

**Accuracy and Predictability of PANC 3 Scoring System in Acute Pancreatitis****Papu Bori<sup>1</sup>, Ajit Kumar Pegu<sup>2</sup>, Somnath Saha Roy<sup>3\*</sup>, Jinku Ozah<sup>4</sup>, Navil Farzad Islam<sup>5</sup>, Sofiur Rahman<sup>6</sup>**<sup>1,3,4,5,6</sup>Post Graduate Trainee, Department of Medicine, Assam Medical College & Hospital, Dibrugarh<sup>2</sup>Professor & Head, Department of Medicine, Assam Medical College & Hospital, Dibrugarh

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Conflict of interest: Nil

**Abstract:****Objective:** To assess the severity of acute pancreatitis including mortality in relation to PANC 3 score and to evaluate the predictability of severity and mortality of PANC 3 score with BISAP scoring system.**Methods:** 90 cases of acute pancreatitis aged more than & equal to 12 years were enrolled in the study and patients with additional comorbidities such as cardiac failure, liver failure, renal failure, chronic obstructive pulmonary disease, diagnosed cases of chronic pancreatitis, and recurrent pancreatitis with a history of complications like pseudocysts and abscesses in the pancreas were excluded from the study. BISAP score and PANC 3 score were determined for the cases and compared.**Results:** To predict severe acute pancreatitis, receiver operating characteristic curve (ROC) produced AUC value of 0.918 for BISAP and 0.904 for PANC 3 score. To predict mortality, ROC curve produced AUC values of 0.885 for BISAP and 0.886 for PANC 3 score.**Conclusion:** PANC 3 score in predicting severe acute pancreatitis and mortality is comparable with that of BISAP score, as it is easy to calculate, simple to use, and does not require a person with experience, and simply needs data that are frequently acquired during or within 24 hours of presentation.**Keywords:** acute pancreatitis, PANC 3 score, BISAP score.

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**Introduction**

Acute pancreatitis is an inflammatory condition that affects the pancreas and may also affect other regional tissues or distant organ systems [1]. It is caused by a complex process with a variety of causes. It can appear as a single attack or be repeated, with intensity ranging from moderate to severe and life threatening [2]. The majority of acute pancreatitis episodes (80%) are minor and self-limiting, with no long-term consequences. Acute pancreatitis affects about 10% to 20% of persons who develop severe symptoms [3]. In such circumstances, there is a risk of developing systemic inflammatory response syndrome (SIRS) and/or multi-organ failure, both of which can lead to death [4,5].

Acute pancreatitis affects roughly 5-35 new cases per 100,000 people worldwide each year, with 3% mortality rate<sup>6</sup>. As a result, a valid risk stratification tool is needed to predict the severity and prognosis of acute pancreatitis. A variety of grading systems for identifying the severity of acute pancreatitis are currently available which includes the Ranson's criteria [7], Acute physiology and chronic health evaluation II (APACHE II) [8], Computed

tomography severity index (CTSI) [9], Bedside index for severity in acute pancreatitis (BISAP) [10], PANC 3 score [11]. Although there are many scoring models available to clinically measure the severity of acute pancreatitis and organ failure, no single system has yet been deemed optimum. As a result, clinicians may favour one method over another for prognosticating acute pancreatitis.

So, it is essential to have a simple and cost-effective risk stratification tool which help to predict the severity and prognosis of acute pancreatitis and the need for intensive treatment in severe disease. Brown et al. (2007) of Harvard Medical School created the PANC 3 Scoring system [11]. It consists of three simple parameters namely a) Haematocrit b) Body Mass Index c) Pleural Effusion and Chest X- Rays. Patients who meet criteria for all three parameters were found to have severe pancreatitis. [11] The PANC 3 Scoring system can be calculated quickly and simply in the Emergency department and studies have shown PANC 3 score provides valuable information for interventions during the critical time period.

### Methods and Methodology

The study was a hospital based cross sectional observational study carried out on patients presenting with features of acute pancreatitis admitted in the Department of Medicine, Assam Medical College and Hospital, Dibrugarh during a period of one year from 1<sup>st</sup> June, 2020 to 31<sup>st</sup> May, 2021.

The institutional ethical committee gave its approval to the study protocol. The diagnosis of acute pancreatitis was obtained using the patient's medical history, physical examination, serum amylase and lipase readings, and an imaging test, abdominal ultrasound to analyse the pancreas and rule out or confirm biliary causes of pancreatitis. Pancreatitis could be diagnosed by the presence of any two of the three criteria.

The study covered all consecutive cases of acute pancreatitis and patients older than 12 years. Patients with additional co-morbidities such as cardiac failure, liver failure, renal failure, chronic obstructive pulmonary disease, diagnosed cases of chronic pancreatitis, and recurrent pancreatitis with a history of complications like pseudocysts and abscesses in the pancreas were excluded from the study. 90 patients were included in the current study after taking into account all the inclusion and exclusion criteria.

A pre-designed proforma was used to collect the data needed for the investigation. Prior to participating in the trial, the patients were fully told about it and their informed consent was obtained. A pre-designed proforma was filled out after a complete general and systemic examination, a thorough clinical history, and the necessary investigations. Data important to the scoring systems was recorded within 24 hours after hospital admission.

### Assessment of severity and associated complications:

Acute pancreatitis was categorized as mild or severe based on organ failure and/or local complications [12]. Organ failure included shock (systolic blood pressure 90mmHg), pulmonary insufficiency (spo<sub>2</sub> 90%), and renal failure (serum Creatinine level >2mg/dl). Acute peripancreatic fluid collection, pancreatic pseudocyst, walled-off necrosis, and acute necrosis collection were among the local complications.

### BISAP Score: [10]

Score is calculated using the following parameters:

1. Blood urea nitrogen (BUN) >25 mg/dl
2. Impaired mental status (Glasgow Coma Scale Score <15)
3. SIRS [SIRS is defined as two or more of the following]:
  - Temperature of <36 or >38°C
  - Respiratory rate >20 breaths/min or PaCO<sub>2</sub> <32 mmHg
  - Pulse >90 beats/min
  - WBC <4,000 or >12,000 cells/mm<sup>3</sup> or >10% immature bands
4. Age >60 years
5. Pleural effusion detected on imaging

Each variable receives a single point. The first 24 hours of data were used to generate the BISAP score.

### PANC 3 Score: [11]

It includes three parameters. [15] These are:

- (A) Haematocrit >44%
- (B) Body mass index >30kg/m<sup>2</sup>
- (C) Pleural effusion reveals on chest X-ray.

Each variable receives a separate score. At the time of admission, the PANC 3 score is determined.

### Statistical Analysis:

The data was calculated and a master chart was created using a predesigned and pretested proforma. Means and standard deviations were used to express continuous variables. For quantitative data, the student's t-test was used. P value of less than 0.05 was considered significant. The area under the receiver-operating curve (ROC) was calculated using the JROCFIT and JLABROC4 algorithms to determine the accuracy and predictability of BISAP and PANC 3 scores for severity and death. The area under the ROC curve (AUC) was used to analyse and compare the performance of predictions. The appropriate cut-off settings for specific parameters were determined using Receiver Operating Characteristic curves (ROC-curves). Various cut-off settings were used to calculate sensitivity, specificity, negative and positive predictive values. All of the analyses were carried out using the Statistical Package for Social Sciences (SPSS for Windows, Version 21.0 Chicago) and Microsoft Excel 2010 versions.

### Results

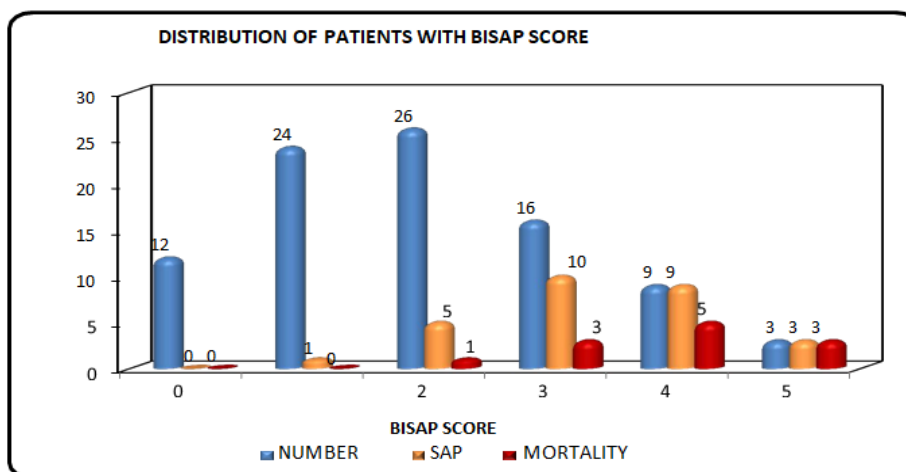
A total of 90 patients (mean age +/- SD = 38.36+-12.43 years) were included in the study, of which male patients were 77.78% and female were 22.22% and alcohol being the most common etiology (64.44%).

**Table 1: Mean and Standard Deviation of different parameters of the study**

Parameter	Mean	Standard Deviation
Age (in years)	38.36	12.43
Serum Amylase (U/L)	528.47	115.37
Serum Lipase(U/L)	3961	1388
Serum Triglyceride(mg/dl)	158.28	47.89

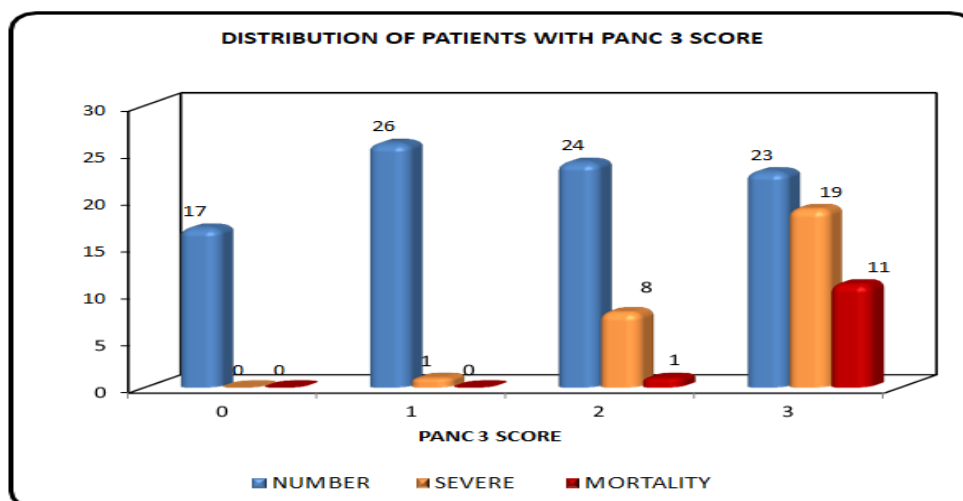
Local complications were present in 28(31.11%) patients which included acute peripancreatic fluid collection, pancreatic pseudocyst, acute necrotic collection and walled off necrosis. Out of 90 cases, 28 (31.11%) patients had severe disease, whereas 62 (68.89%) patients had mild disease. A total of 34 patients experienced organ failure; renal failure occurred in 15 (16.67%), respiratory failure in 12 (13.33%), and cardiovascular problems in 7 (7.78%) patients. 78 (86.67%) patients recovered and were discharged from the hospital and 12 (13.33%) patients expired during hospital stay. As shown in the

graph 1, 12 cases (13.33%) of the study's participants had a score of 0, while 24, 26, 16, 9, and 3 cases received scores of 1, 2, 3, 4 and 5, respectively. The prevalence of patients with severe acute pancreatitis and death were shown to increase when the BISAP score increased, according to the statistics above. Only six of the 62 patients with a BISAP score of  $\leq 2$  experienced severe acute pancreatitis, and there was only one case of fatality. 28 patients had a BISAP score greater than 2, yet 22 of them developed SAP, and 11 of them passed away.



**Graph 1: Distribution of patients with BISAP score**

As shown in the graph 2, Patients with higher PANC 3 scores exhibited greater fatality rates and proportions of severe acute pancreatitis. It was noted that 23 patients out of a total of 90 patients obtained three positive scores. Out of these 23 cases, SAP and mortality accounted for about 19 cases (82.60%) and 11 cases (47.82%), respectively.

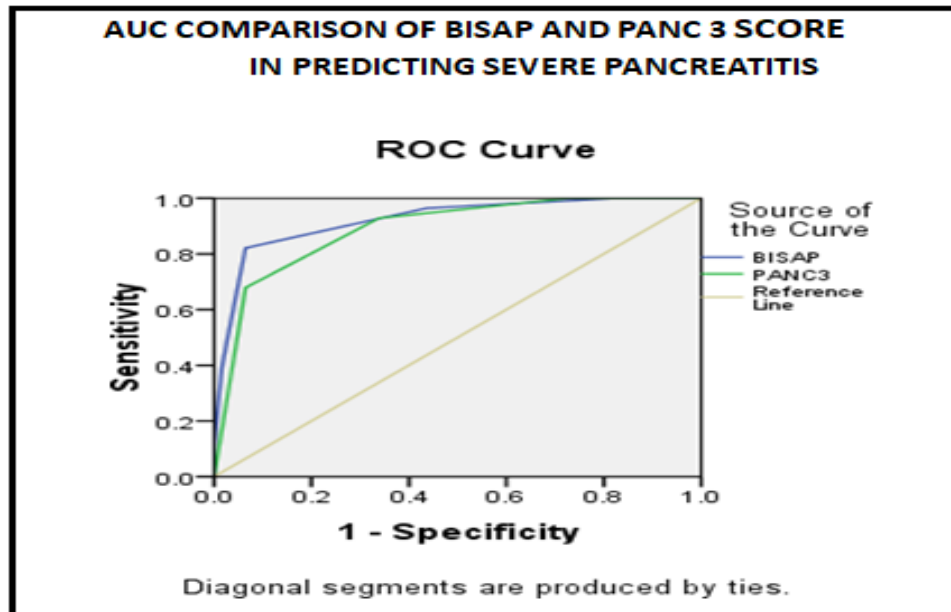


**Graph 2: Distribution of patients with PANC3 score**

As shown in Table 2 and Graph 3, an AUC of 0.918 (0.855-0.980) for BISAP and 0.904 (0.841-0.967) for PANC 3 score were obtained using receiver-operating characteristic (ROC) curves to predict severe acute pancreatitis based on the greatest sensitivity and specificity values. The following cutoffs were chosen for additional study based on the specificity values obtained from the receiver-operating characteristic curves: BISAP > 2 and PANC 3 score indicate that all parameters are positive, i.e., score 3.

**Table 2: AUC of BISAP and PANC 3 score predicting severity**

AUC (95% CI)	Severe Acute Pancreatitis
BISAP	0.918 (0.855 - 0.980)
PANC 3	0.904 (0.841 - 0.967)



**Graph 3: AUC comparison of BISAP and PANC3 score in predicting severe pancreatitis**

Using these cutoff values, the sensitivity, specificity, Positive Predictive Value (PPV) and Negative Predictive value (NPV) in predicting severity of acute pancreatitis were:

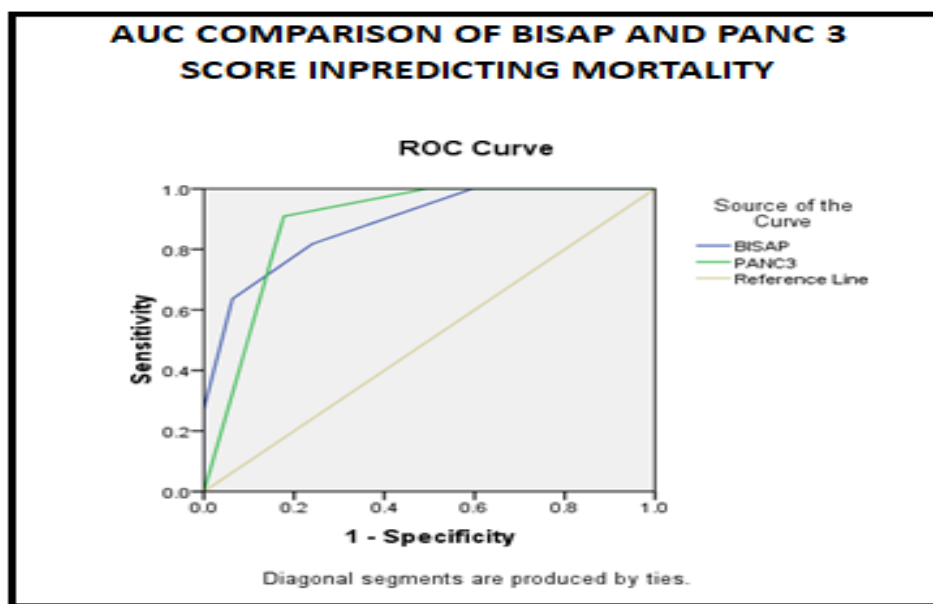
**Table 3: Sensitivity, Specificity, PPV, NPV and Diagnostic Accuracy of BISAP and PANC 3 score in predicting severity**

Variable	Cutoff	Sensitivity	Specificity	PPV	NPV	Accuracy	AUC (95% CI)
BISAP	>2	78.57%	90.32%	78.57%	90.32%	86.67%	0.918 (0.855-0.980)
PANC 3	3	67.85%	93.54%	82.60%	93%	85.56%	0.904 (0.841-0.967)

In order to predict mortality, receiver-operating characteristic (ROC) curves produced AUC values of 0.885 (95% CI, 0.783-0.986) for BISAP and 0.886 (95% CI, 0.819-0.964) for PANC 3 score. The following cutoffs were chosen for additional study based on the sensitivity and specificity values produced by the receiver operating characteristic curves: BISAP >2 and PANC 3 score, meaning all three requirements were satisfied, i.e., score 3.

**Table 4: AUC of BISAP and PANC 3 score in predicting mortality**

AUC (95% CI)	Mortality
BISAP	0.885 (0.783-0.986)
PANC 3	0.889 (0.819-0.964)



**Graph 4: AUC comparison of BISAP and PANC3 score in predicting mortality**

Using these cutoff values, the sensitivity, specificity, Positive Predictive Value (PPV) and Negative Predictive value (NPV) in predicting mortality of acute pancreatitis were:

**Table 5: Sensitivity, Specificity, PPV, NPV and Diagnostic Accuracy of BISAP and PANC 3 score in predicting mortality**

Variables	Cutoff	Sensitivity	Specificity	PPV	NPV	Accuracy	AUC (95%CI)
BISAP	>2	91.60%	78.21%	39.28%	98.30%	80.00%	0.885 (0.783-0.986)
PANC 3	3	91.60%	84.61%	47.82%	98.50%	85.55%	0.886 (0.819-0.964)

From above it is seen that AUC's both PANC3 score and BISAP score in relation to mortality and disease severity have almost similar result.

### Discussion

For managing acute pancreatitis, a number of markers have been validated for predicting the severity of the condition. Early diagnosis of a case has been shown to drastically lower the mortality rate linked to acute pancreatitis while also improving outcome [10]. The most popular multifactorial scoring systems include Ranson's, Glasgow, APACHE II, CTSI, BISAP, and PANC 3. These systems use a variety of clinical data to predict the severity, including age, aetiology, obesity, blood urea nitrogen, lactate dehydrogenase, chronic health status, and inflammatory markers. However, it is challenging to assess the real sensitivity of the markers used in prognosticating the course of the disease due to the numerous risk factors taken into account in each model to define the severity [11]. The ideal predictor of severity is described as being simple, highly sensitive, highly specific, safe, cheap, and reproducible and can be rapidly performed [13]. The objective and goal of this study project were to evaluate the PANC 3 scoring systems' ability to accurately forecast the severity of an acute pancreatitis episode.

A total of 90 cases were enrolled in the present study, out of which majority were in the age group

of 30-39 years (34.47%), followed by 24 patients (26.67%) were in the age group of 20-29 years, 21 patients (23.33%) in the age group of 40-49 years. It is seen that most of the patients belong to male category (77.78%) and alcohol (64.44%) being the most common cause of acute pancreatitis followed by Gall stones (22.22%). Additionally, 28 patients develop local complications and the most local complication was Acute Peripancreatic fluid collection (16.66%) followed by pancreatic pseudocyst, acute necrotic collection and walled off necrosis in decreasing trend. Among, patients who develop organ failure, renal failure was present in 16.67% cases followed by respiratory and cardiovascular failure. It was also found that patients with low serum albumin were at higher risk of developing severe disease and mortality.

The percentage of patients with severe acute pancreatitis and mortality both increased with rising BISAP Score. In all, 62 out of 90 patients had a BISAP Score between 0 and 2. Six patients in this group had severe acute pancreatitis, and the fatality rate was 3.84%. However, of the 28 patients with a BISAP Score greater than 3, 22 patients had severe acute pancreatitis, and 11 patients died. The three positive PANC 3 score criteria were also associated with an increasing trend in severe illness and mortality. 23 patients out of 90 patients had three metrics that were positive. [11] Individuals died as a result of severe acute pancreatitis, which struck 19

out of 23 patients. 9 out of 67 patients experienced severe acute pancreatitis, and 1 patient passed away. ROC curves for BISAP Score predicting severe pancreatitis and death yielded AUC of 0.918 (95% CI, 0.855-0.980) and 0.885 (95% CI, 0.783-0.986) respectively. ROC curves for PANC 3 score predicting severe pancreatitis and death yielded AUC of 0.904 (95% CI, 0.841-0.967) and 0.886 (95% CI, 0.819-0.964) respectively. It is observed that AUCs for PANC 3 score predicting severe pancreatitis and mortality were comparable with those of BISAP Score. These two results are both quite good.

Therefore, PANC3 score can also be used instead of BISAP Score because it is straightforward, affordable, and doesn't require special knowledge or expensive equipment. Our findings support those of another research that have been published. Bhaskar D et al. (2021) [14] in their study found that the sensitivity of 46.6% and specificity of 100 %. They described that PANC 3 can be used to predict the severity of pancreatitis as efficiently as APACHE II Scoring system. Meena SK et al. (2022) [15] in their study on 100 patients observed that the sensitivity of PANC 3 score was 75%, specificity was 96.43%, PPV was 80 %, NPV was 95.29% in predicting severe pancreatitis.

Piyush et al. (2020) [16] did their study on 50 patients and observed that the PANC3 score has 87% sensitivity, 91.30% specificity, 89.47% PPV, 87.50% NPV and accuracy is 88.37%. Shah AS et al. (2017) [17] in their study found that PANC3 score has 96.43% sensitivity and 75% specificity and described it as cost effective and promising score in predicting SAP leading to prompt treatment and early referral to higher centre. In a systematic review and meta-analytical study, Gao W et al. (2015) [18] investigated the value of the BISAP Score for predicting mortality and severity in acute pancreatitis and discovered that it was a reliable tool to identify acute pancreatitis patients at high risk for unfavourable outcomes when compared with the Ranson criteria and APACHE score. Additionally, they discovered that the BISAP score performed better in terms of specificity, but had a poorer sensitivity for detecting mortality and severe acute pancreatitis. In their prospective assessment of the role of the PANC 3 score in predicting acute pancreatitis severity, Panda C et al. (2017) [19] found that the score was a straightforward, straightforward to measure, and cost-effective strategy to identify patients at risk of rising severity and mortality within 24 hours of presentation. Although the numerous factors in our study for predicting organ failure, local complications, mortality, and clinical severity with regard to Ranson's, BISAP, and PANC 3 were similar to other studies contrasting the various scoring systems, our study had a modest sample size. Studies and

literature on the PANC 3 score in acute pancreatitis are scarce, there aren't many studies comparing PANC 3 with BISAP score and only certain instances were subjected to an abdominal CT scan. It turned out that the majority of the conclusions drawn from the current study were more or less in line with those of the other writers. In the current investigation, it was found that the AUCs for the PANC 3 score and the BISAP score had results that are remarkably close. This indicates that the PANC 3 score was comparable to the BISAP score for accuracy and predictability of acute pancreatitis severity and mortality. However, more research with a bigger sample size is required to clearly make firm conclusions because the available data does not clearly indicate which models should be employed in a particular patient population.

### Conclusion

The PANC 3 score is easy to calculate and simply needs data that are frequently acquired during or within 24 hours of presentation. Patients with high PANC3 and BISAP scores were shown to have a greater death rate as well as a higher probability of having severe acute pancreatitis. As it requires no complex inquiry, is simple to use, and does not require a person with experience, the PANC3 score can also be used in place of the BISAP score. In order to aid in the early identification of patients at risk of developing severe disease and passing away, the PANC3 score should be evaluated in all patients with acute pancreatitis. This will help to guide the beginning of early and successful therapy as well as the prevention of sequelae.

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