



CANADIAN ASSOCIATION  
of GENERAL SURGEONS

20  
18

# Dynamic Practice Guidelines for Emergency General Surgery

Committee on Acute Care Surgery, Canadian Association of General Surgeons

# 5

## RISK PREDICTION

Dynamic Practice Guidelines for Emergency General Surgery

**Daniel Ben Lustig, MD, MSc, Monique Marguerie, MSc,**

**Melissa Hanson MD, Jacinthe Lampron MD**

Committee on Acute Care Surgery, Canadian Association of General Surgeons

# DIAGNOSTIC TESTING: PREDICTION SCORING

## Table of Contents

---

1. [Alvarado Score](#) (Appendicitis)
  2. [Glasgow-Blatchford Score](#) (UGIB)
  3. [Ranson's Criteria](#) (Pancreatitis)
  4. [BISAP Score](#) (Pancreatitis)
  5. [CT Severity Index – Balthazar Score](#) (Pancreatitis)
  6. [Sequential Organ Failure Assessment Score – SOFA](#)
-

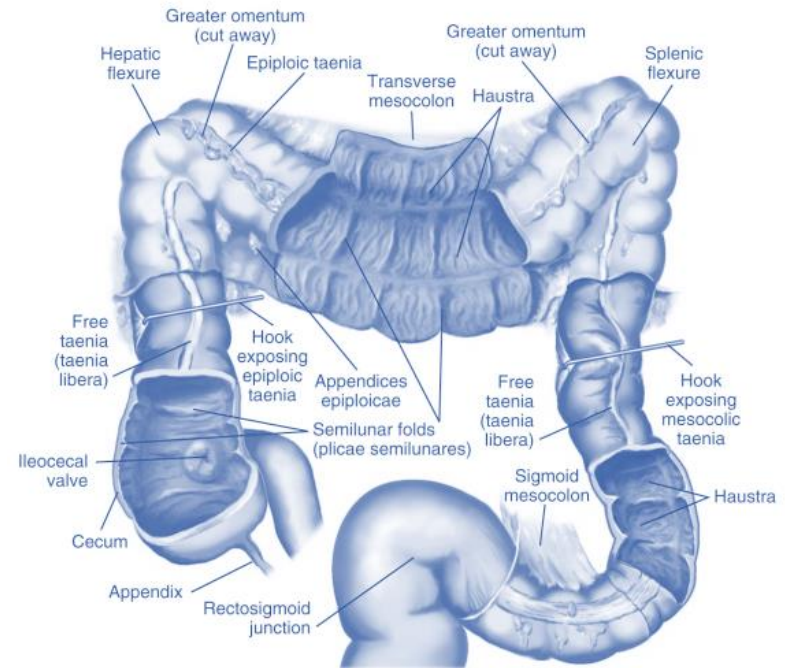
# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

### Definition:

Acute appendicitis remains one the most common global causes of acute abdominal pain requiring emergent surgical intervention. Approximately 7% will have acute appendicitis in their lifetime. Early recognition reduces the morbidity and mortality associated with complications including perforations or appendiceal abscesses (Addis et al. 1990).



# DIAGNOSTIC TESTING

## Prediction Scoring

---

[Return to Table of Contents](#)

### Alvarado Score (Acute Appendicitis)

The [Alvarado Score for acute appendicitis](#) is a validated scoring system that uses 8 predictive signs, symptoms and laboratory data to determine the likelihood that a patient in the emergency department presenting with abdominal pain has appendicitis.

# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

### Alvarado Score (Acute Appendicitis)

Signs	Points
Right lower quadrant tenderness	2
Elevated Temperature (> 37.3)	1
Rebound Tenderness	1

Symptoms	Points
Migration of Pain to the RLQ	1
Anorexia	1
Nausea or Vomiting	1

Lab Values	Points
Leukocytosis >10	2
Leukocyte Left Shift	1

#### Score:

0-3: Low risk, no indication for further imaging

4-6: Moderate risk, CT scans is useful to improve sensitivity/specificity

>7: Surgical consultation and likely appendectomy



# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

---

### Alvarado Score (Acute Appendicitis)

Several studies have evaluated the Alvarado score for ruling in or ruling out an appendicitis using different cut off scores with similar results.

**Low Risk:** A score of 3 or lower had a sensitivity of 96% for ruling out and thus there is no indication for CT. If no other cause is found they can generally be discharged if stable and advised to return to hospital if there is no improvement.

**Moderate Risk:** Scores between 4 to 6 (sensitivity 35.6% and specificity 94%); CT scans in this clinically equivocal group improves the sensitivity and specificity to 90.4% and 95% respectively. If clinically suspicious, admission is warranted for observation and serial examinations.

**High Risk:** Individuals with a score of 7 or higher typically requires surgical consultation and likely an appendectomy.

# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

Acute upper gastrointestinal bleeds (UGIB) are potentially life-threatening depending on the severity of the hemorrhage. Risk stratification for upper GI bleeding is important as it allows to identify patient's who would benefit from closer monitoring or more urgent investigation from those who may be safely discharged home and managed as outpatients.

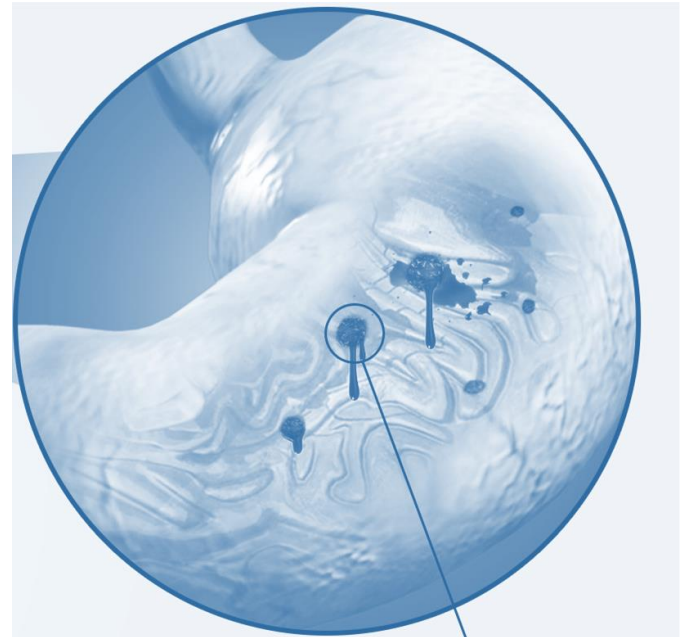


Image adapted from: [Link](#)



# DIAGNOSTIC TESTING

## Prediction Scoring

---

[Return to Table of Contents](#)

Multiple risk stratification scores have been proposed over the years with the [Glasgow-Blatchford Bleeding Score \(GBS\)](#) having the most evidence to identify patients with UGIB who can be safely discharged and managed on an outpatient basis. The GBS is a 9 variable scoring system that helps clinicians determine whether bleeding patients require admission to hospital and the likeliness of additional interventions including transfusions, endoscopy or surgery.

# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

### Glasgow-Blatchford Score (Upper GI Bleed)

Risk Factor		Score
BUN (mg/dL)	18.2-22.4	2
	22.4-28.0	3
	28.0-70.0	4
	>70.0	6
Hgb (g/L)	120-130	1 (0 for women)
	100-120	3 (1 for women)
	<100	6
SBP (mmHg)	100-109	1
	90-99	2
	<90	3
HR >100bpm		1
Melena		1
Syncope		2
Hepatic diseases		2
Heart Failure		2

#### Score:

0: Low Risk - Consider Outpatient Management (99.6% sensitive meaning most can be safely discharged home)

>1: High risk requiring hospital admission, consider ICU admission and urgent endoscopy

<2: 98% sensitive in ruling out death, re-bleeding and the need for intervention



# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

### Acute Pancreatitis

Acute pancreatitis is characterized by severe abdominal pain and elevated pancreatic enzymes. It is a leading cause of abdominal related hospitalizations and can lead to significant morbidity and mortality if left undiagnosed and untreated.

The BiSAP scoring system is a set of criteria used to predict the mortality risk in patients with acute pancreatitis based on 5 variables. Patients with 0 risk factors have a <0.1% risk of mortality, while people with all 5 risk factors have a 22.5% mortality risk.

# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

### Acute Pancreatitis

Acute pancreatitis is characterized by severe abdominal pain and elevated pancreatic enzymes. It is a leading cause of abdominal related hospitalizations and can lead to significant morbidity and mortality if left undiagnosed and untreated.

The BiSAP scoring system is a set of criteria used to predict the mortality risk in patients with acute pancreatitis based on 5 variables. Patients with 0 risk factors have a <0.1% risk of mortality, while people with all 5 risk factors have a 22.5% mortality risk.

# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

### Bedside Index for Severity of Acute Pancreatitis (BISAP) Score

Indicator	Parameters
BUN	> 25 mg/dL (8.9 mmol/L)
Impaired Mental Status	Abnormal mental status with a Glasgow coma score <15 (1 point)
SIRS	Evidence of SIRS (1 point)
Age	>60 years old (1 point)
Pleural Effusion	Imaging study reveals pleural effusion (1 point)

Score:

0-2 Points = Lower Mortality (< 2%)

3-5 Points = Higher Mortality (>15%)



# DIAGNOSTIC TESTING

## Prediction Scoring

---

[Return to Table of Contents](#)

### **Advantages of BiSAP Score in Acute Pancreatitis**

The BiSAP scoring system has been found to have similar accuracy when compared to the widely accepted APACHE-II through multiple independent studies showing its validity. The Ranson and APACHE II scoring systems are limited due to their complexity and numerous parameters that may not be routinely collecting during hospital admission.

# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

### Computed Tomography Severity Index (CTSI)

The Computed Tomography Severity Index (CTSI) for pancreatitis is another scoring system used to assess the severity of acute pancreatitis. This scoring system relies on CT scan findings with IV contrast and is the sum of two different scores: the Balthazar score, and pancreatic necrosis.



Balthazar EJ. 2002. [Radiology](#)

Image from: <https://radiopaedia.org/articles/acute-pancreatitis>

# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

### Computed Tomography Severity Index (Pancreatitis)

Pancreatitis Grading (Balthazar Score)	Score	Score:
Normal pancreas	0	<b>0-3</b>
Enlargement of pancreas	1	Mild Acute Pancreatitis
Inflammatory changes in pancreas and peripancreatic fat	2	<b>4-6</b>
Ill-defined single peripancreatic fluid collection	3	Mod. Acute Pancreatitis
Two or more poorly defined peripancreatic fluid collections	4	<b>7-10</b>
		Severe Acute Pancreatitis

Pancreatic Necrosis	Score
None	0
< 30%	2
30-50%	5
>50%	6



# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

### Ranson's Criteria (Non-Gallstone Pancreatitis)

#### Ranson's Criteria on admission

- Age > 55 yrs
- WBC > 16,000/ $\mu$ L
- Glucose > 11 mmol/L
- Serum LDH > 250 IU/L
- Serum AST > 250 IU/L

#### Score:

- 0-2 = 2% Mortality
- 3-4 = 15% Mortality
- 5-6 = 40% Mortality
- 7-8 = 100% Mortality

#### Ranson's Criteria after 48 hours of admission

- Fall in HCT by more than 10%
- Fluid sequestration of >6L
- Hypocalcemia (Serum Ca < 2.0 mmol/L)
- Hypoxemia (PO<sub>2</sub> < 60 mmHg)
- Increase in BUN to > 1.98 mmol/L (>5mg/dL) after IV fluid hydration/resuscitation
- Base deficit of > 4 mmol/L



# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

---

### Assessment of Sepsis

Sepsis is a life-threatening condition which occurs due to a dysregulated response to an infection resulting in injury to the body's own tissues and organs.

New definitions for sepsis and septic shock were suggested in February 2016 by a panel of experts from the Society of Critical Care Medicine and the European Society of Intensive Care Medicine who developed the Sequential Organ Failure Assessment (SOFA score). Organ dysfunction is suggested a SOFA score of 2 points or more. The SOFA score incorporates clinical assessment scores as well as laboratory assessment measures.

# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

### Sequential Organ Failure Assessment (SOFA) Score

Table 1. The Sequential Organ Failure Assessment (SOFA) Score\*

Variables	SOFA Score				
	0	1	2	3	4
Respiratory Pao <sub>2</sub> /Fio <sub>2</sub> , mm Hg	>400	≤400	≤300	≤200†	≤100†
Coagulation Platelets ×10 <sup>3</sup> /μL‡	>150	≤150	≤100	≤50	≤20
Liver Bilirubin, mg/dL‡	<1.2	1.2-1.9	2.0-5.9	6.0-11.9	>12.0
Cardiovascular Hypotension	No hypotension	Mean arterial pressure <70 mm Hg	Dop ≤5 or dob (any dose)§	Dop >5, epi ≤0.1, or norepi ≤0.1§	Dop >15, epi >0.1, or norepi >0.1§
Central nervous system Glasgow Coma Scale	15	13-14	10-12	6-9	<6
Renal Creatinine, mg/dL or urine output, mL/d	<1.2	1.2-1.9	2.0-3.4	3.5-4.9 or <500	>5.0 or <200

\*Norepi indicates norepinephrine; Dob, dobutamine; Dop, dopamine; Epi, epinephrine; and Fio<sub>2</sub>, fraction of inspired oxygen.

†Values are with respiratory support.

‡To convert bilirubin from mg/dL to μmol/L, multiply by 17.1.

§Adrenergic agents administered for at least 1 hour (doses given are in μg/kg per minute).

||To convert creatinine from mg/dL to μmol/L, multiply by 88.4.

[Click to Continue to Evaluation of SOFA Score](#)



# DIAGNOSTIC TESTING

## Prediction Scoring

[Return to Table of Contents](#)

### Sequential Organ Failure Assessment (SOFA) Score

*Evaluation of the SOFA Score*

