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# A proposal for a preoperative clinical scoring system for acute cholecystitis



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## ARTICLE INFO

### Article history:

Received 7 July 2015

Received in revised form

30 August 2015

Accepted 3 September 2015

Available online 9 September 2015

### Keywords:

Acute cholecystitis

Preoperative clinical score

Gallbladder wall thickness,  
elevated CRP

High white blood count

Laparoscopic cholecystectomy

## ABSTRACT

**Background:** Acute cholecystitis is a common diagnosis for which surgery is usually indicated. However, the heterogeneity of clinical presentation makes it difficult to standardize management. The variation in clinical presentation is influenced by both patient-dependent and disease-specific factors. A preoperative clinical scoring system designed to include patient-dependent and clinical factors might be a useful tool in clinical decision making.

**Methods:** The data of patients undergoing laparoscopic cholecystectomy for acute cholecystitis in a university hospital were retrospectively reviewed. Patient-dependent factors (age, sex, body mass index, and American Society of Anesthesiologists score) and disease-specific factors (history of biliary colics, white blood count, C-reactive protein, and gallbladder wall thickness) were used to compute a clinical score between zero and nine for each patient. Cholecystitis was classified as mild (score  $\leq 3$ ), moderate ( $4 \leq \text{score} \leq 6$ ), or severe (score  $\geq 7$ ).

**Results:** Cholecystitis was mild in 45 cases, moderate in 105 cases, and severe in 27 cases.

Among patient-dependent factors, the male gender, age  $>65$  y, and American Society of Anesthesiologists score  $>2$  correlated significantly with high scores,  $P = 0.001$ . Equally, high white blood count, elevated C-reactive protein, and gallbladder wall thickness  $>4$  mm correlated significantly with high scores,  $P = 0.001$ . These findings were confirmed on multivariate analyses. High scores correlated significantly with the duration of surgery ( $P = 0.007$ ), the need of intensive care unit management ( $P = 0.001$ ) and the length of stay ( $P = 0.001$ ). However, there was no significant association between the preoperative score and the rate of conversion ( $P = 0.103$ ) or the rate of complication ( $P = 0.209$ ).

**Conclusions:** This preoperative clinical scoring system has a potential to select patients with severe cholecystitis and therefore might be a useful tool in clinical decision making.

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## 1. Introduction

Acute cholecystitis (AC) is a frequent reason for a visit to the emergency department. Although surgery is generally accepted as the main stay of treatment, the divergence in the clinical presentation of AC renders the standardization of

treatment difficult. Being able to determine the preoperative extent of gallbladder inflammation might facilitate the clinical decision making.

The clinical presentation, disease course and outcome of AC might be influenced by both patient-dependent and clinical factors. Advanced age at the time of surgery, male gender,

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<http://dx.doi.org/10.1016/j.jss.2015.09.010>

concomitant conditions, body mass index (BMI), gallbladder wall thickness, recurrent biliary colics, elevated C-reactive protein (CRP), high white blood count (WBC), and the extent of gallbladder inflammation have been confirmed as risk factors for complications in patients undergoing laparoscopic cholecystectomy (LC) [1–9].

The Tokyo Guidelines of 2007 and the updated version of 2013 (TG13) provide recommendations for the diagnosis and severity grading of acute cholangitis and cholecystitis. The TG13 uses clinical data, findings from blood chemistry, and abdominal ultrasound sonography to classify AC into three severity grades [10–12]. Our experience with patients presenting with AC suggests that the clinical decision making should be individualized, owing to the heterogeneity of presentation. Therefore, a preoperative clinical severity grading system for AC should be designed to include both patient-dependent and clinical parameters.

The aim of this study was to design a preoperative clinical scoring system for acute cholecystitis. This preoperative clinical scoring system was designed by computing patient-dependent and clinical risk factors for complications after LC for AC and might be helpful in the clinical decision making and comparison of outcomes.

## 2. Methods

This study was approved by the ethics committee of the Witten–Herdecke University. A retrospective review of our departmental database for patients undergoing LC for AC within a 3-y period from January 2012 until December 2014 was performed. Patients were consecutively recorded after presentation in the emergency department. Findings from clinical examination, abdominal ultrasound sonography, and blood chemistry were used to diagnose AC as outlined in the Tokyo Guidelines [10–12].

As part of our institutional standards, all patients with AC were put on intravenous antibiotics usually Tazobactam. A same “admission cholecystectomy policy” is maintained in our department. Thus, surgery was scheduled as soon as possible depending on the presence or absence of comorbidities with the need for special consultation. Patients classified as “unfit for surgery” were conservatively managed with antibiotics, pain medication, and bowel resting. In such cases, elective cholecystectomy was offered about 6 wk after “cooling off” the acute episode.

Laparoscopic cholecystectomy is a standard procedure in our department. In all cases, LC was performed using four trocars. Surgery began with the placement of a 12-mm trocar after a supra-umbilical incision. Surgery proceeded with the placement of an 11-mm trocar in the epigastrium slightly to the left of middle line and two 5-mm trocars in the right upper abdomen under visual control. The leading surgeon was an attending surgeon with expertise in laparoscopy. Single shot antibiotic was administered before incision depending on the time interval between the last antibiotic application and begin of surgery. The gallbladder was removed via the supra-umbilical incision using an endobag. Histopathology was performed in all cases.

Demographic data including age, sex, BMI and comorbidities as defined by the American Society of Anesthesiologists (ASA) at the time of surgery were retrieved for each patient. History of gallbladder complaint, for example, upper abdominal colics was recorded. Preoperative data including WBC, CRP, and sonographic gallbladder wall thickness were recorded for each patient. Postoperative data including the duration of surgery, rate of conversion, complications, management in the intensive care unit, mortality, and the length of stay (LOS) were recorded for each case. The final histopathology records were consulted for the extent of gallbladder inflammation. Gallbladder inflammation was classified as “uncomplicated” or “complicated”. Uncomplicated cholecystitis was defined as gallbladder edema with acute inflammation and the presence of neutrophilic granulocytes. Complicated cholecystitis included empyematous cholecystitis (AC with gallbladder empyema), necrotizing cholecystitis (total necrosis of all layers of gallbladder wall), or gangrenous cholecystitis (loss of mucosal lining and vascular architecture with profound inflammation).

We used known risk factors for complications after LC for AC to design this clinical scoring system, Table 1. Using this system, a clinical score in the range from 0–9 was calculated for each patient included.

The Statistical Package for Social Science, IBM, version 22, was used to analyze the collected data. Continuous variables were described using absolute case numbers and percentages. As the data was normally distributed, central tendencies were described using mean values with the corresponding standard

**Table 1 – Parameters used for the development of this clinical severity score.**

Parameters	Score
Patient-dependent parameters	
Sex	
Female	0
Male	1
Age (y)	
≤65	0
>65	1
BMI	
≤30 kg/m <sup>2</sup>	0
>30 kg/m <sup>2</sup>	1
ASA score	
1–2	0
3	1
>3	2
Clinical parameters	
Recurrent colics	
Yes	1
No	0
Gallbladder wall thickness	
≤4 mm	0
>4 mm	1
WBC	
≤12.000	0
>12.000	1
CRP	
≤5	0
>5	1

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