

ORIGINAL RESEARCH

Use Of Mannheim Peritonitis Index Screening System, In Predicting the Outcome In Patients With Peritonitis At Sharda Hospital

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ABSTRACT

Background: Peritonitis is inflammation of peritoneum and peritoneal cavity caused by localized or generalized infection.

Primary peritonitis results from bacterial, chlamydial, fungal, or mycobacterial infection in absence of perforation or inflammation of GI or GU tract. Secondary peritonitis occurs in the setting of GI or GU perforation or inflammation with common causes including acute appendicitis, colonic diverticulitis, and pelvic inflammatory disease.

Methods: This is an observational prospective cross sectional study including 73 patients presenting to surgical emergency with features of peritonitis. Patient's information were collected both on hospitalization and after surgical exploration; severity of peritonitis was evaluated using the MPI. According to MPI score patients were divided in appropriate groups (<21, 21-27, >27) and analyzed accordingly. The statistical analysis used chi-square test, Kolmogorov-Smirnov test, Kruskal Wallis test & ANOVA test.

Result: In groups <21, 21-27 and > 27 points according to MPI mortality was 0%, 10.53% and 76% respectively. age > 50 was largely associated with increased mortality. There has been a significant correlation between the MPI score and organ failure, Hospital stay.

Conclusion: MPI scoring system is a simple and effective tool for assessing this group of patients, and can be used as a guiding tool to decide on the management of the patient after the definitive procedure is done. Increasing scores are associated with poorer prognosis, needs intensive management and hence it should be used routinely in clinical practice

Key Word: Peritonitis; Mannheim Peritonitis Index (MPI); mortality

INTRODUCTION

Peritonitis is inflammation of peritoneum and peritoneal cavity caused by localized or generalized infection. Peritonitis is most often caused by exposure of the peritoneum to infectious noxa when perforating a hollow organ of the abdominal cavity., for example, by foreign bodies, bile during gallbladder or intrahepatic or extrahepatic bile duct perforation., gastric acids during gastric or duodenal ulcer perforation, urine during bladder perforation, etc.) In women, peritonitis may occur with ovarian cyst rupture. or fallopian tube infections. Regarding the clinical symptoms, their range is very wide., from the inconspicuous development of abdominal pain in the beginning, leading to severe septic shock. with a direct threat to the patient's life ⁽¹⁾

Primary peritonitis has no (documented) source of infection. Infection usually spreads from lower genitals through fallopian tubes, from upper respiratory tract infection or from middle ear in males⁽²⁻⁵⁾

Secondary peritonitis is secondary to any intraabdominal bowel. or other visceral pathology, e.g., perforation, appendicitis. E. coli (70%) is the most common. organism involved⁽⁶⁻⁷⁾

Tertiary peritonitis is defined as persistent or recurrent intraabdominal infection. after sufficient treatment for primary or secondary peritonitis. It usually occurs after 48 hours. It occurs after abdominal surgeries, which is usually severe and the patient may go in for Systemic Inflammatory response syndrome or Multi organ dysfunction syndrome⁽⁸⁻⁹⁾

Identifying both prognostic factors. and severity scales that provide objective description. of the patient condition at specific points. such as the preoperative and postoperative period. is useful to improve our understanding of the problem. involved ⁽¹⁰⁾.

Mannheim peritonitis index (MPI) was developed by Wacha and Linder in 1983⁽¹¹⁻¹⁴⁾

Early prognostic evaluation of peritonitis is desirable to select high risk patients for more aggressive therapeutic procedure such as radical debridement, lavage system, open management and planned relaparotomy.

PERITONITIS IS THOUGHT TO PASS THROUGH THREE PHASES

PHASE 1- Involves rapid removal of contaminants from the peritoneal cavity into systemic circulation. The contaminated peritoneal fluid passes through stomata in the diaphragmatic peritoneum and is absorbed into lymphatic lacunae. The lymph flows into the main lymphatic duct through the substernal nodes. The resultant septicaemia predominantly involves Gram negative facultative anaerobes and is associated with high morbidity.

PHASE 2- Involves synergistic interaction between aerobes and anaerobes as they encounter host complement and phagocytes. The complement is activated by classical pathway, with the alternate and lectin pathway in support. Phospholipids surfactant produced by the parietal mesothelial cells work synergistically with complement to increase opsonisation and phagocytosis. Peritoneal mesothelial cells are also potent secretors of proinflammatory mediators, therefore peritoneal mesothelial cells play a major role in the cell signalling pathway leading to recruitment of phagocytes to the peritoneal cavity and the upregulation of mast cells and fibroblast in the sub mesothelium.

PHASE 3- It is an attempt by host defences to localize infection mainly via production of fibrinous exudates that traps microbes within its matrix and promotes local phagocytic effectors mechanism. It also serves to promote development of abscesses.

In 1987 Linder MM, Wacha H⁽¹⁵⁾, Feldmann U, Wesch G et al conducted a study based on experience with 1243 patients suffering from purulent peritonitis. 255 patients were included in the study and they were studied prospectively. For intra-abdominal infection an index named the MANNHEIM PERITONITIS INDEX was established that allows for the first time to predict lethal outcomes of the disease in the individual patients.

In 1994 the reliability of the Mannheim peritonitis index was assessed and its predictive power for different populations examined in a study of 2003 patients from seven centres in three European countries by Billing A, Frohlich D and Schildberg FW ⁽¹⁶⁾. This study concludes that the mean index score and the mean mortality rate correlated in different groups, reflecting a homogenous standard of therapy for peritonitis and that the Mannheim peritonitis index provides an easy and reliable means for risk evaluation and classification for patients with peritoneal inflammations associated with multiple organ failure and severe chronic health problems.

Diffuse peritonitis is a disease with high occurring mortality also shown in recent data. Tolonen et al. reported an overall 30-day mortality of 14.5%, with mortality fluctuating

extremely based on the presence or absence of severe comorbidities⁽¹⁷⁾. It is evident that the patient's overall condition is an essential aspect of further prognosis.

There are a number of scoring systems, but the vast majority are still not readily usable for routine surgical practice. Mannheim Peritonitis Index (MPI), POSSUM, APACHE II, and the Peritonitis Severity Score (PSS) are considered to be the most effective⁽¹⁷⁻²²⁾.

MPI, in particular, seems to be a valid scoring system capable of predicting the fate of patients with diffuse peritonitis rather well. Different mortality levels were reported in individual groups based on MPI values. Mortality rises with increasing MPI, which was also demonstrated in our study⁽²¹⁻²⁷⁾.

Table 1 : Mannheim Peritonitis Index

Mannheim Peritonitis Index	
Risk factor scores	
Age > 50 years	5
Female sex	5
*Organ failure	7
Malignancy	7
Preoperative duration of peritonitis > 24 h	7
Origin of sepsis not colonic	4
Diffuse generalized peritonitis	6
Exudates	
Clear	0
Cloudy, purulent	6
Faecal	12
*Kidney failure	Creatinine level > 177 µmol/L or Urea level > 167mmol/L or Oliguria 20ml/hour
*Pulmonary insufficiency	PO ₂ < 50 mmHg or PCO ₂ > 50 mmHg
*Intestinal obstruction/paralysis	> 24hours or Complete mechanical ileus,
*Shock	Systolic BP<90mm of hg, MAP<60mm of hg

MATERIAL AND METHODS

This was an observational, cross-sectional study which was carried out prospectively in the Department of the Surgery, School of Medical Sciences & Research, Greater Noida, UP to assess the effectiveness of Mannheim Peritonitis Index (MPI) in predicting mortality in patients who presented with features of peritonitis from the duration of December 2020 to July 2022 and total there were 73 consecutive patients with the indication of Peritonitis were enrolled.

Total duration of data collection of the patients was 20 month.

MPI score was calculated at the time of patient presenting with peritonitis. According to inclusion and exclusion criteria with MPI score they were divided in one of the three groups. The first group included patients who obtained a total of points lower than 21; the second group – patients who obtained between 21 and 27 points; and the third– those who obtained more than 27 points.

INCLUSION CRITERIA

- Age >18 yr.
- Primary and secondary peritonitis.

EXCLUSION CRITERIA

- Peritonitis associated with comorbidities e.g.- CVD, COPD.
- Iatrogenic.

Patients' informations were collected upon informed consent on hospitalization and after surgical exploration. Data analyzed included age, gender, presence of co-morbidities, time from onset of symptoms, clinical parameters, laboratory tests, site and cause of visceral perforation, extension and characteristic of peritonitis, type of surgery performed and clinical outcome, including number and type of complications and in-hospital mortality.

The data normality was checked by using Kolmogorov-Smirnov test. The association of the variables were analysed using Kruskal Wallis test , independent t test and ANOVA ,Chi-Square test. Sensitivity, specificity, positive predictive value and negative predictive value was calculated of Mannheim Peritonitis Index for predicting mortality.Spearman rank correlation coefficient was used to find correlation of Mannheim Peritonitis Index with duration of hospital stay(days).

The data entry was done in the Microsoft EXCEL spreadsheet and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, version 25.0.

For statistical significance, p value of less than 0.05 was considered statistically significant.

RESULTS

Mortality in the studied group was 28.76%.

Association of Mannheim Peritonitis Index with age > 50 was largely associated with increased mortality. More number of male patients (64.38%) presented with peritonitis as compared to female patients (35.62%).

Common condition that the patients presented with is maximum with Ileal perforation with score <21 (16.67%), 21-27 (25%), >27 (58.33%).

If Mannheim Peritonitis Index ≥ 21 , then there was 47.73% probability of mortality and if Mannheim Peritonitis Index <21, then 100.00% chances of survival. Among patients who survived, 55.77% of patients had Mannheim Peritonitis Index <21.

Median (25th-75th percentile) of duration of hospital stay(days) in Mannheim Peritonitis Index >27 was 18(10-24) which was significantly higher as compared to Mannheim Peritonitis Index 21-27 (15(12-16.5)) and Mannheim Peritonitis Index <21 (8(7-10)). (p value=0.0001).

Significant positive correlation was seen between Mannheim Peritonitis Index with duration of hospital stay(days) with correlation coefficient of 0.514.

Proportion of died patients was significantly higher in Mannheim Peritonitis Index >27(76%) as compared to Mannheim Peritonitis Index <21(0%), 21-27(10.53%). (p value <.0001) Mean \pm SD of Mannheim Peritonitis Index in deceased was 33.86 ± 4.88 which was significantly higher as compared to alive (19.08 ± 7.57). (p value <.0001)

Proportion of patients with Mannheim Peritonitis Index: - >27 was significantly higher in patients with organ failure as compared to patients without organ failure. (>27: - 68.75% vs 7.32% respectively). Proportion of patients with Mannheim Peritonitis Index: - <21, 21-27 was significantly lower in patients with organ failure as compared to patients without organ failure. (<21: - 12.50% vs 60.98% respectively, 21-27:- 18.75% vs 31.71% respectively). (p value <0.0001).

Table 2: Distribution of Mannheim Peritonitis Index of study subjects.

Mannheim Peritonitis Index	Frequency	Percentage
<21	29	39.73%
21-27	19	26.03%
>27	25	34.25%
Mean ± SD	23.33 ± 9.62	
Median (25th-75th percentile)	23(16-31)	
Range	4-43	

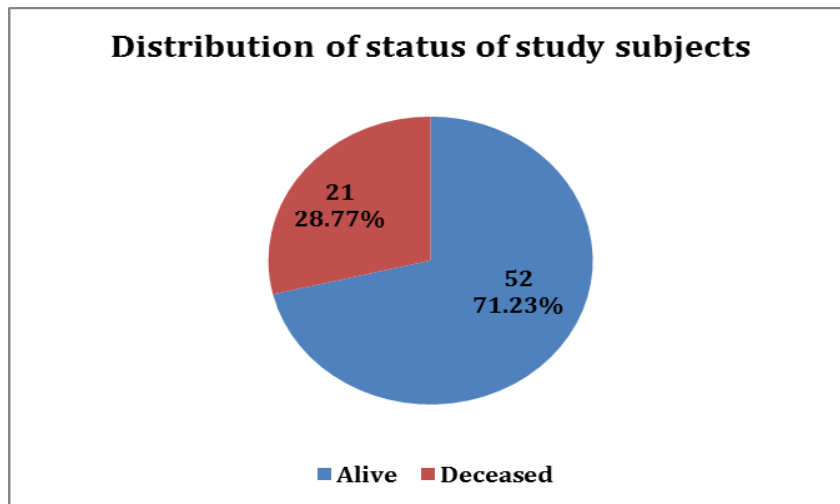


Table 3: Distribution of diagnosis of study subjects.

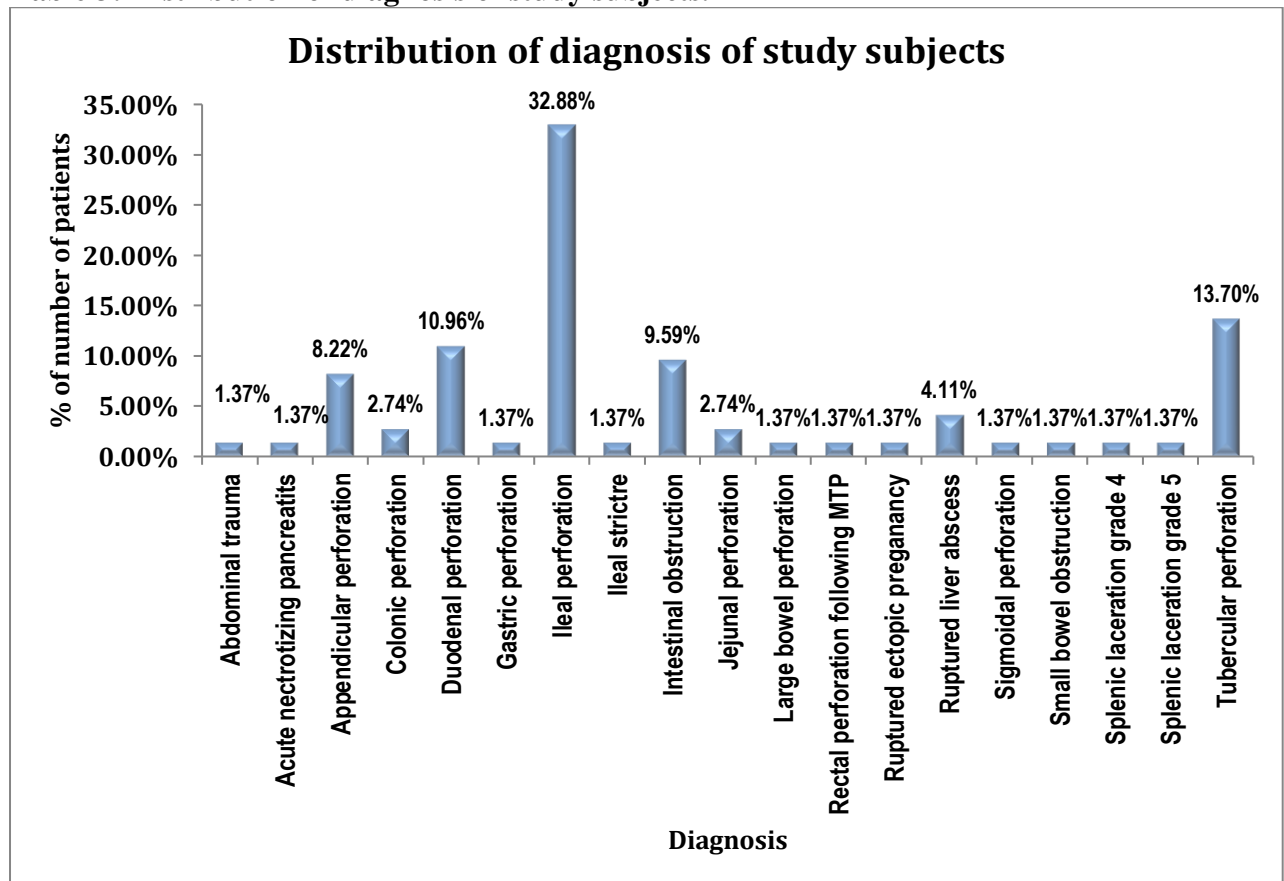
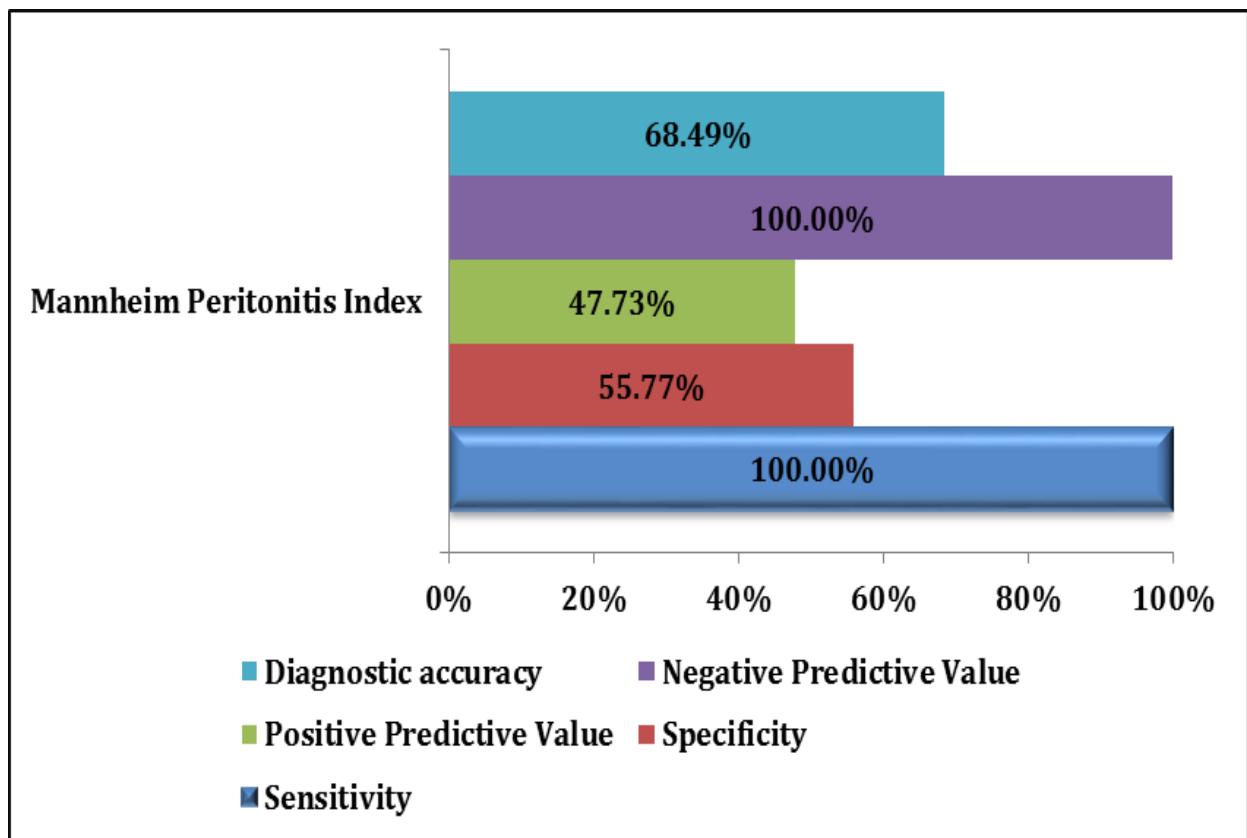


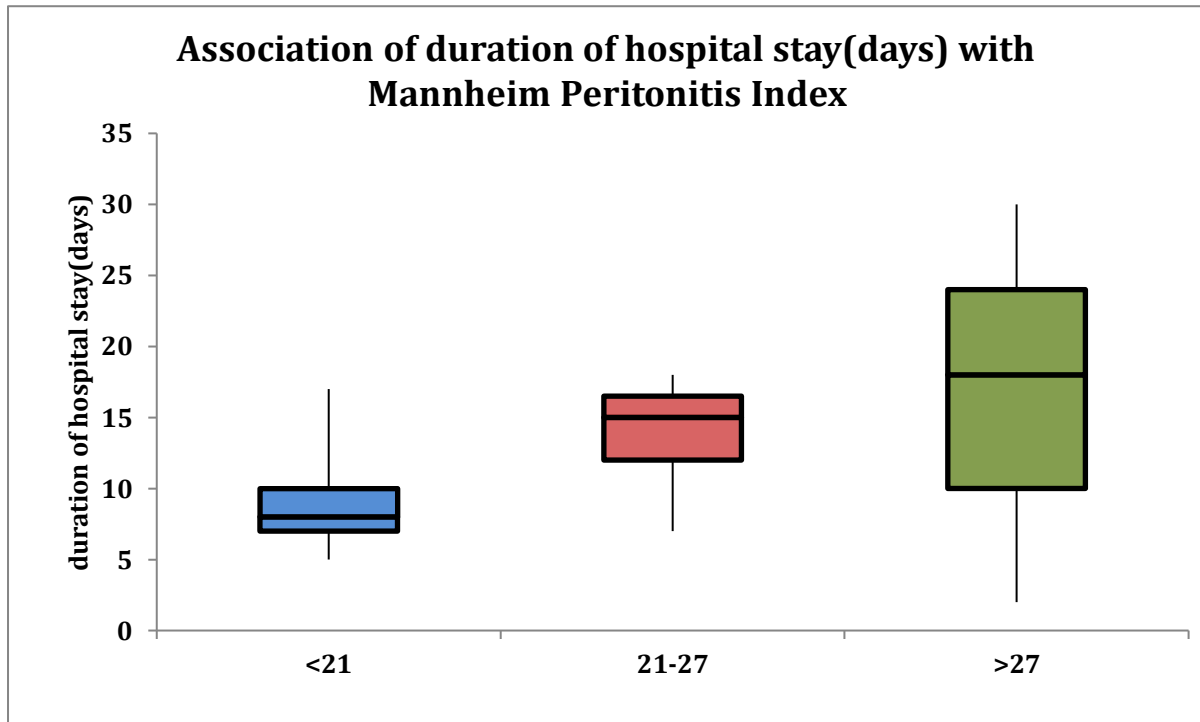
Table 4: Sensitivity, specificity, positive predictive value and negative predictive value of Mannheim Peritonitis Index for predicting mortality.

Variables	Values
Sensitivity (95% CI)	100% (83.89% to 100%)
Specificity (95% CI)	55.77% (41.33% to 69.53%)
AUC (95% CI)	0.78(0.67 to 0.87)
PPV (95% CI)	47.73% (32.46% to 63.31%)
NPV (95% CI)	100% (88.06% to 100%)
Diagnostic accuracy	68.49%

**Table 5: Association of duration of hospital stay(days) with Mannheim Peritonitis Index**

Duration of hospital stay(days)	<21(n=29)	21-27(n=19)	>27(n=25)	Total	P value
Mean \pm SD	9.41 \pm 3.05	14.26 \pm 3.09	15.88 \pm 8.23	12.89 \pm 6.09	0.0001 [‡]
Median (25th-75 th percentile)	8 (7-10)	15 (12-16.5)	18 (10-24)	12 (8-17)	
Range	5-17	7-18	2-30	2-30	

[‡] Kruskal Wallis test



DISCUSSION

Mortality in patients with peritonitis remains high; various multi centric studies insist this reality. Numerous factors accountable for this are kind of fundamental pathology, condition of the patient, nature of treatment offered to the particular patient.

Hence it is difficult to foresee the prognosis in these patients. The disease process of peritonitis is complex in nature, to understand this scoring system which provides objective description of patient 's condition at point is needed⁽²⁸⁾

Mannheim Peritonitis Index was initially developed from information gathered from 1253 patients with peritonitis treated between 1963 and 1979, and was produced by discriminate investigation of 17 conceivable risk factors, by Wacha.

8 of these were of prognostic pertinence and are as of now utilized broadly to predict mortality from peritonitis. The information is collected at the time of admission and first laparotomy.

Since the publication of MPI, every one of the examinations attempted to approve Mannheim peritonitis index including our investigation demonstrate a noteworthy ascent in death rate over the basic score of 27. At the point when ordered in three groups, the most reduced mortality was seen in <21 score and the most elevated with scores >27 ($p < 0.001$).

Although expanding score predicts expanding mortality, it ought to be noticed that still a death rate makes due with scores over 27 among deceased patients.

CONCLUSION

MPI score is highly associated with mean duration of hospital stay of the patients. In present study we found that hospital stay was high in patients with high MPI score.

MPI is disease particular, simple scoring system for anticipating the mortality in patients with secondary peritonitis. Expanding scores are related with poorer prognosis, needs intensive management and henceforth it is ought to be utilized routinely in clinical practice.

MPI scoring system is a simple and effective tool for assessing this group of patients, and can be used as a guiding tool to decide on the management of the patient after the definitive procedure is done. Among the various variables of the scoring system duration of pain, organ

failure on presentation and presence of feculent exudates had a significant hand in predicting the eventual outcome of the patient.

Increasing scores are associated with poorer prognosis, needs intensive management and hence it should be used routinely in clinical practice

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