



World Society of the Abdominal Compartment Syndrome

Preliminary Consensus Definitions on Intra-Abdominal Hypertension (IAH) and Abdominal Compartment Syndrome (ACS): Results from the International ACS Consensus Definitions Conference

1. Intra-abdominal pressure (IAP) is the pressure concealed within the abdominal cavity. IAP varies with respiration. The normal adult IAP is around 5mmHg, but can be non-pathologically increased in the obese. Elevated IAP is a common finding among critically ill medical and surgical patients.
2. IAP should be expressed in mmHg (1 mmHg = 1.36 cm H₂O) and measured at end-expiration in the complete supine position after ensuring that abdominal muscle contractions are absent and with the transducer zeroed at the level of the mid-axillary line.
3. The current reference standard IAP measurement method is the pressure measured via an indwelling urinary drainage catheter within the bladder.
4. The recommended standard technique for measuring IAP is as follows: 1) connect the culture aspiration port of the urinary tubing to a transducer; 2) clamp the tubing distal to the aspiration port; 3) instil a maximal volume of 50 ml of sterile room temperature saline into the bladder with the patient in the complete supine position; 4) zero the transducer at the mid-axillary line; 5) after a stabilisation period of at least 30-60 seconds, mean IAP is read either on the bedside monitor or as the height of the urine column in the drainage tubing.
5. Abdominal perfusion pressure (APP) assesses not only the severity of IAP, but also the adequacy of the patient's systemic perfusion. APP = mean arterial pressure (MAP) – IAP.
6. Intra-abdominal hypertension (IAH) is the pathologic elevation of IAP. IAH is defined by a sustained or repeated IAP \geq 12 mmHg or an APP \leq 60 mmHg.
7. IAH may be graded as follows:

Grade I	IAP between 12-15 mmHg
Grade II	IAP between 16-20 mmHg
Grade III	IAP between 21-25 mmHg
Grade IV	IAP greater than 25 mmHg
8. According to the duration of symptoms, IAH may also be classified into two types:

Acute	IAH that develops within hours as a result of trauma or intra-abdominal hemorrhage, OR IAH that develops over a period of days as a result of sepsis, capillary leak, or critical illness.
Chronic	IAH that develops over months to years as a result of morbid obesity, intra-abdominal tumor, chronic ascites, or pregnancy, in which the abdominal wall adapts progressively to the increase in IAP allowing time for the patient to physiologically adapt to the elevated IAP.
9. Abdominal Compartment Syndrome (ACS) is present when organ dysfunction occurs as a result of IAH. ACS is defined by a sustained or repeated IAP \geq 20 mmHg and/or APP $<$ 60 mmHg in association with new-onset single or multiple organ system failure. In contrast to IAH, ACS is not be graded, but rather considered as an "all or nothing" phenomenon.
10. ACS may be further classified into three types:

Primary	ACS that develops due to conditions associated with injury or disease in the abdomino-pelvic region requiring emergent surgical or angioradiological intervention (damage control laparotomy, bleeding pelvic fractures, massive retroperitoneal hematomas, failed non-operative management) or following elective abdominal surgery (secondary peritonitis, liver transplantation).
Secondary	ACS that develops due to conditions outside the abdomen (sepsis, capillary leak, major burns, other conditions requiring massive fluid resuscitation).
Recurrent	ACS that redevelops following initial successful surgical or medical treatment of either primary or secondary ACS or following closure of a previous decompressive laparotomy.

For further details on these Consensus Definitions as well as educational materials and information on World Society of the Abdominal Compartment Syndrome membership, please go to www.wsacs.org.

CONSENSUS DEFINITION ADDENDUM

Examples of appropriate IAH and ACS classification

Patient Scenario	IAH Class	IAH Grade	ACS Class
Blunt thoracoabdominal trauma with severe liver injury, hypotension, and high airway pressures. Initial IAP 40 mmHg.	Acute	Grade IV	Primary
Penetrating cardiac injury with cardiorespiratory collapse requiring massive resuscitation. Cardiac injury is repaired, but IAP increases to 21 mmHg on hospital day three.	Acute	Grade III	Secondary
Septic shock due to intestinal perforation. IAP 25 mmHg.	Acute	Grade IV	Primary
Severe burns to abdomen / chest. Patient develops an IAP > 20 mmHg on day 7.	Acute	Grade III	Secondary
Chronic liver failure complicated by variceal bleeding and cardiorespiratory collapse. IAP 18 mmHg	Chronic	Grade II	Primary
Blunt abdominal trauma with severe liver injury. Damage control laparotomy performed with successful resolution of primary ACS. Abdominal closure is performed 2 weeks later. Oliguria develops on post-operative day 3 with IAP 28 mmHg and APP < 50 mmHg	Acute	Grade IV	Recurrent

Data Analysis and Statistical Guidelines for Future Studies

- The prevalence and incidence of IAH/ACS should be based on the above cited definitions and classifications.
- Results should be given for mean, median and maximal IAP values on admission and during the study stay.
- IAP thresholds should be based on the analysis of receiver operating characteristics (ROC) and the area under the ROC curve.
- Studies examining new devices to measure IAP should always compare the new IAP measurement method with the currently accepted reference standard.
- Validation of new techniques should not be limited to the analysis of (significant) correlation coefficients, but should also include a Bland & Altman analysis.

Indications for IAP monitoring

- Postoperative abdominal surgery patients with a distended abdomen
- Patients with abdominal trauma
- Mechanically ventilated patients with other organ dysfunction as assessed by daily Sequential Organ Failure Assessment (SOFA) score
- Patients with a distended abdomen and signs or symptoms consistent with Abdominal Compartment Syndrome
 - Oliguria
 - Hypoxia
 - Hypotension
 - Unexplained acidosis
 - Mesenteric ischemia
 - Elevated intracranial pressure (ICP)
- Patients with abdominal packing after temporary abdominal closure for multiple trauma or liver transplantation
- Patients with an open abdomen, especially if they have an IV bag ("Bogota bag") closure (such patients may develop recurrent ACS despite their "open" abdomen).
- Patients who have not had an operation, but have received large volumes of fluid resuscitation in the context of an underlying capillary leak problem (pancreatitis, septic shock, trauma, etc.)

Etiologic factors for IAH

- Acidosis (pH below 7.2)
- Hypothermia (core temperature below 33°C)
- Polytransfusion (> 10 units of packed red cells / 24 hours)
- Coagulopathy (platelet count below 55000/mm³ OR an activated partial thromboplastin time (APTT) more than 2 times normal OR a prothrombin time (PTT) below 50% OR an international standardised ratio (INR) more than 1.5)
- Sepsis (as defined by the American - European Consensus Conference definitions)
- Bacteraemia
- Liver dysfunction with ascites
- Mechanical ventilation
- Use of positive end expiratory pressure (PEEP) or the presence of auto-PEEP
- Pneumonia
- Abdominal surgery, especially with tight abdominal closures
- Massive fluid resuscitation (> 5 liters of colloid or crystalloid / 24 hours)
- Gastroparesis / gastric distention / Ileus
- Haemoperitoneum
- Pneumoperitoneum