Egyptian Journal of Medical Research

Print ISSN: 2682-4396 / Online ISSN: 2682-440X

Original article

Platelet-albumin-bilirubin score for prediction of complications in cirrhotic patients with acute variceal bleeding

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Article Info

Article history:

Received 18 March 2024

Accepted 11 September 2024

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Keywords

Cirrhosis

Albumin Bilirubin

Platelet albumin bilirubin

Variceal bleeding.

Abstract

Background: Acute variceal bleeding as a cause of upper gastrointestinal tract hemorrhage is a serious problem that resulting in early death of cirrhotic patients. So, predicting the risk of early re-bleeding and death is crucial for preventing morbidity and mortality. Nowadays , there are multiple scoring systems with good prognostic power have been developed, but there is still a need to find an easier and better scores that can be applied in clinical practice within each population and country. **Aim**: evaluation of the role of ALBI and PALBI scores as a prognostic tools in cirrhotic patients with variceal bleeding. **Methodology** : cross-sectional prospective study **,** done on patients admitted to *Hepatology, Gastroenterology and Infectious diseases* department at Beni-Suef University Hospital in Egypt who complained of acute onset of variceal

bleeding. ALBI and PALBI were calculated and correlated with rates of hospital rebreeding and mortality.

Results: This study was done on 100 patients. The rates of first attack of bleeding, rebreeding and in-hospital mortality were 43 patients (43%), 37patients (37%) and 20 patients (20%). Age was a significant risk factor for in hospital morbidity and mortality (P= 0.008*) . Hb, WBCs, *PLTs*, Creatinine, *liver enzymes (AST, ALT) and* Bilirubin (T, D) *had a statically significant relation to re-bleeding*. *R*egarding hospital mortality, ALBI , PALBI and MELD scores have a better prognostic value in prediction of mortality *with* AUC 0.726, 0.798 and 0.750 respectively. **Conclusion**: ALBI, PALBI and MELD scores were helpful for prediction of hospital mortality in patients with variceal bleeding.

1. Introduction:

Variceal bleeding is an expected consequence of portal hypertension in cirrhotic patients and associated with high mortality (**1),** therefore (CTP) with (MELD) scores are considered as important models for evaluating the survival of cirrhotic patients with gastrointestinal bleeding. undergoing surgery **(2)**, but there are some limitations as CTP score encephalopathy are subjectively assessed **(3,4**), while (MELD) score was developed in patients to evaluate prognosis after TIPS and to prioritize liver transplant settings (**5,6**) is objective.

Recently Johnson [**7**] had recommended (ALBI) score, that composed of only serum bilirubin and serum albumin, avoiding other subjective items with results which are ranging in 3 different cutoff points of three grades [**7**], then Roayaie et al. [**8**] evaluate PALBI which was with adding platelets that clue of portal hypertension helping for stratifying the risk in HCC patients, few studies that apply the 2 scores in evaluation of cirrhotic patients complaining of variceal bleeding, initially found hopeful value [**9,10**]. The benefit of such usual tests, that are widely applicable, is that they reflect portal hypertension and liver function. In our study, we evaluated the ALBI and PALBI, in

predicting morbidity and mortality among cirrhotic patients with variceal bleeding during their hospital stay

2. Patients and Methods:

Site of the study: Hepatology, Gastroenterology, and Infectious diseases Department at Beni-Suef University Hospital, Egypt.

Date and period of the study: from (November 2023) on 100 patients.

Inclusion criteria, *cirrhotic* patients complained of acute variceal bleeding, whether it was the 1st attack or a recurrent attack of hematemesis or cosealed hematemesis discovered by nasogastric tube with decrease in hemoglobin level.

Exclusion criteria, non-cirrhotic Patients with acute gastrointestinal bleeding, without varices

All patients included in our study were subjected to : full history of bleeding and other comorbidities, laboratory tests as Complete blood count, (WBCS, PLT, Hb) , coagulation profile (INR) and blood biochemistry,(AST, ALT, Albumin, Bilirubin, creatinine). They were undergone urgent diagnosis and treatment with resuscitation and Blood transfusion to achieve hemodynamic stability(SBP more than 90 mmHg). endoscopy was done within the first 12 hours. Patients then were followed for 5 days to detect incidence of rebreeding, as defined by lecturers [**11**].

From admission labs, ALBI score (**7**), PALBI score (**8**), MELD score (**12.13) and** Child-Pugh score [**14**] were calculated. these scores were evaluated in each condition, first attack, rebreeding, and hospital mortality.

Ethical Consideration:

The study was performed after approval of the Ethical Committee. Approval No. FMBSUREC/03102023/Nafady

Statistical Analysis

Data was coded to fit the statistical analysis by (SPSS) version 26 under windows

3. Results:

Table 1. Demographic characteristics of patients.

Variables	Survived cirrhotic patients complicated with Upper GIT bleeding		Mortality In cirrhotic patients N= 20	*P-value*
	First attack N= 43	Re-bleeding N= 37		
Current age (years)				
Mean±SD	60.55±8.94	56.91±10.81	65.10±6.72	**0.008**
range	32-70	29-70	47-75	
Sex				
Male	29 (67.4)	24 (64.9)	16 (80)	0.478
Female	14 (32.6)	13 (35.1)	4 (20)	
Hypertension				
Yes	8 (18.6)	6 (16.2)	13 (35)	0.221
No	35 (81.4)	31 (83.8)	13 (65)	
DM				
Yes	13 (30.2)	11 (29.7)	7 (35)	0.915
No	30 (69.8)	26 (70.3)	13 (65)	

**P-value is significant at ≤0.05, * by χ2 test and t test for age*

Among the demographic characteristics of studied patients; age as only risk factor for morbidity and mortality was statistically significant (P= 0.008*) **(table1**).

Table 2. Biochemical parameters among cirrhotic complicated with Upper GIT bleeding and died patients

Variables	Survived cirrhotic patients complicated with Upper GIT bleeding		Mortality In cirrhotic patients N= 20	*P-value*
	First attack of bleeding N= 43	Re-bleeding N= 37		
Mean ± SD				
Hb	8.97±0.96	8.92±0.94	9.90±1.81	***0.007***
WBCs	*6.42±2.70*	*5.07±1.87*	*8.98±2.81*	***0.0001***
PLT	153.65±67.29	132.75 ±73.12	107.50±66.61	***0.0001***
Albumin	*2.97±0.46*	*2.93±0.53*	*2.73±0.51*	0.188
Creatinine	0.99±0.42	0.89±0.27	1.25±0.50	***0.006***
CRP	6.09±15.48	4.25± 7.65	6.35±8.20	0.733
INR	1.30±0.25	1.35±0.27	1.26±0.25	0.422
ALT	48.06±40.29	53.94±40.061	93.25±91.15	**0.008**
AST	*38.488±23.51*	*38.27±26.67*	*69.15±33.34*	***0.0001***
Bilirubin(T)	1.33±1.65	1.35±1.20	3.79±4.93	**0.001**
Bilirubin, (D)	0.52±0.79	0.54±0.62	1.99±2.82	**0.0001**

**P-value is significant at ≤0.05. *by one way a nova*

By comparing blood parameters between cirrhotic patients with GIT bleeding and died patients, patients with in-hospital mortality had reduced renal function as higher serum creatinine (1.25±0.50 mg/dl) more than in first attack group and rebreeding group. elevated liver enzymes(ALT, AST) among patients with hospital mortality were more than first and recurrent bleeding. elevated serum bilirubin (total &Direct, elevated White blood count , and also elevated Hemoglobin with a statistically significant difference *, and regarding PLT, it was significantly lower in count* (P*=0.0001) in patient who died at hospital than in patients* with both first and recurrent bleeding .

Table 3. Endoscopic grading of varices among patients

Variables	Survived cirrhotic patients complicated with Upper GIT bleeding		Mortality In cirrhotic patients N= 20	*P-value*
	First attack of bleeding N= 43	Re-bleeding N= 37		
Grading of varices				
Gastric varices	5 (11.6)	4 (10.8)	6 (30)	0.110
Grade 1	17 (39.5)	16 (43.2)	7 (35)	0.829
Grade 2	8 (18.6)	6 (16.2)	3 (15)	0.924
Grade 3	7 (16.3)	9 (24.3)	7 (35)	0.252
Grade 4	9 (20.9)	6 (16.2)	2 (10)	0.553

**P-value is significant at ≤0.05, by χ2 test*

no statistically significant difference was found between groups regarding the grade of varices

Table 4. Co-morbidities among cirrhotic patients complicated with Upper GIT bleeding and died patients

Variables		Survived cirrhotic patients complicated with Upper GIT bleeding		Mortality In cirrhotic patients N= 20	*P-value*
		First attack of bleeding N= 43	Re-bleeding N= 37		
Co-Morbidities					
splenomegaly		36 (83.7)	31 (83.8)	14 (70)	0.374
Fundal injection		5 (11.6)	4 (10.8)	4 (20)	0.578
Ascites	Mild	10 (23.3)	8 (21.6)	5 (25)	0.063
	Moderate	6 (14)	10 (27)	8 (40)	
	Marked	0	2 (5.4)	2 (10)	
HCC		*5 (11.6)*	*2 (5.4)*	*12 (60)*	***0.0001***
PVT		3 (7)	0	3 (15)	0.070

HCC was significantly higher in non survivors

Table 5. Albumin-bilirubin score, MELD and Child Pugh scores among survived cirrhotic patients complicated with Upper GIT bleeding and died patients

Scores		Survived cirrhotic patients complicated with Upper GIT bleeding		P-Value	Mortality In cirrhotic patients N= 20	*P-value*
		First attack of bleeding N= 43	Re-bleeding N= 37			
		Mean ± SD				
ALBI score		-1.724±0.499	-1.67±0.54	0.644	-1.28±0.577	***0.008***
PALBI score		*-2.95±0.546*	*-2.92±0.577*	*0.797*	*-2.17±0.762*	***0.0001***
MELD score		8.38±4.99	8.29±4.89	0.941	13.33±5.63	***0.001***
Child score	**A**	21 (48.8)	*12 (32.4)*	*0.234*	*1(5)*	**0.0001**
	B	*19 (44.2)*	*23 (62.2)*		*9 (45)*	
	C	*3 (7)*	*2(5.4)*		*10 (50)*	

When we evaluated different scores (ALBI, PALBI, MELD and Child Pugh) among cirrhotic patients complicated with Upper GIT bleeding and died patients: ALBI, PALBI, MELD and Child scores were significantly high in non survivors patients in hospital so they are considered good tests for predicting hospital mortality

By using ROC, (ALBI, PALBI score and MELD) were assessed to predict mortality as showed,

Variable	Sensitivity	Specificity	AUC	Cut off point	p-value
ALBI score	55%	12%	0.726	-1.13	**0.002**

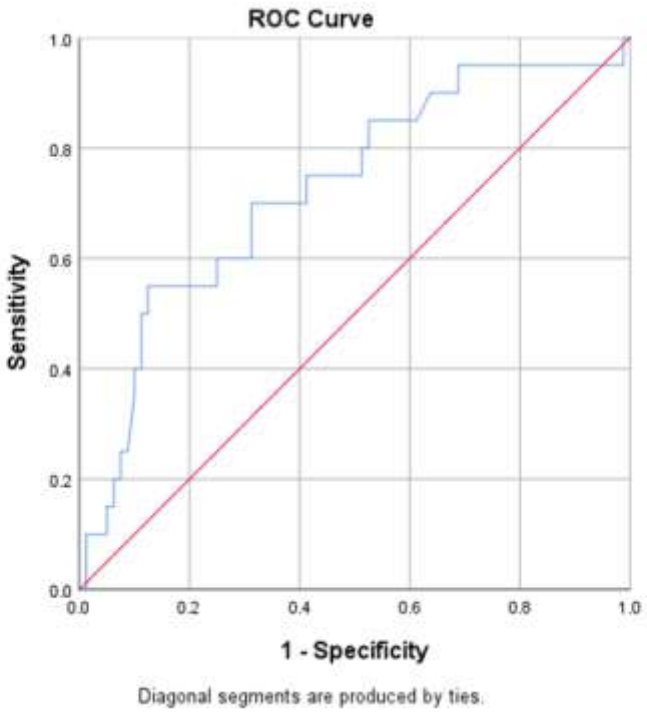

Figure 1- ALBI score

at a Cut off value (-1.13) AUC (0.726) with Sensitivity 55%, specificity of 12% and statically significant (P=0.002*).

Figure-2 ***PALBI score***

Variable	Sensitivity	Specificity	AUC	Cut off point	p-value
PALBI score	75%	80%	0.798	-2.55	**0.0001**

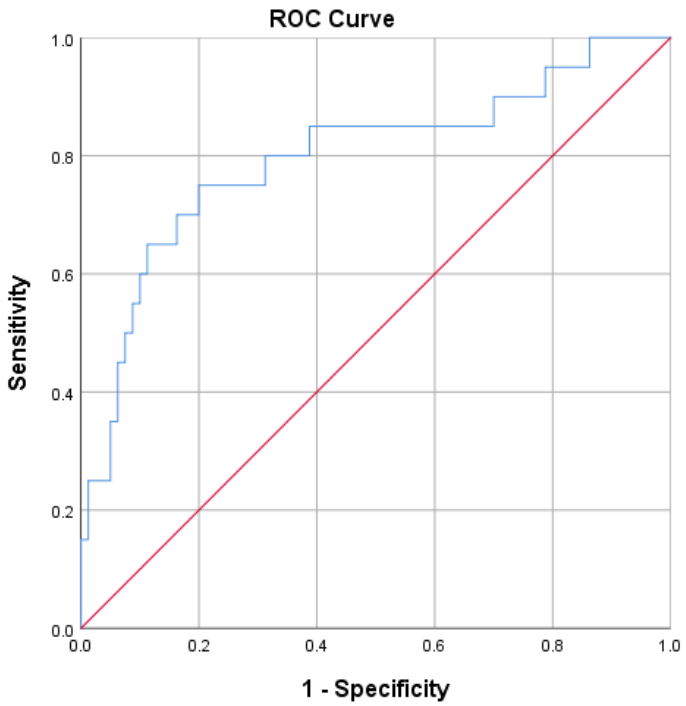

Figure 2- PALBI score

at a Cut off value (-2.55) :AUC (0.798) with Sensitivity 75%, specificity 80% and statically significant (P=0.0001*).

Figure-3 ***MELD score***

Variable	Sensitivity	Specificity	AUC	Cut off point	p-value
MELD score	65%	81%	0.750	12.60	**0.001**

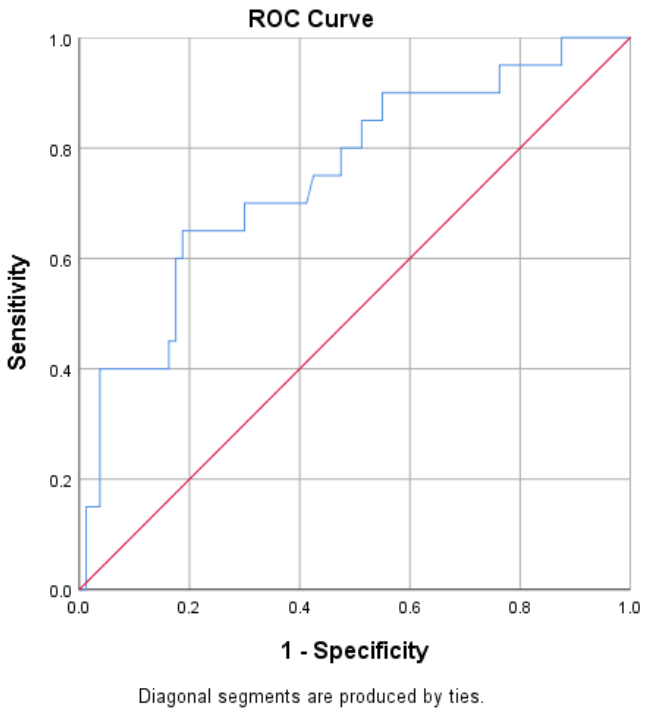

Figure3- MELD score *at a* Cut off value (12.60) AUC (0.750) with Sensitivity 65%, specificity 81% and statically significant (P=0.001*).

4. Discussion:

Patients with cirrhosis were known to have a risk of variceal bleeding, mainly due to uncontrolled portal hypertension [**15**].The (100 patients) of our study with active variceal bleeding, had an average age of (60.55±8.94 years) in patients with fist attack of hematemesis and (65.10±6.72 years) in patients who died in hospital. Sixty nine patients were males and thirty one were females. Our study is in agreement with the studies that found the occurrence of cirrhosis is commonly occurred in middle age, and a higher risk of first bleeding, re-bleeding and mortality rates were more in males (**16**)

Our data showed a correlation between liver function and risk of bleeding, as statically significant (p= 0.001)elevated serum bilirubin level was found in non-survivors. While albumin level was similar in all groups (p= 0.188).

Theoretically Platelet count and spleen diameter have correlation with portal hypertension (**17**).while in our study splenomegaly was not significantly related (p=0.374) to neither bleeding nor mortality

but thrombocytopenia was significantly lower (p= 0.0001) in re-bleeding and non-survivor groups. Splenomegaly is attributed to vascular disturbances, and always a reflection of high portal pressure, but thrombocytopenia occurs in different causes, such as shortened platelet life time , decreased thrombopoietin, the hepatitis virus and myelotoxicity effects or portal hypertension (**18**)

In our study, an important finding was the increased risk of bleeding with occurrence of HCC in cirrhotic patients, which attributed to arteriovenous shunting within the tumor, neovascularization and modifications of liver tissue, which lead to elevation of portal pressure (**19**). This explained the increased risk of bleeding and rebreeding. In our study: five patients with HCC developed first attack of bleeding while twelve patients (60%) died (*p= 0.0001**) but portal vein thrombosis was close to reach a statistical significant difference between groups (P=0.070). *This was in agreement* with Ripoll *et al*. (**20**), who found that poor outcome of bleeding among patients with HCC, as was with higher mortality rate , but in contrast with our study regarding other risk factor as the presence of portal vein thrombosis (PVT) that were independent predictors of bleeding and mortality, may be due small number of cases in our study.

In our study, presence of ascites with different grades (mild, moderate and marked) was not statically significant as modifying fartor (p=0.063), in contrast Yoshida et al , found that the only risk factor in patients with active gastric varix complaint from both early and late rebreeding was ascites (21).

our results showed a statistically significant (p=*0.006)* increase of incidence of renal impairment in patients who died in hospital ,this was in agreement with Liang *et al*., who found that deterioration of renal function was associated with higher rebreeding risk (22).

Our study noted that there was a statistically significant high MELD score ,(p=*0.001)* in non-survivors (13.33±5.63), that exceeded both first attack group (8.38±4.99) and rebreeding group(8.29±4.89) an this was documented as risk factor among cirrhotic patients with variceal bleeding. Also, this agreed with Liang *et al*, who found that MELD score ≥18 and CTP score ≥ 9, were predictors of rebreeding independently in cirrhotic patients (22)

We found that Child-Pugh score "C" was statically significant higher (p=0.0001) in-hospital mortality group, but this was not the case in first attack of bleeding and rebreeding (p= 0.234). this agreed with multiple studies

which found that, CTP score was a predictor of mortality and re-bleeding among cirrhotic patients risky gastric varices (23.24)

By looking at (table 3) , the grading of Gastric Varices and characteristic of endoscopic finding were not significant related to mortality or re-bleeding (p= 0.110). matching the results reported previously by Marques et al (24)

When doing upper GIT endoscopy, it was encountered that the most of patients were with grade I varices (39.5%) and (43.2%) of patients were in rebreeding and thirty five percent died in hospital. Nine patients (20.9%) of grade 4 group presented with first attack while 6 of the same group (16.2%) with rebreeding and 2 patients (10%) died in hospital. In agreement with Zou et al. **[25]** who also found that higher risk in cirrhotic patients complaint from variceal bleeding during first 5 days with in-hospital mortality rate of is 4.4%. Thus, bleeding of esophageal varices is associated with high in-hospital mortality and so is a serious complication in cirrhotic patients, thereby requiring early active treatment methods especially for high-risky groups.

Regarding ALBI , PALBI and the MELD scores in patients With first attack of bleeding and recurrent bleeding they did not differ significantly (p= *0.644,p= 0.797, p=0.941)* .While with patients who died in hospital ,they showed statistically significant higher values respectively (p=*0.008), (p=0.0001) and (p=0.001).*

Incidence of rebreeding among our patients was (37%) which is relatively high This may be due pattern of selection of our studied patients .In contrast, many studies declared that rebreeding rates was as low as 2.56%, 3.2%, 6.1%, 3.9%[**26.27***]*.

Child score in our study was divided into 3 groups (A.B.C). Most of patients were classified as child A. Patients presented with first attack of bleeding and recurrent bleeding weren't statistically significant (p=0.234), while predicting mortality in-hospital with significant difference (p=0.0001).

In agreement with us, reports that, showing the value of CTP score with variceal bleedings were inconsistent, as Aluizio reported that the Child-Pugh score had no role in prediction of rebreeding (**28)**. Also , the study of Elshaarawy et al. as They reported PALBI and ALBI scores showed a good prognostic value, significantly better than Child-Pugh (p<0.01) (**29).**

In contrast to this, the study of Tantai et al. who declared that CTP had better value in the predicting the rebreeding risk (**30**). The association of CTP and MELD scores in

evaluating prognosis of patients with variceal bleeding is matching each other (31.32).

Our study showed ALBI, *PALBI* and MELD scores with analyzing hospital mortality in patients with variceal bleeding , have statically prognostic value, (p= 0.002), (p= 0.0001) and (p= 0.001) with AUC of (0.726) , (0.798), and(0.750) respectively , this was partially in agreement with Nagaraja et al. [**33**] who reported that only ALBI score has better predictive value with good AUROC(0.743) .

While the study of Zou et al. **[25]** who showed that , predicting hospital mortality in variceal bleeding cirrhotic patients with AUC of the ALBI score was higher value 0.808 with significance (p<0.001), like our study. This may be due to more number of patients than our study.

Also Chen et al. [**34**] perform a study on 221 patients and concluded that PALBI score has better benefit in predicting the death within 30 days among variceal bleeding patients and showed higher value AUC like our study

ALBI and PALBI are objective scores combining both synthetic liver function with portal hypertension are not subjective as in case of CTP, despite the obstacles of single hospital in our study, the better performance of ALBI with PALBI was observed than CTP . Also MELD score which includes creatinine with gastrointestinal tract bleeding. is affected temporarily Plus, results of INR, observed by Lisman et al[35] who discovered greater differences with 7 European laboratories and also confirmed by Trotter ,[36] that a changes in INR levels with 14 different laboratories in America. ALBI was better than PALBI [37]. Also, it seems that ALBI has a good prognostic value in assessment of decompensated cirrhotic patients, whereas PALBI has prognostic role in risk assessment of portal hypertension.

Limitations

This study had many limitations. as it was a single hospital study , some details are missed regarding HBV, HCV infection or the history of alcohol consumption and lifestyle factors, Thus, it is recommended to overcome this by a multi-center cohort prospective study that includes such data.

Another limitation was that Hepatic Venous Pressure Gradient (HVPG), as a standard method in actual measurement of portal pressure was not available in our study [38].

Further studies with longer follow-up durations, enabling the good observation of a sufficient number of patients, may be required.

5. Conclusion:

ALBI, PALBI and MELD scores have hopeful value for prediction of hospital mortality with variceal bleeding.

Declarations

Ethics declarations:

Ethics Approval by Research Ethical Committee, faculty of Medicine, Beni-suef university , FWA#:FWA00015574, Approval No ;FMBSUREC/ 03102023/Nafady

Funding

No fund was obtained.

Conflict of interest

The authors declared, no conflict of interest

Consent for publications:

Approved for publications

Not applicable as no individual data, images or were included in the study.

Availability of data and material: all data is available

Please contact author for data requests.

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Code availability: available

Authors contribution :

WMS: Collected cases, manuscript preparation and Editing.

ASS: put the study design, analyzed the data and discussion, reviewed the manuscript and editting.

ShN: helped in Data analysis, reviewed the manuscript and editting

Abbreviations

*HTN**, Hypertension***

DM, Diabetes Mellitus

ALT, Alanine amino transferase

AST, Aspartate amino transferase

ALB, albumin

Bilirubin(T), Total bilirubin

CBC. Complete Blood Count,

HGB, Hemoglobin,

WBC—white blood cell.

PLT—platelets;

CRP, C-reactive protein,

INR International Ratio,

HCC, hepatocellular carcinoma

PVT, Portal vein thrombosis

ALBI, Albumin-Bilirubin

PALBI , Platelet-Albumin-Bilirubin

MELD , Model of End-stage Liver Disease

CTP , Child-Turcotte-Pugh

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