

A Novel Risk Scoring System for Predicting Variceal Oesophageal and Gastric Bleeding in Patients with Cirrhosis and the tailored Nursing Care Delivery Based on the Assessment

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ABSTRACT

Background: An accurate risk assessment is critical for predicting variceal bleeding complications in cirrhosis patients and enhancing nursing care delivery. Herein, we aimed to design a novel risk scoring system for variceal oesophageal and gastric bleeding and develop tailored nursing care strategies based on the risk assessment using the system.

Methods and findings: A risk scoring system was developed according to a retrospective analysis of risk factors for variceal oesophageal and gastric bleeding and clinical characteristics in 825 cirrhosis patients hospitalized in 2013. Risks of bleeding of patients with cirrhosis hospitalized in 2014 were assessed using the scoring system. Risk assessment in 992 cirrhosis patients hospitalized in 2014 identified 396 patients at high risk of bleeding. Tailored predictive nursing care was then delivered to patients in the high-risk group. The tailored nursing care delivery significantly reduced the bleeding rate and the mortality rate of the patients with cirrhosis who were assessed using the novel risk scoring system in 2014, and the rate of patient satisfaction was dramatically elevated as well.

Conclusions: Thus, the novel scoring system and the tailored nursing care delivery may have a great impact on preventing bleeding and decreasing mortality in patients with cirrhosis.

INTRODUCTION

Bleeding due to esophageal and gastric varices is one the most common and serious complications of cirrhosis, with a high mortality rate. Collateral circulation is established in decompensated cirrhosis due to increased portal hypertension with subsequent rupture of lower esophageal or gastric varices causing upper gastrointestinal

bleeding. Gastro duodenal ulcer and acute gastric mucosal lesions can also cause upper gastrointestinal bleeding. Accurately assessing the risk factors of patients with liver cirrhosis for complications of rupture of esophageal and gastric varices is of great significance for effective implementation of predictive nursing measures and improvement of patient prognosis. In the present study, we retrospectively analyzed and summarized the risk factors of variceal esophageal and gastric bleeding in patients with cirrhosis from January to December 2013 and designed a risk factor scoring system. This system was applied in 2014 to implement predictive nursing care for patients with a high risk of bleeding. The incidence of variceal esophageal and gastric bleeding and patient mortality rate were significantly reduced by the tailored nursing care delivery developed from this risk factor scoring system [1-5].

MATERIALS AND METHODS

Patients

The informed written consent of the patients and acceptance of the study protocol by the ethics committee of Hangzhou Xixi Hospital, Hangzhou, China has been obtained. A retrospective study was conducted on a total of 825 patients with liver cirrhosis diagnosed with cirrhosis by ultrasonography from January to December 2013. 76 of the 825 patients suffered from variceal esophageal and gastric bleeding. Among them, 54 were males, and 22 were females, aged from 32 to 70 (50.2 ± 5.4) years old. From January to December 2014, a total of 992 patients with cirrhosis were hospitalized, and 396 patients with high-risk bleeding were screened out and received tailored predictive nursing care. 24 of 396 high-risk bleeding patients suffered from variceal esophageal and gastric bleeding. Among them, there were 17 males and seven females, aged 39-61 (50.8 ± 6.0) years old.

Design of the risk factor scoring system for variceal esophageal and gastric bleeding in patients with cirrhosis

A retrospective analysis was undertaken to develop a new risk factor scoring system for variceal esophageal and gastric bleeding based on the clinical characteristics in patients with cirrhosis from January to December 2013. The risk scoring system includes 10 items: 1) a history of bleeding from esophageal and gastric varices within a year (1 point); 2) a history of peptic ulcer (1 point); 3) a history of drinking (1 point); 4) a history of mood swings (such as anger, excitement, and depression) (1 point); 5) any long-term use of hormones and non-steroidal drugs; 6) presence of ascites (1 point); 7) rough food intake (1 point); 8) prothrombin time (≥ 16 s) (1 point); 9) platelet count ($\leq 100 \times 10^9/L$) (1 point); 10) severity of esophageal and gastric varices (light -1 point; moderate -2 points; severe -3 points). Patients with a total score ≥ 4 points were considered at high risk of bleeding.

Application of risk factor scoring system for variceal esophageal and gastric bleeding in patients with cirrhosis 396 patients diagnosed with decompensated cirrhosis hospitalized from January to December 2014 were at high risk of bleeding (≥ 4 points) using the risk scoring system, and tailored predictive nurse care was then designed and delivered [6,7].

Tailored nursing care based on the risk assessment using the novel scoring system

Diet management: Intake of rough food was reported as one of the important causes of variceal esophageal and gastric bleeding in patients with decompensated cirrhosis hospitalized multiple times due to bleeding. Thus, for those patients whose scores were ≥ 4 points, the diet was switched to a soft food diet at $36\sim 38^\circ\text{C}$, 4-5 times a day. Those with scores ≥ 2 points, semi-liquid or liquid diet at $36\sim 38^\circ\text{C}$, 4-5 times a day was strongly suggested. For those patients with drinking history, abstinence from alcohol was highly recommended.

Medication: For those patients with a risk factor score of ≥ 4 points and with a history of gastric ulcer or long-term treatment with hormones and non-steroidal drugs, it was recommended to use drugs that inhibit acid and protect the gastric mucosa such as proton pump inhibitors, pantoprazole, and omeprazole. It was suggested to reduce or stop the use of hormones and non-steroidal drugs according to the patient's conditions. If the medication was necessary, replacement with a drug that causes minimum damage to gastric mucosa was recommended. Intake of alkaline food such as soda crackers or acid inhibitors was suggested in combination with the medication to protect the gastric mucosa. For patients with esophageal and gastric varices whose score was ≥ 2 points, ground, room temperature oral diuretics were prepared. The patients were closely observed for stomach discomfort during the medication, including evaluating the color, character, and volume of stool, hyperactivity of bowel sounds and laboratory tests results. For those patients who had not undergone surgical treatment or where portal pressure could not be reduced, it was recommended to review the results of a gastroscopy every six months to one year to evaluate the degree varices [8].

Psychological support: Patients with a history of bleeding or at high risk of bleeding were commonly pushed into an anxious and depressed emotional state. Therefore, it was particularly important to strengthen psychological counseling while doing the above predictive care. Continuous communication with patients and their family members and isolation of the patients from emergencies in the family to avoid excessive mood swings were intensified in the predictive nursing care. Strenuous exercise should also be avoided for the patients in the recovery period.

Tailored nursing care delivery to patients with ascites and abnormal coagulation function abnormalities

Predictive nursing care of patients with ascites: According to factors such as the amount of ascites and serum albumin levels in patients at high risk of bleeding, appropriate diuretics for diuresis were selected for patients, and the patients were given intravenous albumin or plasma supplementation. High-protein diet and limitation of sodium intake were adopted. Status of ascites elimination was dynamically evaluated [9,10].

Predictive nursing care for patients with coagulation function abnormalities: For patients with coagulation function abnormalities, coagulation function and hypersplenism were closely observed, particularly prothrombin time and platelet counts. The patients with coagulation function abnormalities were supplemented with fibrinogen, plasma, platelets, etc.

RESULTS AND DISCUSSION

The risk scoring system for predicting variceal esophageal and gastric bleeding in cirrhosis patients developed based on the clinical characteristics of the patients was shown in Table 1.

Table 1. Risk scoring chart for assessment of assessment of variceal esophageal and gastric bleeding in patients

Items	0 point	1 point	2 points	3 points
A history of bleeding within a year	No	yes		
A history of peptic ulcer	No	yes		
A history of drinking	No	yes		
A history of mood swings	No	yes		
Any long-term use of hormones and non-steroidal drugs	No	Yes		
Ascites	No	Yes		
Intake of rough food	No	Yes		
Prothrombin time ($\geq 16s$)	No	Yes		
Platelet count ($\leq 100 \times 10^9/L$)	No	Yes		
Severity of esophageal and gastric varices	No	Light	Moderate	Severe

With cirrhosis if a patient’s total score of the 10 items was ≥ 4 points, the patients were considered at risk of variceal esophageal and gastric bleeding. From January to December 2013 and 2014, there were a total of 825 and 992 patients hospitalized for cirrhosis, respectively Table 2.

Table 2. Information of cirrhosis patients hospitalized in 2013 and 2014 assessed at high risk of variceal esophageal and gastric bleeding (number of patients).

Year	Patients	Risk score ≥ 4		Gender		Age	History of drinking	
		B	N	male	female		Yes	No
2013	825	76	427	54	22	50.2 \pm 5.4	55	21
2014	992	24	372	17	7	50.8 \pm 6.0	5	19

NOTE: B: bleeding group; N: non-bleeding group

Among the 825 patients hospitalized in 2013, a total of 503 were at high risk of variceal esophageal and gastric bleeding, as determined by the new risk factor scoring system (a score ≥ 4 points). 76 patients at high risk of bleeding experienced bleeding during hospitalization. Upper gastroenterological bleeding occurred in only 24 out of 396 patients in 2014 that were assessed at high risk of bleeding but subsequently received tailored nursing care (Table 2). The correlation between bleeding from the esophagus and gastric fundus varices and the degree of varices in patients with cirrhosis hospitalized in 2013 and 2014 were 89.47% and 91.67%, respectively, indicating that variceal bleeding was closely correlated with degree of varicosity and predictive nursing care delivery did not affect the correlation. There was no significant difference between the two correlations in 2013 and 2014 ($\chi^2=0.006$; $p > 0.05$) Table 3 [14].

Table 3. The correlation between the bleeding from esophagus and gastric fundus varices and the degree of varicose in patients with cirrhosis (number of patients).

Year	Risk score ≥ 4		Degree of varicose			Correlation
	B	N	Light	Medium	Severe	Yes
2013	76	427	2	6	68	89.47%
2014	24	372	0	2	22	91.67%

NOTE: B: bleeding group; N: non-bleeding group. $\chi^2=0.006$; $p > 0.05$

The volume of ascites was dramatically reduced by predictive nursing care delivery in 2014 compared to that of patients in 2013 ($\chi^2=13.94$; $p < 0.001$) Table 4.

Table 4. Comparison of the volume of ascites in patients experienced bleeding in 2013 and 2014 (number of patients)..

Year	Risk score ≥ 4	Volume of ascites in bleeding group				
		N	No	Small	Medium	large
2013	76	427	12	14	41	21
2014	24	372	5	10	6	3

NOTE: B: bleeding group; N: non-bleeding group. $\chi^2=13.94$; $p < 0.001$

Table 5. Comparison the rate of bleeding of patients with risk score ≥ 4 and < 4 and rate of bleeding in 2013 and 2014 (number of patients).

Year	Patients	Risk score ≥ 4		Risk score < 4		Rate of bleeding (%)
		B	N	B	N	
2013	825	76	427	0	322	15.11
2014	992	24	372	0	596	6.06

NOTE: B: bleeding group; N: non-bleeding group. $\chi^2=14.357$; $p < 0.001$

As shown in Table 5, the rates of bleeding in patients at high risk of bleeding in 2013 and 2014 was 15.11% and 6.06%, respectively ($\chi^2=14.357$; $p < 0.001$), demonstrating that predictive nursing care delivery for the patients in the high-risk group significantly reduced the incidence of bleeding. There were no patients with scores < 4 that experienced bleeding in both 2013 and 2014. There were 25 deaths in the bleeding group (76 patients) in 2013 and 4 deaths in the bleeding group (24 patients) in 2014. However, the mortality rates decreased from 32.89% to 16.67% ($\chi^2=10.49$; $p < 0.001$) after predictive nursing care delivery Table 6.

Table 6. Comparison of rates of mortality caused by variceal esophageal and gastric bleeding and rate of nursing care satisfaction of patients at high risk of bleeding hospitalized in 2013 and 2014 (number of patients).

Year	Patients	Risk score ≥ 4		Number of deaths	Rate of satisfaction
		B	N	Rate of mortality (%)	(%)
2013	825	76	427	25 (32.89)	72.8
2014	992	24	372	4 (16.67)	95.7

NOTE: B: bleeding group; N: non-bleeding group. $\chi^2=10.49$; $p < 0.001$

Finally, the satisfaction rates with nursing care from the patients at high risk of bleeding were increased by 22.9% from 72.8% to 95.7% Table 6.

CONCLUSION

Bleeding from esophageal and gastric varices is the most common complication of cirrhosis. It is reported that more than 90% of bleeding in cirrhosis is caused by esophageal and gastric varices, portal hypertensive gastropathy, and peptic ulcer. At the decompensated stage of cirrhosis, increased portal pressure, rupture of esophageal and gastric varices, a dilated portal vein, appearance of ascites, and portal hypertensive gastropathy can easily cause bleeding. The incidence of bleeding is closely associated with portal pressure and the degree of esophageal and gastric varices. The frequency and severity of bleeding are positively correlated to the degree of esophageal and gastric varices, the severity of cirrhosis, and the mortality rate. Found that the more serious the degree of esophageal and gastric varices, the higher risk of gastrointestinal bleeding. Drugs or surgical intervention should be given as early as possible to prevent bleeding. Meanwhile, it is also proposed that various bleeding factors are not enough to be independent predictors of bleeding from esophageal and gastric varices in patients with cirrhosis. The new risk score system designed in the present study was based on recent literature and analysis of clinical characteristics of these patients. For those in the group with high risk of bleeding, predictive nursing care was developed according to the high-risk factors in the scoring system with tailored strategies applied to diet, medications, and patients' psychological state. Tailored predictive nursing care delivery significantly reduced the incidence of variceal esophageal and gastric bleeding and mortality rate of patients with cirrhosis and improved their quality of life.

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