INVITED ARTICLE

Classification Schemes for Acute Cholecystitis

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Received on: 15 September 2022; *Accepted on:* 10 October 2022; *Published on:* 31 December 2022

Abstract

The impact of the increasing burden of emergency general surgery (EGS) cannot be understated. Each year, millions of patients will present to the hospital with a condition that will require an emergency operation. Over the past 2 decades, there has been a steady increase in this patient volume. Both calculous and acalculous cholecystitis account for 12% of the entire EGS population, making laparoscopic cholecystectomy one of the most commonly performed operations. With increased scrutiny of operating room utilization and postoperative complications, it has become imperative to be able to qualify disease severity and risk-adjust patients in order to accurately compare outcomes. We recognize that not all cholecystitis is created equal, with the spectrum running from minimal to no inflammation in symptomatic cholelithiasis to perforated gangrenous cholecystitis adhered to the duodenum. Such high variance calls for a reliable cholecystitis scoring system to allow the surgical team to properly educate the patient on their risks for complications, prepare for operative time, and appropriately analyze outcomes. This article will review the three predominant scoring systems for acute cholecystitis—the Tokyo grading scale, the American Association for Surgery of Trauma (AAST) grading scale, and the Parkland grading scale (PGS) for cholecystitis to review their development, strengths, and weaknesses.

Keywords: American Association for Surgery of Trauma grade, Cholecystitis, Cholecystitis grading scale, Emergency surgery, Parkland grading scale, Tokyo Guidelines.

Panamerican Journal of Trauma, Critical Care & Emergency Surgery (2022): 10.5005/jp-journals-10030-1394

Introduction

Acute cholecystitis is one of the most common surgical problems encountered by general and acute care surgeons. This should be of no surprise as greater than 20 million individuals in the United States have gallstone disease, with an annual incidence of acute cholecystitis affecting approximately 200,000 people.[1] Furthermore, there is a smaller but relevant portion of the population that suffers from acalculous cholecystitis, which contributes to the overall disease burden.[2] Taken together, cholecystitis accounts for 12% of the entire EGS disease burden.[3] The standard of care for acute cholecystitis is laparoscopic cholecystectomy, a cornerstone of EGS. However, we recognize that there is a range of inflammation and anatomic variability associated with acute cholecystitis, which alters the degree of difficulty for cholecystectomy, the duration of operation, and the rates of postoperative complications. Such high variance calls for a reliable scoring system to allow the surgical team to properly educate the patient on their risks for complications, prepare the surgical team for the operative time and the potential need for assistance or conversion, and appropriately analyze outcomes. In today's environment of publicized complication rates, it is important that there is a modality to appropriately risk-adjust operations to allow for equitable comparison of outcomes among cholecystectomies with similar severity of the disease. Additionally, it is conceivable that a validated scoring system could provide the required documentation to allow for increased reimbursement rates for operations performed in patients with the most severe, that is, higher grade, cholecystitis.

When considering what an optimal grading scale should encompass, there are a few standards that should be met. A good scoring system should (1) cover the spectrum of disease but not be so broad that it is cumbersome to remember, (2) be directly relatable to outcome comparisons, including clinical outcomes and hospital metrics, (3) have high interrater reliability among users, and (4) allow for the potential preemptive change in therapeutic interventions.

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How to cite this article: Cripps MW, Weber NT. Classification Schemes for Acute Cholecystitis. Panam J Trauma Crit Care Emerg Surg 2022;11(3):139–144.

Source of support: Nil

Conflict of interest: None

In this review article, we will evaluate and describe the current major grading systems for acute cholecystitis to help the reader better understand the history, strengths, and weaknesses of these scales.

Tokyo Guidelines (TG) for Acute Cholecystitis and Cholangitis

All the major grading scale systems attempt to classify cholecystitis based on the ability to categorize the grades of inflammation. The TG were the initial attempts to help both diagnose and quantify the severity of cholecystitis, as the definitions up until then had been somewhat ambiguous. Subsequent scales have focused more on the delineation of an assigned grade by the severity of the disease, as opposed to diagnosis and severity assessment.

The TG for acute cholangitis and cholecystitis were initially published in 2007. Specifically for acute cholecystitis, the guidelines assigned three categories of severity derived from the diagnostic criteria that included mild, moderate, or severe. Both the diagnostic criteria and the grading scale were based on a systematic review

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of the available evidence at the time, and the experts' consensus was achieved at the International Consensus Meeting for the Management of Acute Cholecystitis and Cholangitis, held on 1st–2nd April 2006, in Tokyo.[4]

The diagnostic criteria of the TG are based on a combination of local and systemic signs of inflammation as well as imaging and clinical suspicion (Table 1). The local signs are (1) temporary cessation of breathing due to pain when palpating the right upper quadrant (RUQ) during expiration, classically referred to as Murphy's sign or (2) a mass, pain, or tenderness in the RUQ. Of note, local signs of inflammation are based solely on physical exam findings. The second component of the Tokyo scale is systemic inflammation, which is identified by objective physical exam, laboratory, or radiologic findings. These include fever, increased C-reactive protein (CRP) or white blood cell (WBC), or imaging showing inflammation around the gallbladder. In the 2007 edition, when a patient has a finding in each of the local and systemic findings groups, then the patient has a diagnosis of acute cholecystitis. Additionally, in the 2007 guidelines, there is another pathway to which a diagnosis of cholecystitis could be made. If the patient has clinical suspicion of cholecystitis and it is confirmed by radiologic findings, then the diagnosis of cholecystitis is definitive. The imaging studies listed in the guidelines included ultrasound, magnetic resonance imaging, computed tomography, and Tc-hepatobiliary iminodiacetic acid scan. Thus, a patient may arrive at a diagnosis of acute cholecystitis *via* two pathways. This ambiguity in diagnosis will lead to slight changes in the 2013 revision.

The assessment of the severity of cholecystitis by the Tokyo scale is separated into mild, moderate, and severe (Table 2). The lowest severity is defined as mild (grade I) acute cholecystitis. This is simply an acute cholecystitis that does not meet the criteria for moderate or severe cholecystitis or acute cholecystitis in an otherwise healthy patient. Moderate (grade II) acute cholecystitis is defined by having any one of the following conditions: elevated WBC, palpable tender mass in the RUQ, duration of complaints for greater than 72 hours, and marked local inflammation (biliary peritonitis, pericholecystic abscess, hepatic abscess, gangrenous cholecystitis, or emphysematous cholecystitis). Severe (grade III) acute cholecystitis is acute cholecystitis with accompanying organ dysfunction (cardiovascular, neurological, respiratory, renal, hepatic, or hematologic).

The TG Revision Committee met again at their predetermined 5-year review of the 2007 guidelines, which resulted in the publication of the 2013 TG (TG13).[5,6] The goal of the revision was to aim for better specificity and higher diagnostic accuracy. During the committee's internal review of the 2007 guidelines, there was a concern about the ambiguity and difficulty of use due to the two pathways for which a definitive diagnosis could be made. Furthermore, they concluded that the first pathway to define a definitive diagnosis (using one criterion from local and systemic signs of inflammation each) was not supported in current practice and determined that only positive diagnostic imaging could result in a definitive diagnosis. This led to the change in the TG13 guidelines to state that when one item in both A and B were positive, it was only considered a "suspected diagnosis of cholecystitis" and could only be a "definitive diagnosis" when imaging was supportive of acute cholecystitis. The TG13 authors proposed that these clarified definitions of diagnostic criteria would have improved specificity rates than the 2007 TG (TG07) definitions. Some of the support for these changes included a multi-institution retrospective study that found a high sensitivity for gallbladder wall thickening (92.3%) and low sensitive rates for RUQ abdominal mass (0.8%).[7]

When reviewing the severity assessment of the TG07 guidelines, the TG13 committee reported that an increasing mean length of hospital stays correlated with increasing TG07 severity. Furthermore, they found no contradictory data that would suggest the need to significantly alter the severity criteria.[6] As such, the committee only made minor changes to the description of grade III severity in TG13. Specifically, it was decided that because dopamine and norepinephrine were both considered as evidence of cardiovascular dysfunction in the Sequential Organ Failure Assessment scoring system, these criteria would also be included in the definition of cardiovascular dysfunction in the grading scale.[8]

After the publication of the TG13 guidelines, there were multiple studies done to correlate the effect of the guidelines on outcomes, with most studies focusing on the assignment of severity. For example, one multicenter retrospective study was performed in Japan and Taiwan.[9] The main outcome variable was the 30-day overall mortality rate, which was reported to be 1.1% for grade I, 0.8% for grade II, and 5.4% for grade III. With respect

Table 1: TG07 diagnostic criteria for acute cholecystitis. Note that in the 2013 update of the TG, a "definitive diagnosis" of cholecystitis could only be made with imaging findings

A. Local signs of inflammation
• Murphy's sign • RUQ mass/pain/tenderness
B. Systemic signs of inflammation
• Fever • Elevated CRP • Elevated WBC
C. Imaging findings: imaging findings characteristic of acute cholecystitis
Definitive diagnosis
• One item in A and one item in B are positive
• C confirms the diagnosis when acute cholecystitis is suspected clinically

Table 2: Criteria for mild (grade I), moderate (grade II), and severe (grade III) acute cholecystitis

Criteria for mild (grade I) acute cholecystitis
Does not meet criteria of moderate (grade II) or severe (grade III) acute cholecystitis or acute cholecystitis in a healthy patient with no organ dysfunction and only mild inflammatory changes in the gallbladder, making cholecystectomy a safe and low-risk operative procedure
Criteria for moderate (grade II) acute cholecystitis
Accompanied by any one of the following conditions:
• Elevated WBC count (>18000/mm^3)
• Palpable tender mass in the right upper abdominal quadrant
• Duration of complaints >72 hours
• Marked local inflammation (biliary peritonitis, pericholecystic abscess, hepatic abscess, gangrenous cholecystitis, and emphysematous cholecystitis)
Criteria for severe (grade III) acute cholecystitis
Accompanied by dysfunctions in any one of the following organs/systems:
• Cardiovascular dysfunction (hypotension requiring treatment with dopamine >5 µg/kg per min, or any dose of dobutamine)
• Neurological dysfunction (deceased level of consciousness)
• Respiratory dysfunction (PaO_2/FiO_2 ratio <300)
• Renal dysfunction (oliguria, creatinine >2.0 mg/dL)
• Hepatic dysfunction (PT-INR >1.5)
• Hematological dysfunction (platelet count <100,000/mm^3)

to the surgical procedures, laparoscopic cholecystectomy was performed for grade I patients ($p < 0.001$), and the higher the grade, the more likely open surgery would be selected ($p < 0.001$). Another such retrospective study evaluated 445 patients with acute cholecystitis and found that increasing severity was associated with statistically significant increased length of stay, conversion to open, and operative duration ($p = 0.001$ for all).[10] When the next predetermined 5-year review occurred, the group identified 216 studies, including 19 randomized controlled trials, that had been done evaluating the TG. Most of the studies showed reasonable use of the grading scale and found that outcomes such as length of hospitalization and conversion to laparotomy were significantly higher in the higher grades. As a result of these multiple studies of positive association, the diagnostic criteria and grading scale remained unchanged for TG 2018. The committee reported that the grading scale is most appropriately used to predict prognosis.[11]

Overall, the strengths of the TG severity assessment lie in a long history of review and revision of their initial reports. Subsequent analyses show that higher grades are associated with increased hospital stay and conversion to open operations. However, their severity assessment has been criticized for being relatively non-descript of the spectrum of cholecystitis.

American Association for Surgery of Trauma Grading Scale

The impact of the increasing burden of EGS cannot be understated. In 2012, an analysis of the Agency for Healthcare Research and Quality's Nationwide Inpatient Sample reported that EGS accounted for over 27 million hospital admissions which is over 7% of all hospitalizations and about a quarter of these patients required an operation. These numbers are likely to continue to increase.[12] In response to these growing needs, the AAST convened a Committee on Severity Assessment and Outcomes to make a clearer definition of EGS and develop a grading system for common EGS diseases.[13] The AAST recognized that as the population and EGS cases increase, it will become increasingly important to be able to accurately qualify disease severity and risk-adjust patients in order to accurately compare outcomes across the nation.

The AAST committee followed the philosophy that to accurately measure disease severity, it would need to consider the anatomic severity, physiologic severity, comorbidity or preexisting conditions, and age of the patient. The AAST scales were developed in a similar fashion to the organ injury scale and tumor nodes metastases system for staging various types of cancer based on tumor size, node status, and metastatic disease in that there is a general model that would then be applied to specific pathologies. In their initial effort, the AAST published grading systems for eight gastrointestinal conditions commonly encountered in EGS (appendicitis, acute colonic diverticulitis, acute cholecystitis, intestinal obstruction, abdominal wall hernias, acute pancreatitis, acute arterial mesenteric ischemia, and perforated peptic ulcer). They have subsequently published scales for eight other EGS conditions.

The AAST Committee on Patient Assessment and Outcomes held a series of meetings and conference calls between 2012 and 2013 to prepare this grading system for EGS diseases.[13] In an effort to be holistic in the categorization of EGS diseases, the descriptions and grades were specifically defined using findings derived from four distinct categories: (1) clinical, (2) imaging, (3) operative, and (4) pathologic. Furthermore, in situations where the grade differed between the categories (i.e., the imaging was more severe than the clinical), then the highest grade would then be used as the final grade.[14] The AAST deliberately avoided including operative intervention in the grading scale in an effort to measure severity at the time of patient presentation, regardless of the decision to operate.

Table 3 shows the uniform five-tiered grading system for measuring the anatomic severity of disease in EGS and the application of the system with the lowest grade signifying disease limited to the organ of origin and progressing to widespread disease. For acute cholecystitis specifically, grade I is acute cholecystitis, and grade II is gangrenous or emphysematous cholecystitis. The third, fourth, and fifth grades are all variations of gallbladder perforation, separated by associated conditions such as local contamination, abscess or fistula, or generalized peritonitis to determine the grade (Table 3). Again, the final grade would be assigned based on the highest severity of clinical, imaging, operative, or pathologic.

Vera *et al*. were the first to attempt to validate the AAST scoring system in a retrospective analysis of 315 patients and found that only 6% of patients with cholecystitis fell into grades III–V (5% grade III, 1% grade IV, and 0% grade V). Of note, though the LOS, hospital readmission, and death all increased with increasing grades. However, they were not able to correlate other complications with increasing AAST grade.[15] Another single-center retrospective study compared the AAST to the TG in 443 patients. In this analysis, 302 patients (68%) were grade I or II. Similar to the Vera et al. study, they were able to show a positive correlation with postoperative complications and increasing AAST score with grade III cholecystitis having an odds ratio (OR) of 3.2 (1.4–5.2), grade IV an OR of 4.5 (3.3–7.7), and grade V an OR of 8.6 (6.1–10.4). There was also an association between increased conversion rates with increased AAST score [OR 4.9; 95% confidence

Table 3: AAST disease grade description (general description and description specific to acute cholecystitis)

	American Association for the Surgery of Trauma disease grade description (general description for EGS)	*Acute cholecystitis*
Grade I	Local disease	Acute cholecystitis
Grade II	Confined to the organ Minimal abnormality Local disease	Gallbladder empyema or gangrenous cholecystitis or emphysematous cholecystitis
Grade III	Confined to the organ Severe abnormality Local extension beyond the organ	Gallbladder perforation with local contamination
Grade IV	Regional extension beyond the organ	Gallbladder perforation with pericholecystic abscess or gastrointestinal fistula
Grade V	Widespread extension beyond the organ	Gallbladder perforation with generalized peritonitis

interval (CI) 2.3–7.1]. Furthermore, the area under the curve (AUC) comparison of AAST to TG showed that the AAST outperformed the TG in mortality, overall complications, and cholecystostomy use.[16]

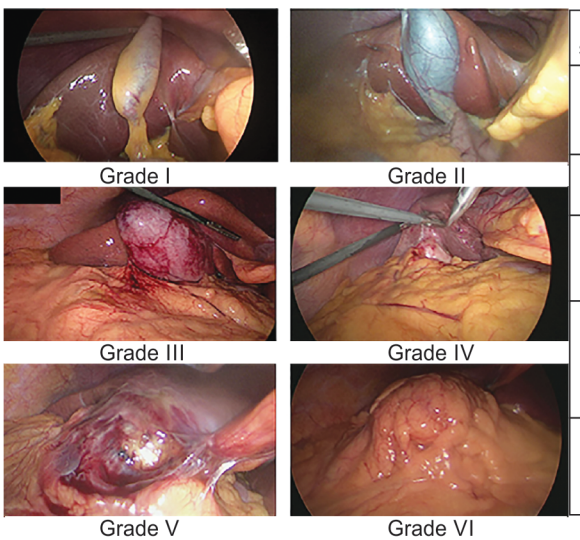
The AAST excels in its efforts to be comprehensive in its scoring methodology, and studies report positive correlations with outcomes, including one demonstrating superiority to the TG. However, in the cholecystitis-specific grading scale, there is a significant weakness in its anatomic description. This is clearly demonstrated by the overwhelming majority of patients failing to be classified as higher than a grade III.

Parkland Grading Scale for Cholecystitis

The acute care surgical team at Parkland Memorial Hospital devised their own grading scale published in 2018.[17] As opposed to the other scoring systems, which use a combination of physical exam findings, preoperative laboratory values, and/or pathology reports to predict severity and outcomes, the Parkland team took advantage of the technologic ability to routinely capture and store hundreds of intraoperative images of cholecystitis. They then used these images to develop their scale with a primary focus on the severity of inflammation across the spectrum of cholecystitis. The PGS studies are then a stepwise report of the method of development, determination of interrater reliability, comparison of postoperative complications, and finally, efforts to determine what preoperative values correlate with the defined grades.

In their initial manuscript, Madni et al. described the PGS as a five-tiered, operative-based scale focusing on the severity of inflammation with some inclusions for abnormal anatomy. The grading scale was developed around the concept of the "initial view" of the gallbladder. That is, what are the laparoscopically visualized characteristics of the gallbladder when it is initially retracted cephalad. For those gallbladders that are initially completely covered in reactive inflammatory tissue (i.e., omentum, adhered bowel) and cannot be retracted cephalad, this is considered the initial view (Fig. 1). Grade I in the PGS is a gallbladder that shows very little, if any, inflammation and is colloquially referred to as the "robin's egg blue" gallbladder. Grade II has a little more evidence of inflammation which can be seen when there are some adhesions to the gallbladder from the omentum or duodenum but no further up the gallbladder than the neck. Grade III has significantly more evidence of inflammation, as seen when the omental adhesions are up to the body of the gallbladder but not obscuring it or if there is pericholecystic fluid visualized in the operation. An injected or severely distended gallbladder could also qualify as grade III. After grade III, there is significantly more inflammation, to which the authors have since referred to as severe acute cholecystitis. In grade IV, the omentum near obscures most of the gallbladder, but the dome can still be seen. Additionally, if there is inflammation, such as that seen in grades I–III AND/OR anatomic abnormality (i.e., intrahepatic gallbladder, Mirrizi, etc.), this would also be grade IV. The most severe PGS grade is grade V. These gallbladders are entirely encased by the omentum or show evidence of perforation/necrosis/gangrene. To determine if this scoring system was easily usable by surgeons, Madni et al. prepared multiple images of various gallbladders with varying degrees of inflammation. These images were assigned a grade by the creators of the scoring system and then they were blindly evaluated by several other acute care surgeons. The result showed an interrater reliability index of 0.804 (95% CI: 0.733–0.867; $p = 0.0001$), considered an excellent level of agreement between surgeons. Furthermore, there was a complete pathologic agreement with gangrenous cholecystitis, as this was only found in those patients with grade V cholecystitis.[17]

In their initial publication, the Parkland group reported some trends in age, preoperative labs, and outcomes associated with grades of cholecystitis, but that study was retrospective and not adequately powered to detect these differences. In 2019, they published their prospective analysis of the PGS to address a few of these weaknesses. In this study, they had surgeons prospectively grade the severity of cholecystitis and then had a separate group of surgeons grade the images in a retrospective, controlled fashion, and once again, found a very high intraclass correlation coefficient (ICC) of 0.812 (95% CI: 0.762–0.8636, $p = 0.0001$) thereby demonstrating solid prospective reliability. They also found a significant 10–21% increase in operative time between adjacent grades. There was also a large difference between the lowest and highest grades, with the mean operative time for a grade I cholecystectomy taking 63.31 ± 22.46 vs 108.13 ± 41.67 minutes for a grade V cholecystectomy ($p = 0.0001$). Additionally, there was a similar increase in a Likert-type scale of operative difficulty that increased at a similar rate to the PGS score ($p = 0.0001$). Finally, there



Cholecystitis severity grade	Description of severity
I	Normal appearing gallbladder ("Robin's egg blue") • No adhesions present • Completely normal gallbladder
II	Minor adhesions at neck, otherwise normal gallbladder • Adhesions restricted to the neck or lower of the gallbladder
III	Presence of ANY of the following: • Hyperemia, pericholecystic fluid, adhesions to the body, distended gallbladder
IV	Presence of ANY of the following: • Adhesion obscuring majority of gallbladder • Grade I–III with abnormal liver anatomy, intrahepatic gallbladder, or impacted stone (Mirrizi)
V	Presence of ANY of the following: • Perforation, necrosis, inability to visualize the gallbladder due to adhesions

Fig. 1: The PGS for cholecystitis

was an increased rate of complications that were directly related to rising PGS grades, as well.[18]

After this single institution prospective validation, the Parkland group then proceeded to publish their comparison of the PGS vs the AAST scale for cholecystitis (AAST-C) in a single institution study in 179 laparoscopic cholecystectomies. In this study, surgeons were assigned a PGS and an AAST-true grade. As a reminder, the AAST scale assigns four separate scores to a patient from clinical, imaging, operative, and pathologic categories. Once each score is determined, the highest of these four scores becomes the overall true AAST grade, labeled as AAST-true. The PGS scale, once again, had an excellent ICC of 0.8647. There was a wide range of ICC among the AAST-C components, from low in the clinical category (ICC = 0.3472) to high in the imaging category (ICC = 0.9243), with an excellent overall AAST-true ICC of 0.8341. The PGS outperformed the AAST in predicting OR difficulty (R^2 of 0.566 vs 0.202) and case length (R^2 of 0.217 vs 0.037), but were similar in predicting length of stay (AUC of 314.01 vs 318.86). Furthermore, the PGS was a better predictor of conversion to open cholecystectomy (AUC, 0.903 vs 0.756), partial cholecystectomy (AUC, 0.878 vs 0.833), and overall complication rates (AUC, 0.703 vs 0.647).[3]

In an external evaluation of the PGS, multiple studies have confirmed similar results. Abdul Razack et al. found that increasing grade (PGS) is significantly associated with an increased difficulty of surgery, conversion rates, length of the operation, and incidence of postoperative bile duct leak.[19] In another study of 178 patients, Baral et al. also found preoperative WBC, conversion to open, subtotal cholecystectomy, length of surgery, and postoperative bile leak all significantly increased with increasing grades.[20] Lee et al. also found a positive correlation between outcomes and increasing PGS, as well as delineating grades IV and V as severe acute cholecystitis.[21]

The PGS seems to demonstrate in several studies a strong ability to predict OR times, conversion rates, and complications. However, the main Achilles' heel of the PGS is a completely intraoperative-based scale and is unusable in the preoperative assessment and nonoperative management of cholecystitis. Thereby, it does not assist in the ability to educate the patient on the risks of operation or allow for potential changes in therapeutic interventions.

American Association for Surgery of Trauma Multicenter Trial Comparing Cholecystitis Grades

In 2020, a coalition of eight trauma centers reported on their multicenter, prospective trial comparing the three predominant cholecystitis grades—the Tokyo grading scale, the AAST-C, and the PGS.[22] A total of 861 patients were entered into the study, of which 781 underwent a cholecystectomy. This study confirmed some of the major criticisms of each of the scales. For the TG, nearly a third did not meet the criteria for acute cholecystitis and had to be assigned a grade 0. The PGS did not allow for any preoperative determination of grade and is not applicable to those who are managed nonoperatively. Additionally, the PGS was not assigned prospectively to all patients. Therefore, there were two categories for PGS—a prospective and retrospective assignment. The AAST-C was shown to have poor discrimination across the inflammatory spectrum, with 89% of patients being assigned to grade II.

All three scoring systems showed some correlation between the increasing grade of severity and postoperative complications. With regards to outcome measures, which included all-cause complications, mortality, bile leak, bail-out operation, conversion to open, OR time, and discharge home, the prospective Parkland Grade outperformed the AAST and TG with respect to all outcomes except for mortality (not enough occurrences in the prospective Parkland Grade) and discharged home. Furthermore, the Parkland prospective had excellent results with high AUCs for most categories. For example, the AUC for complications was 0.599 for the AAST and 0.720 for the Parkland prospective, $p = 0.005$, and for conversion to open, it was 0.603 for the AAST and 0.844 for the Parkland prospective, $p < 0.001$. There were some centers during the trial that attempted to assign a PGS to the gallbladder in a *post hoc* fashion, that is, from the operative reports. It is not surprising to note that when this method was employed, the PGS did not perform as well, as it was always intended to be a prospective visually assigned grade. However, it does highlight the importance of assigning the PGS in real-time during the operation.

Post-MIT Updates

This dataset has been utilized to help improve the PGS scale and the AAST scale to address some of their inherent weaknesses. The PGS team is attempting to address the lack of adequate preoperative assignment of PGS. Whereas other grading scales have essentially taken a linear risk factor approach to assign risk for severe cholecystitis, the PGS authors utilized a similar strategy to Sangji et al.[23] in their EGS risk factor scoring system but is focused solely on acute cholecystitis instead of all EGS disease processes. This method resulted in the severe acute cholecystitis score, presented at the 2021 AAST and showed reasonable predictive capability for patients with severe acute cholecystitis (PGS grade IV or V).

Using a Delphi methodology, the AAST revised their grade to improve distribution across grades. The new grading scale was applied to the 861 patients' data collected from the original multi-institutional trial. The revised AAST showed a more normal distribution across the grades, and the revision outperformed the original AAST score but still failed to outperform the Parkland Grade or the emergency surgery score. It appears that the ongoing issue with the AAST grade is it is primarily an anatomic grading scale.[24]

Conclusion

Emergency general surgery is steadily headed toward becoming the predominant surgical problem facing hospitals. The ability to risk adjust these patients is going to be critical for outcomes comparisons, research, and reimbursement. With cholecystitis accounting for a significant portion of these patients, the development of an accurate and predictive grading scale is imperative. The PGS appears to be the overall best grading system across multiple outcomes.[22,24] It still suffers from an inability to be assigned in nonoperative patients and lacks a preoperative ability to predict the grade. These are critically important in patient education and the determination of therapeutic interventions. Both the AAST and PGS will continue to revise their scale and likely incorporate concepts similar to the emergency surgery score in their future analyses.

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