lesion identified and no SRH	All other diagnoses	Malignancy of upper tract	
Major SRH	None or dark spot only		Blood in upper GI tract, adherent clot, visible or spurting vessel	

Maximum additive score prior to diagnosis = 7. Maximum additive score following diagnosis = 11.
SRH - Stigmata of recent haemorrhage; IHD - Ischemic heart disease

Table II: Outcomes of subjects according to Rockall risk scores

Rockall Score	Subjects n (%)	Rebleeding n (%)	Mortality n (%)	Surgery n (%)
≤ 2	461 (34.8)	27(5.9)	24(5.2)	1(0.2)
3	205 (15.5)	20 (9.8)	22 (10.7)	5 (2.4)
4	248 (18.7)	32 (12.9)	25 (10.1)	9 (3.6)
5	177 (13.4)	31 (17.5)	18 (10.2)	2 (1.1)
6	93 (7.0)	18 (19.4)	13 (14.0)	3 (3.2)
7	109 (8.2)	14 (12.8)	7 (6.4)	5 (4.6)
≥ 8	30(2.3)	6(20)	6(20)	1(3.3)
Total	1323 (100)	148 (11.2)	115 (8.7)	26 (2.0)

Therefore, the objective of this study is to evaluate the ability of Rockall risk score in identifying patients at high risk of non-variceal upper gastrointestinal rebleeding. Our secondary objectives were to validate Rockall score in predicting UGIB patients at risk of mortality and need for surgical intervention to secure bleeding ulcers.

MATERIALS AND METHODS

This is a retrospective audit of endoscopic records of all patients who underwent emergency endoscopy in Hospital Sultan Ismail (HSI) from January 2009 till October 2014. HSI is a large general type hospital serving the southern state of Johor Peninsular Malaysia with a population of over five million. Patient’s registration number was traced from the endoscopic unit. Demographic data and parameters for Rockall risk score were extracted from HSI's electronic records.

Patient population

The General Surgery department in HSI receives referrals from the emergency department, local district clinics and internal hospital referrals for patients with upper gastrointestinal bleeding. All cases being referred was attended by a surgical medical officer on site call of referral and decision for emergency endoscopy was made by the surgeon on-site call. All patients had at least a history suggestive of UGIB, with one of the signs - coffee ground vomitus, maleamic stools, hematemesis or drop in

haemoglobin of more than 2 grams/decilitre with or without hemodynamic instability. Patients with suspected UGIB were administered a bolus dose of proton pump inhibitor and decision for subsequent infusion or bolus PPIs was decided by the surgeon on site call. Adequate resuscitation with transfusion of blood product was done prior to endoscopy in accordance to our local clinical practice guidelines.³ Emergency endoscopy in our study was defined as endoscopy performed within the same admission but not more than 72 hours from the time of referral. Patients with endoscopic findings of non-variceal UGIB aged more than 15 years was included as shown in Figure 1. Variceal bleeds and emergency endoscopy performed for other indications other than UGIB were excluded. There were a total of seven endoscopists involved which includes two surgeons under gazettement, three general surgeons and two consultant surgeons throughout the duration of study. Following endoscopy, patients were discharged with a review in our general surgery follow-up clinic within 30 days. After hospital discharge, patients were continued on an oral form of proton pump inhibitor. Rebleeding in our study was defined as signs and symptoms of recurrent bleeding such as malena, hematemesis or coffee ground vomitus, which was confirmed on second endoscopy after first primary endoscopic haemostasis. Mortality was defined as any death related to UGIB. In our population, patients were stratified into high risk patients that had a score of ≥8, moderate risk with scores of 3-7 and low risk with scores of ≤2.

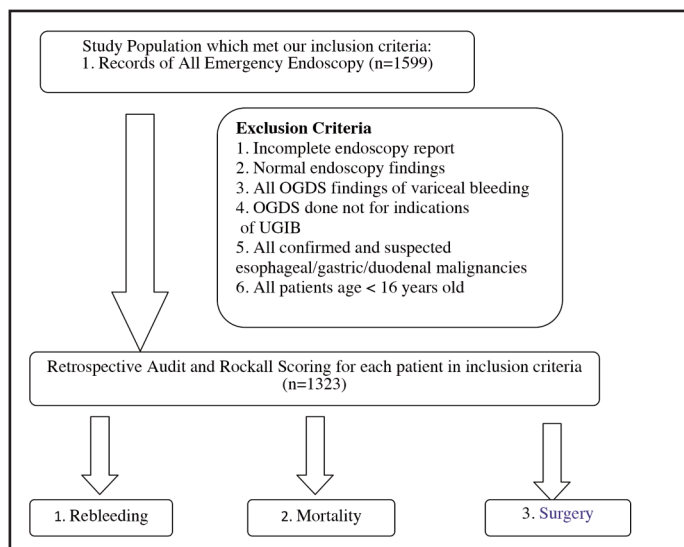


Fig. 1: Flowchart of methodology and desired outcomes.

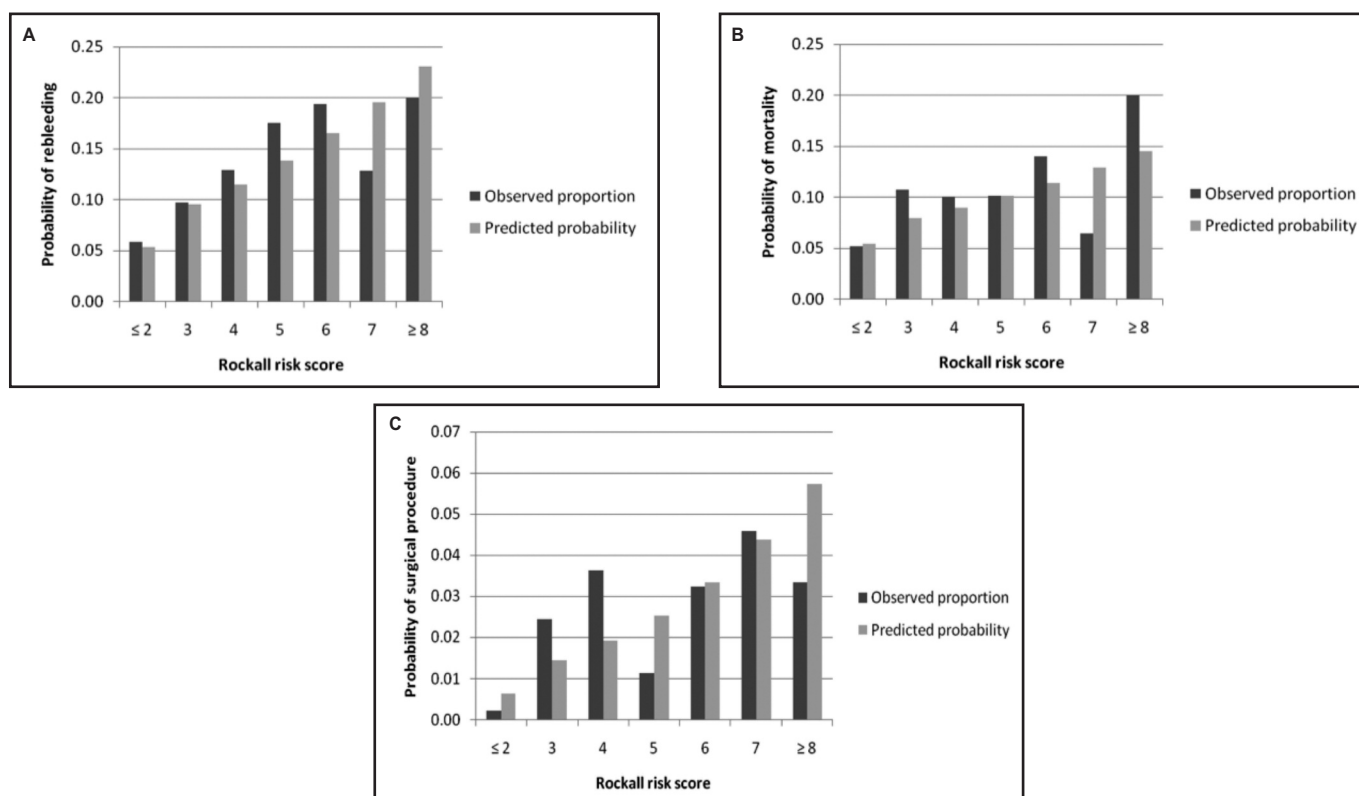


Fig. 2: Goodness-of-fit predicted versus observed outcomes by Rockall risk score. A: Rebleeding, B: Mortality, C: Need for surgery.

Data collection

This research was registered in accordance to protocol with the National Medical Research Registry (NMRR-15-29-23977). Prior to start of data collection, permission was obtained from the director of HSI, Head of General Surgery department and ethics approval from the Malaysian Ministry of Health

Research Ethics Committee (KKM/NIHSEC/P15-111) in accordance with current guidelines on Good Clinical Practice, the Declaration of Helsinki, and subsequent relevant versions. Data was collected retrospectively using patients’ electronic records. As this was done anonymously, informed consent was not required by the ethics review board.

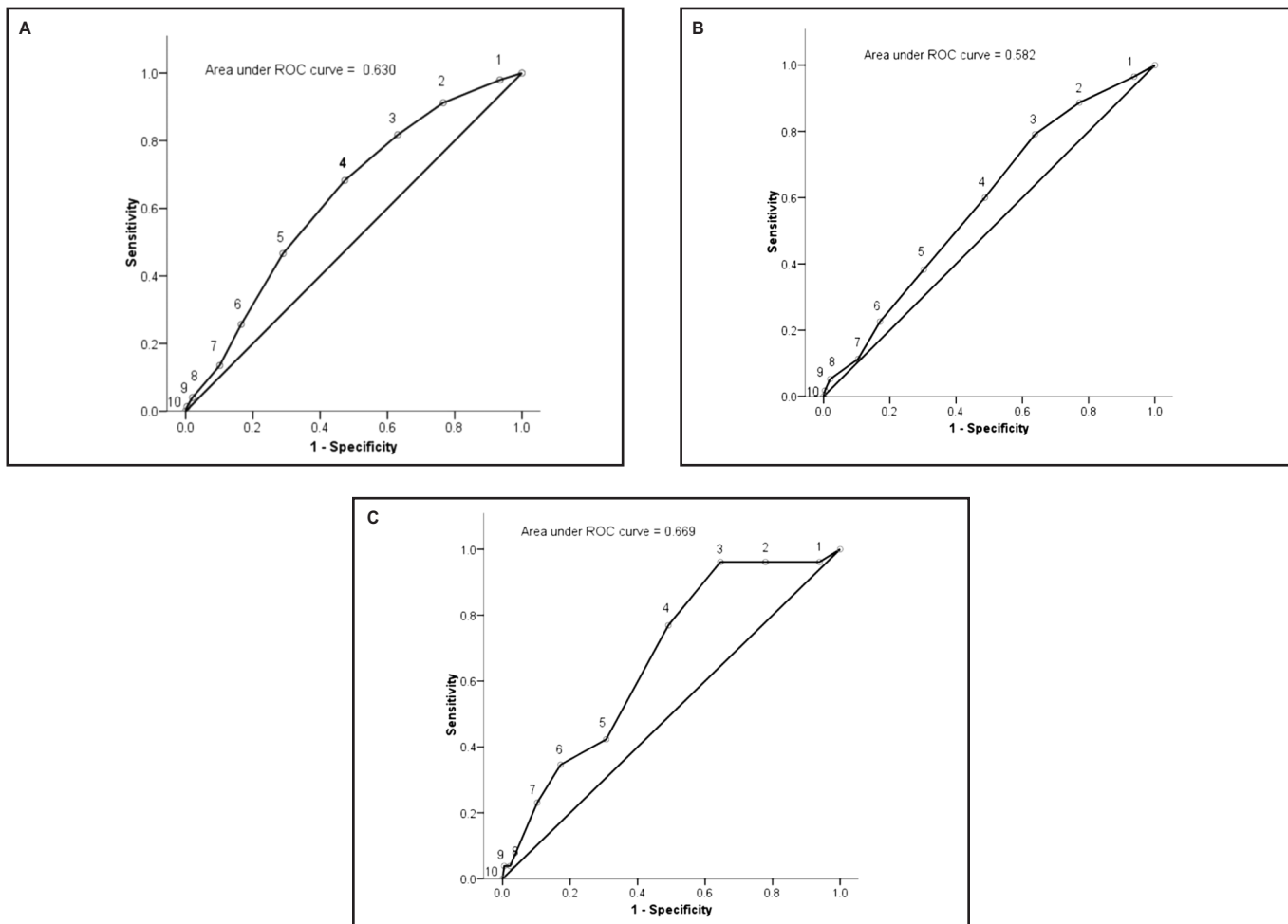


Fig. 3: Area under receiver operating characteristic curve outcomes of Rockall score.
 A: Rebleeding, B: Mortality C: Need for surgery

Analysis

Analysis was performed using SPSS for Windows version 16.0 (SPSS Inc., Chicago, USA). We used Chi-square Goodness-of-fit tests to assess the degree of calibration and AUROC to evaluate the discriminative ability of Rockall risk score in patient risk stratification of high risk of developing rebleeding, mortality and need for surgical intervention.

RESULTS

Endoscopic records for patients with the ICD-10-CM K92.2 diagnosis from January 2009 till October 2014 was screened, of which 1323 patients that achieved primary haemostasis fulfilled our inclusion criteria. The study population had a male preponderance of 847 subjects to 476 female patients with a mean age of 57.9 (17.2) years. Mean length of stay was 9.5 days.

In accordance to Rockall's original publication, patients were classified into high (scores ≥ 8), moderate (scores 3-7) and low (scores ≤ 2) risk for rebleeding and mortality. Thirty patients were in the high-risk group followed by the moderate risk 62.9% (832 patients) and low risk with 34.8% (461 patients).

The overall rebleeding rate was 11.2% (148/1323), mortality rate of 8.7% (115/1323) and need for surgical intervention was 2.0% (26/1323). Individual scores with observed rates of rebleeding, mortality and need for surgery is seen in Table II. Patients in the high-risk group had an odds ratio of 4.02 (95% CI: 1.51, 10.66) at rebleeding in comparison to the moderate and low risk groups.

Calibration of Rockall scores using the Goodness-of-fit test showed that the observed outcomes did not match the predicted probabilities as shown in Figure 2. The observed outcomes showed a variant of increasing and decreasing trend which was not consistent with the predicted outcomes. Chi square test was done and showed that all three outcomes of rebleeding ($p < 0.001$), mortality ($p = 0.001$) and need for surgery ($p = 0.038$) had p-values of less than 0.05. This indicates that Rockall risk score is poorly calibrated in predicting probabilities of rebleeding, mortality and surgery.

AUROC was plotted and illustrated in Figure 3 to distinguish the discriminative ability of Rockall scores in each patient that was represented by their individual scores in experiencing rebleeding, mortality and need for surgery.

Rockall score performed poorly in all three outcomes with AUROC value of 0.63 (95% CI: 0.59-0.67), $p < 0.001$ for rebleeding, 0.58 (95% CI: 0.53-0.63), $p < 0.004$ for mortality and 0.67 (95% CI: 0.58-0.76), $p < 0.003$ for need for surgical intervention.

From our observation, with increasing Rockall scores there was an increase of percentage of patients that rebleed. Rebleeding rates was highest in the high-risk group with 20% rebleeding in comparison to the moderate and low risk groups with 13.8% and 5.9% respectively. Outcomes of mortality and surgery also showed similar trends with increased percentage of patients as the scores increases in the mortality and surgery category as shown in Table II.

Overall the Rockall score was poorly calibrated and failed to show discriminative ability for the outcomes of mortality, rebleeding and need for surgery. However, we observed that with increasing Rockall scores of individual patients, the rates of all three outcomes increased.

DISCUSSION

Risk stratification according to clinical risk scores has been encased in many international UGIB clinical management guidelines.^{3,12} Clinician can decide on early discharge of patients at low risk of rebleeding and prevent unnecessary admissions by risk stratification.^{8,14} Rockall risk score has been widely validated internally and externally to evaluate patient's individual risk in regards to death and rebleeding.¹³ Despite being validated worldwide, there are still conflicting results on the use of Rockall score as a predictor of rebleeding in UGIB patients.¹¹ Based on the original study by Rockall of four thousand English patients, there was an increasing trend of rebleeding with increasing Rockall scores.⁹ However a Canadian study by Enns et al. of 1869 patients and a study by Church et al. proved that Rockall score was not a useful tool in predicting rebleeding.^{2,4} In our study we attempt to prove the usefulness of Rockall score in a Malaysian tertiary general type hospital equipped with endoscopist, in predicting the outcomes of rebleeding, mortality and the need for surgical intervention of bleeding gastric and duodenal ulcers within 30 days.

From this study, we were able to compare our local rebleeding and mortality rates to international tertiary care level standards. The results were acceptable and comparable with a study from United Kingdom. Our overall rebleeding and mortality rate was 11.2% and 8.7% respectively in comparison to a similar study conducted by Church et al. which had a rebleeding rate of 15% and mortality rate of 9%.⁴ Our research produced results of Rockall score being poorly calibrated and has a poor discriminative ability for predicting rebleeding and mortality which did not come as a surprise. We had similar results with the United Kingdom governance body, National Institute for Clinical Evidence (NICE) 2012 Full guidelines of Management of Acute Upper Gastrointestinal Bleeding which showed that Rockall score had a very low quality with respect to predicting mortality and rebleeding with AUROC, as low as 0.67 and 0.56 respectively.⁸

Despite having a negative result, Rockall score is still being used and it is in our Malaysian clinical practice guidelines as there is no superior scoring system apart from the Glasgow Blatchford scoring which is being used to triage patients for hospital admission currently.³ From a clinician's perspective, Rockall score can be used to triage patients and give a sense of urgency towards patients that may be subjected to high risk of rebleeding and mortality after first endoscopy. This is proven by our study as we see an increase in rebleeding rates as the patients scores increase subsequently.⁹ An alternative of risk stratification which is Rockall score, besides using the Forest classification of gastric ulcer is important to predict patients at high risk to develop rebleeding. This is because rebleeding is a significant predictor of mortality with reported mortality rates as high as 16 times for death from the initial bleeding.^{9,13,14} Hence, patients with a Rockall score of more than 8 are encouraged to be observed closely for signs and symptoms of rebleeding which may improve patient outcome if detected early. The other benefits of this study is that by using Rockall score we were able to consolidate and focus our resources in terms of ICU and HDW care for patients that were triaged as high risk of rebleeding. An average ICU stay would cost about RM3000.00 which translates to USD 767.00 per day.

The Rockall risk score has been widely validated over a decade since its appearance and plays an important role in the UGIB management as per stated in the International Consensus on the management of patients with Non-variceal Upper gastrointestinal bleeding 2010.¹⁵ However it is still not routinely practiced in many hospitals as reported by Barkun et al. A recent study by Barkun et al. revealed that despite knowing that risk stratification plays an important role in the management of UGIB, it is still not routinely practised in many tertiary centres. A large audit on patients in the United Kingdom showed that only 19% of 6750 patients had risk stratification done either by Rockall Risk Score or the Glasgow Blatchford score.¹³ Despite having a negative result, it is still the best scoring system and we advocate its use to triage patients into risk groups. With proper risk stratification, this may improve our quality of care and at the same time focus our resources on high risk patients.

Study Considerations and Limitations

The main limitation of this study is that data collection was done retrospectively, thus making this study liable to missing and inaccurate data. This limitation has been partly overcome by the large number of patients that we recruited, and also the careful documentation of our patient records in the hospital. Although this is a study done on a single centre experience and data from other centres in Malaysia may influence the data with different results, HSI is a large general hospital, and we feel that our experience reflects that of other general hospitals which serves the majority of patients seeking emergency healthcare in the country. Our centre also did not have the luxury of having an interventional radiologist, hence most of our subjects who rebled, were subjected to surgery - under running of bleeding ulcers. The effects of surgery itself may have contributed to death in patients who are already in a poor state of health, which may have influenced our results. Lastly, the experience of each endoscopist varies with training. There were a total of seven

endoscopists ranging from surgeons under gazettement to consultant surgeons during this period of study. The techniques used to secure bleeding endoscopically vary with experience. It would be time consuming and exhausting to have a single endoscopist for all emergency endoscopy.

CONCLUSION

Rockall Score has a poor discriminative ability and is poorly calibrated for rebleeding in upper gastrointestinal bleeding. However, it is the best tool we have now to stratify patients into risk groups.

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COMPETING INTEREST

All the authors have declared no competing conflict of interest.

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