

Intra-abdominal hypertension: ICU Nurse Driven Guidelines



Nurses *can* make a difference

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Disclosures

- Consultant for Potrero
- Special Employee of the Food & Drug Administration



Objectives

- By the conclusion of this presentation the nurse will be able to:
 - State the physiological effects of intra-abdominal hypertension.
 - Describe nursing interventions that can be initiated to reduce the intra-abdominal pressure.

American Association of Critical Care Nurses (AACN) Synergy Model for Patient Care

“Providing safe passage to patients and their families”



Providing Safe Passage

- Acute & Critical Care Nurses screen & monitor their patients for potential complications:
 - Sepsis
 - Pressure Ulcers
 - Falls
 - Catheter associated – Urinary Tract Infection
 - Central Line associated blood stream infection

Providing Safe Passage

- If you had the knowledge and tools to identify and intervene on a serious complication in the critically ill, wouldn't you want to act upon it?



World Society of the Abdominal Compartment Syndrome

- Intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS) have been increasingly recognized in the critically ill as causes of significant morbidity and mortality.
- The variety of previous definitions has led to confusion and difficulty in comparing one study to another.
- An international group of critical care specialists convened to standardize definitions for both IAH and ACS as well as establish standards for the measurement of intra-abdominal pressure (IAP).



World Society of the Abdominal Compartment Syndrome
www.wsacs.org

WORLD SOCIETY OF THE ABDOMINAL COMPARTMENT SYNDROME (WSACS)

- The WSACS was founded in 2004 to promote education and research on IAH and ACS.
- Its membership includes physicians, surgeons, anesthesiologists, intensivists, nurses, respiratory therapists, and others.



WSACS Guidelines

- Initial guidelines - 2006 & 2007
- Revised/ updated guidelines – 2013
- Plan to update again in 2021

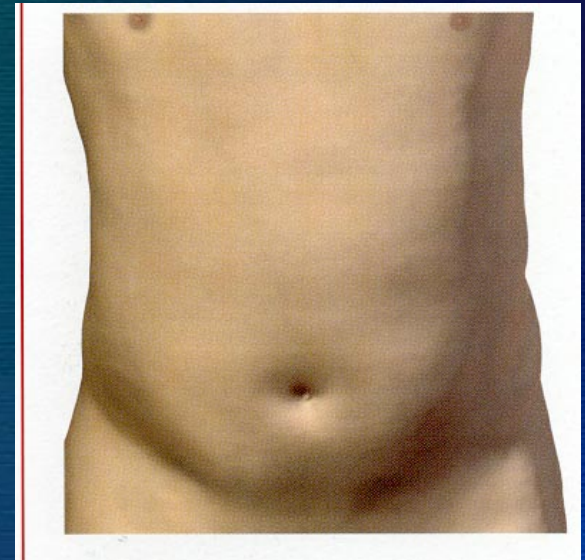
Name Change

- The World Society of the Abdominal Compartment Syndrome has had a name change to:
- **The Abdominal Compartment Society**



What is intra-abdominal pressure (IAP)?

- Intra-abdominal Pressure (IAP)- is the steady-state pressure concealed within the abdominal cavity.
 - IAP in the normal adult is 0-5 mmHg
 - Typical ICU patient 5-7 mmHg



Intra-abdominal Hypertension

- Intra-abdominal Hypertension (IAH) - is defined by a sustained or repeated pathological elevation in IAP \geq 12mmHg

Intra-abdominal Hypertension

- Grading System
 - Grade I – 12-15 mmHg
 - Grade II – 16-20 mmHg
 - Grade III – 21-25 mmHg
 - Grade IV > 25 mmHg

Grading System

- Grade I – decompression not indicated
- Grade II - treatment based on patient's clinical condition. Requires close monitoring
- Grade III - Abdominal decompression is indicated even in the absence of overt signs and symptoms
- Grade IV – Surgical emergency

Abdominal Perfusion Pressure (APP)

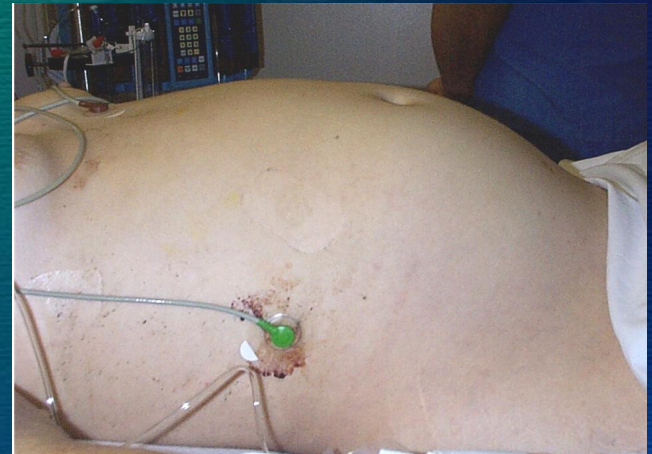
- Proposed as a more accurate predictor of visceral perfusion and a potential endpoint for resuscitation
- Calculated the same as cerebral perfusion pressure
 - $APP = MAP - IAP$
- A target APP of at least **60 mmHg** has been demonstrated to correlate with improved survival

Abdominal Compartment Syndrome (ACS)



- Abdominal Compartment Syndrome (ACS) is defined as a sustained IAP > 20mmHg
 - that is associated with new organ dysfunction/ failure
 - with or without an APP < 60 mmHg

What are the Causes of IAH?

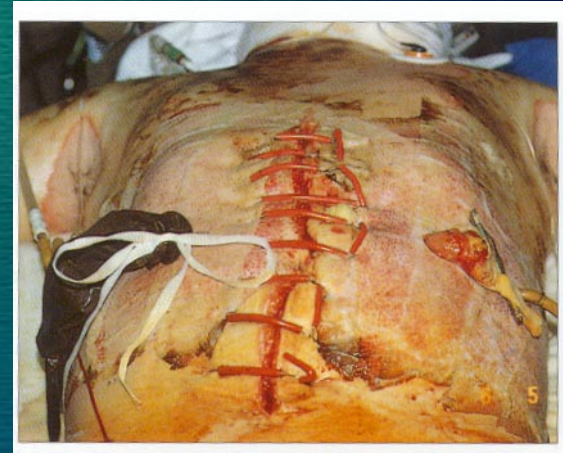


Primary Abdominal Compartment Syndrome

- Surgical – condition associated with injury or disease in the abdomino-pelvic region that requires early surgery or angioradiological intervention, or that develops post abdominal surgery

Etiologies

- Primary (surgical)
 - Blunt/ penetrating trauma
 - Liver transplantation
 - Ruptured AAA
 - Post-operative bleeding
 - Retroperitoneal hemorrhage
 - Mechanical Intestinal obstruction
 - Post-operative closure of the abdomen under tension
 - Bleeding pelvic fractures



Secondary Abdominal Compartment Syndrome

- Medical – refers to conditions that do not require surgery or early angioradiological intervention.



Etiologies



- Secondary (medical)
 - Severe intra-abdominal infection
 - Massive fluid resuscitation
 - Pancreatitis
 - Ileus
 - Sepsis
 - Major burns
 - Chronic
 - Ascites
 - CAPD
 - Morbid obesity
 - Pregnancy

Recurrent IAH

- Recurrent ACS refers to the condition in which ACS redevelops following previous surgical or medical treatment of primary or secondary ACS.



Intra-abdominal Hypertension (IAH)

- There is overwhelming evidence that supports:
 - More than 50% of ICU patient have some degree of IAH
 - Surgical patients get it more frequently but medical patients get it worse and die from it more often
 - IAH has been identified as an independent risk factor for death in the critically ill
 - It is a cause of multisystem organ failure
 - Abdominal palpation is not sensitive/ specific enough to identify IAH

Reintam Crit Care Med. 2019; 47:535-542

Murphy Crit Care Med 2018; 46:958-964

Muturi BMC Emergency Medicine 2017; 17:10

Vidal Crit Care Med. 2008; 36 (6): 1823-1831.

Malbrain, Intensive care Medicine. 2004; 30: 822-829.

Efstathiou Intensive Care Med 2005;31 supp1 1: S183 Abs 7

Hernandez. Intensive Care Med 2005;31 supp1 1: S183 Abs 339

Reintam. Intensive Care Medicine. 2008; 34, 1624-1631.

Joseph J Trauma 2004; 57(4): 687-95

Does IAH / ACS affect patient outcome?

Points:

- IAH and ACS are common entities in the critical care environment
- IAH and ACS increase morbidity, mortality and ICU length of stay.....

However:

- Clinical signs of IAH are unreliable and only show up late in the clinical courseSO
- Early monitoring (TRENDING) & detection of IAH with early intervention is needed to reduce these complications.

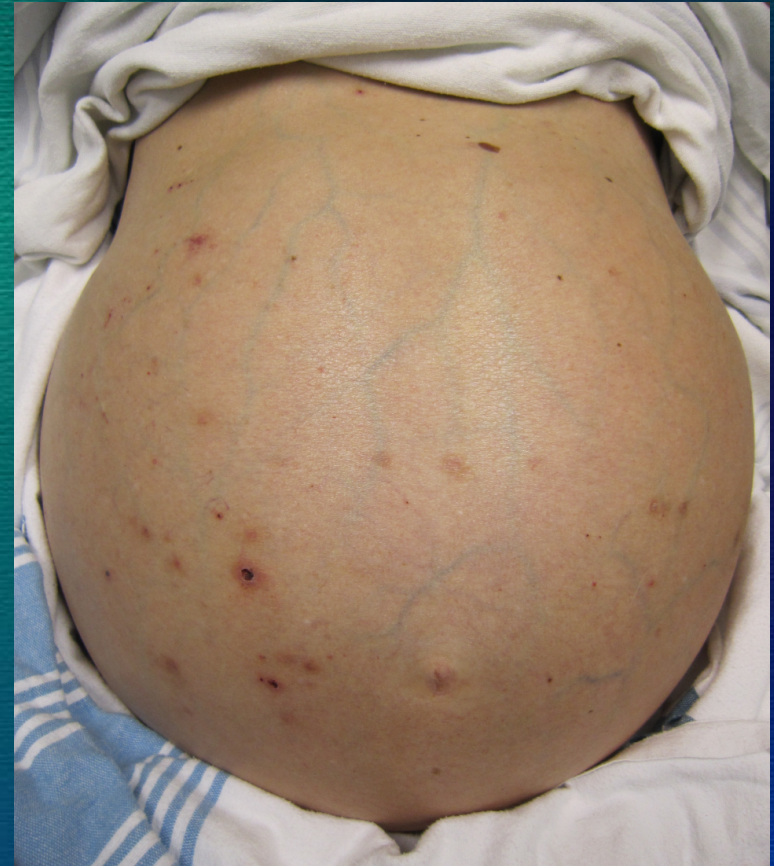
Whose IAP should be measured?

- **WSACS Recommendations:**
- Intra-abdominal pressure monitoring should be considered if the patient has any one risk factor for IAH



Risk Factors: Categories

- Diminished abdominal wall compliance
- Increased intra-luminal contents
- Increased intra-abdominal contents
- Capillary leak/fluid resuscitation
- Other/ Miscellaneous



Diminished abdominal wall compliance

- Abdominal surgery
- Major trauma
- Major burns
- Prone positioning



Increased intra-luminal contents

- Gastroparesis/gastric distention
- Ileus
- Colonic pseudo-obstruction
- Volvulus

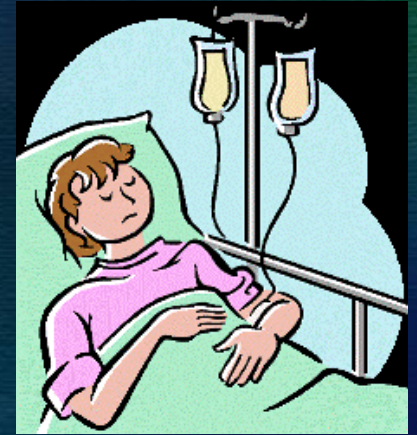


Increased intra-abdominal contents

- Acute pancreatitis
- Distended abdomen
- Hemoperitoneum/pneumoperitoneum or intra-peritoneal fluid collections
- Intra-abdominal infection/abscess
- Intra-abdominal or retroperitoneal tumors
- Laparoscopy with excessive insufflation pressures
- Liver dysfunction/cirrhosis with ascites
- Peritoneal dialysis

Capillary leak/fluid resuscitation

- Acidosis
- Damage control laparotomy
- Hypothermia
- Increased APACHE-II or SOFA score
- Massive fluid resuscitation or positive fluid balance
 - 5L within 24 hours
- Polytransfusion
 - 10 units within 24 hours



Others/miscellaneous

- Age (70 or greater)
- Bacteremia
- Sepsis
- Coagulopathy
- Increased head of bed angle
- Massive incisional hernia repair
- Mechanical ventilation
- Obesity or increased body mass index
- PEEP greater than 10cm H₂O
- Peritonitis
- Pneumonia
- Shock or hypotension



Physiologic Effects of IAH

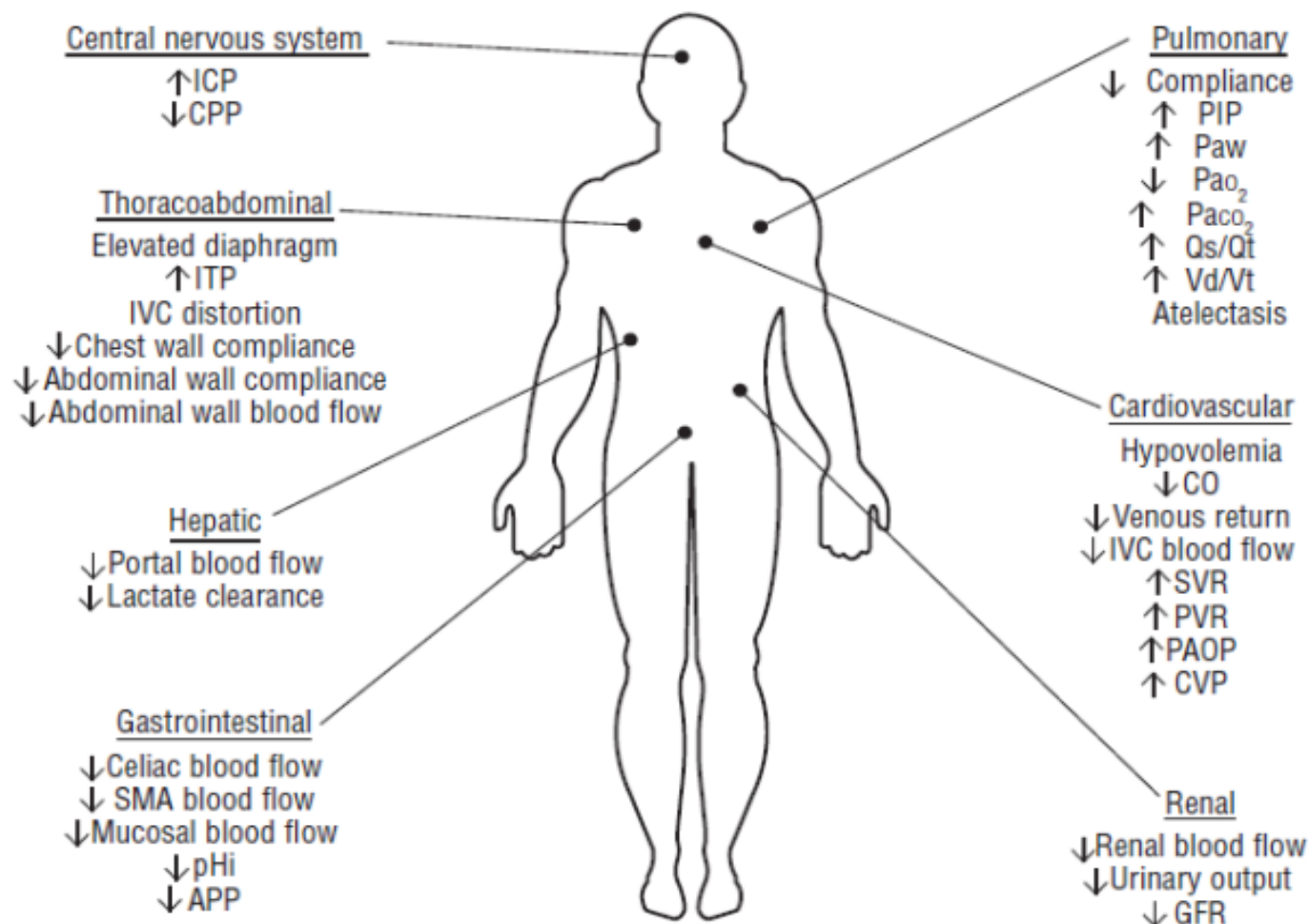


Figure 1 Physiological effects of intra-abdominal hypertension on multiple organ systems.

Abbreviations: APP, abdominal perfusion pressure; CO, cardiac output; CPP, cerebral perfusion pressure; CVP, central venous pressure; GFR, glomerular filtration rate; ICP, intracranial pressure; ITP, intrathoracic pressure; IVC, inferior vena cava; PAOP, pulmonary artery occlusion pressure; Paw, mean airway pressure; pH_i, gastric intramucosal pH; PIP, peak inspiratory pressure; PVR, pulmonary vascular resistance; Qs/Qt, intrapulmonary shunt; SMA, superior mesenteric artery; SVR, systemic vascular resistance; Vd/Vt, pulmonary dead space.

This figure was first published in Cheatham ML. Abdominal compartment syndrome: pathophysiology and definitions. *Scand J Trauma Resuscitation Emerg Med*. 2009;17:10. doi:10.1186/1757-7241-17-10. The article is available from <http://www.sjtreem.com/content/17/1/10>.

Why should IAP Be measured?

- Three published studies regarding hands on assessment vs. measuring IAP
- Findings of hands on assessment
 - Sensitivity 40-61%
 - Positive Predictive Value ~ 45%
 - Accuracy 70-76%
- Conclusion
 - Physical examination is not accurate enough to replace IAP measurements



How Often Should IAP be Measured?

- Initially every hour until a trend develops then every 4 hours
- Measure more frequently than every 4 hours if actively intervening to lower the IAP
- Wouldn't it be great if we could have continuous measurements?

Accuryn

- This device can monitor IAP continuously or intermittently
- Measures continuous urine output and bladder temperature





Collaborative Management

Collaborative Management

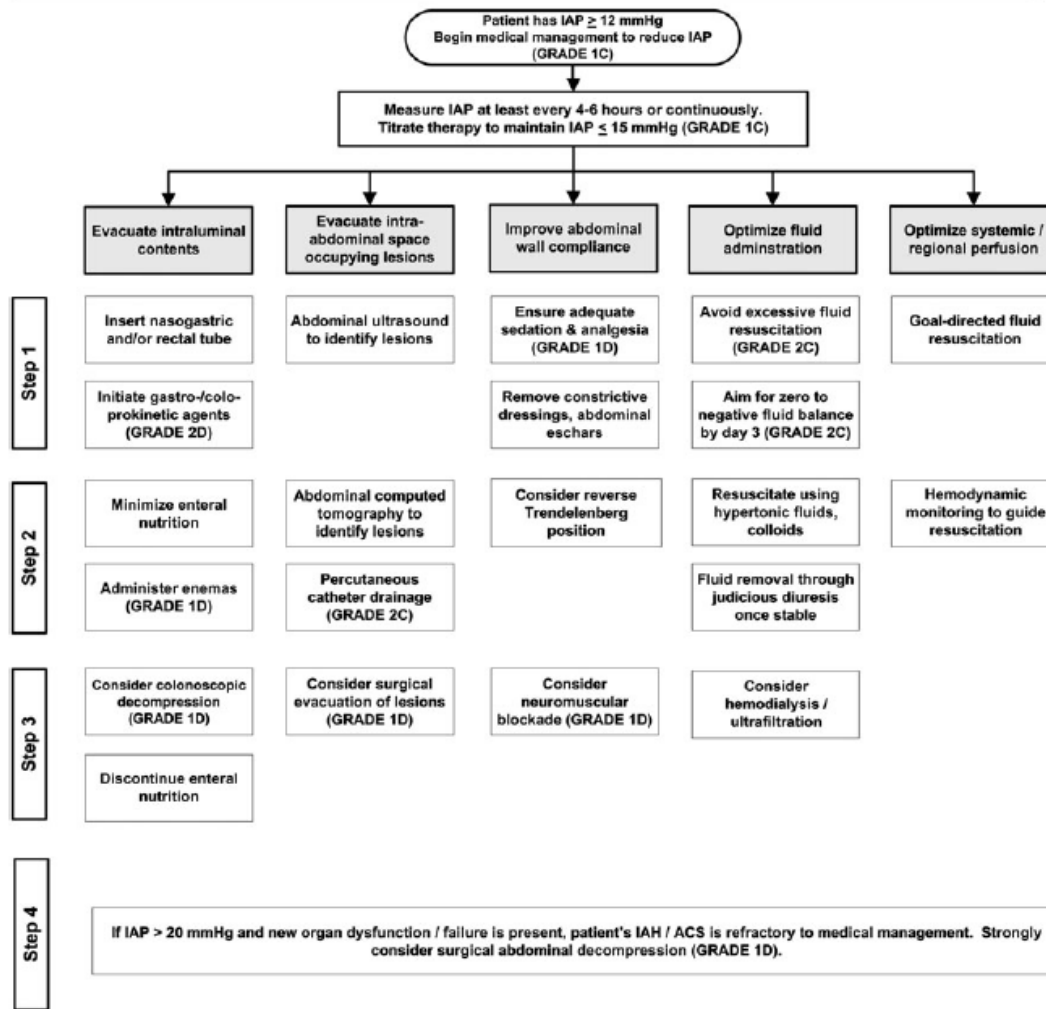
- Primary Conditions
 - Usually require surgical intervention
- Secondary Conditions
 - Require a stepwise approach based on the causative factors

Abdominal Compartment Society Medical Management Guidelines

- The evidence showed that the surgical patients get IAH more often, but the medical patients get it worse and have a higher mortality
- The Society developed a medical management guideline to assist non-surgeons in managing IAH

IAH / ACS MEDICAL MANAGEMENT ALGORITHM

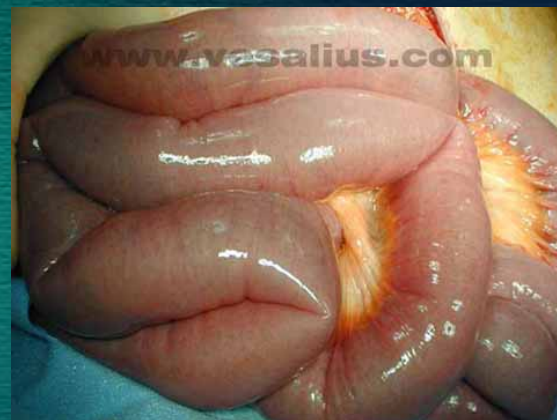
- The choice (and success) of the medical management strategies listed below is strongly related to both the etiology of the patient's IAH / ACS and the patient's clinical situation. The appropriateness of each intervention should always be considered prior to implementing these interventions in any individual patient.
- The interventions should be applied in a stepwise fashion until the patient's intra-abdominal pressure (IAP) decreases.
- If there is no response to a particular intervention, therapy should be escalated to the next step in the algorithm.



www.Wsacs.org

Fig. 2 Updated intra-abdominal hypertension (IAH)/abdominal compartment syndrome (ACS) medical management algorithm. IAP intra-abdominal pressure

If IAP > 25 mmHg (and/or APP < 50 mmHg) and new organ dysfunction / failure is present, patient's IAH / ACS is refractory to medical management. Strongly consider surgical abdominal decompression.



Abdominal Compartment Society Nursing Management Guidelines

- International Committee:

- Rosemary Lee DNP,APRN - Florida, USA
- John Gallagher DNP,RN, CCNS – Pennsylvania USA
- Janeth Chiaka Ejike MD – California USA
- Leanne Hunt PhD, RN - Sydney, Australia
- Brad Harrell DNP, APRN -Tennessee, USA
- Kathleen Bombeke RN – Antwerp, Belgium
- Donna Nayduch MSN, RN – Florida, USA
- Cynthia Zaletel MSN, RN, CCNS – Illinois, USA

Executive Committee

- Jan J. DeWaele MD, PhD – Ghent, Belgium
- Inneke Delaet MD – Antwerp, Belgium
- Andrew W, Kirkpatrick MD – Alberta, Canada

Nursing Management Guidelines

- The Medical Management Guidelines are evidence based
- The Nursing Management Guidelines are derived from the Medical Management Guidelines

Nursing Management Guidelines

- The Nursing Guidelines group recommend implementing the guidelines in an interdisciplinary manner
- Consider developing a nurse driven protocol for implementing and monitoring IAP.
- The full guidelines can be found in:
 - Lee, R., Gallagher J., Ejike J.C., Hunt, L. Intra-abdominal Hypertension and the Open Abdomen: Nursing Guidelines from the Abdominal Compartment Society. Critical Care Nurse. 2020 40 (1) 13-26



Nursing Guidelines

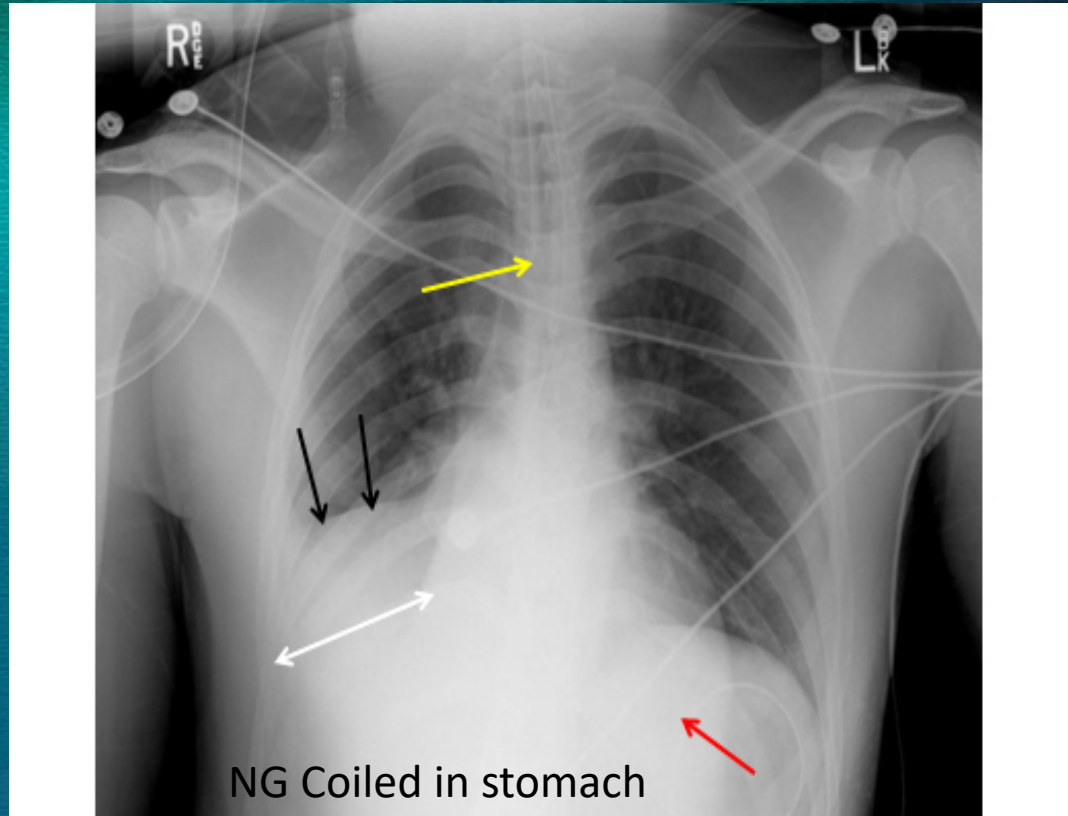
PARTIAL EXCERPTS

Nursing Interventions

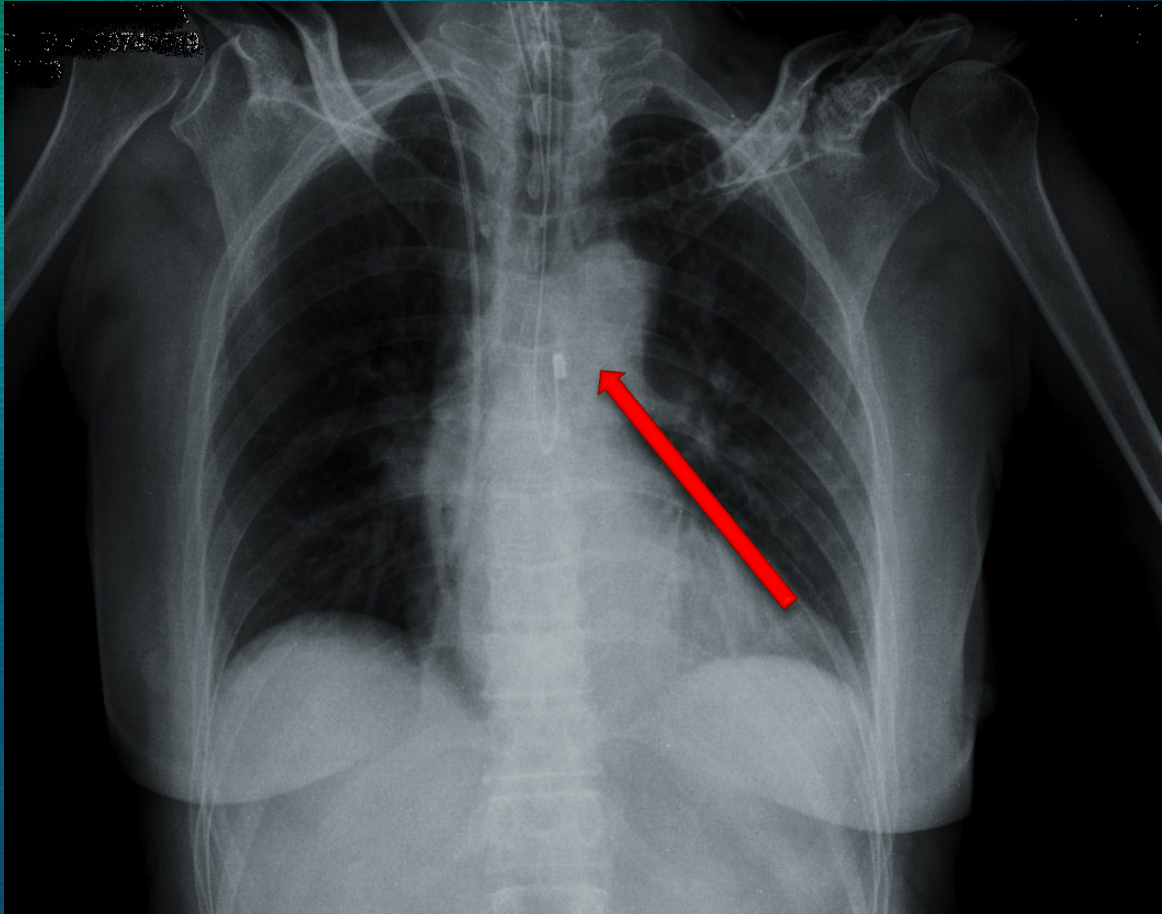
- Evacuate Intraluminal Contents
 - Nasogastric Tube/ Rectal Tube
 - Maintain patency of Tube
 - Ensure tube is properly positioned
 - Appropriate suction for NG tube



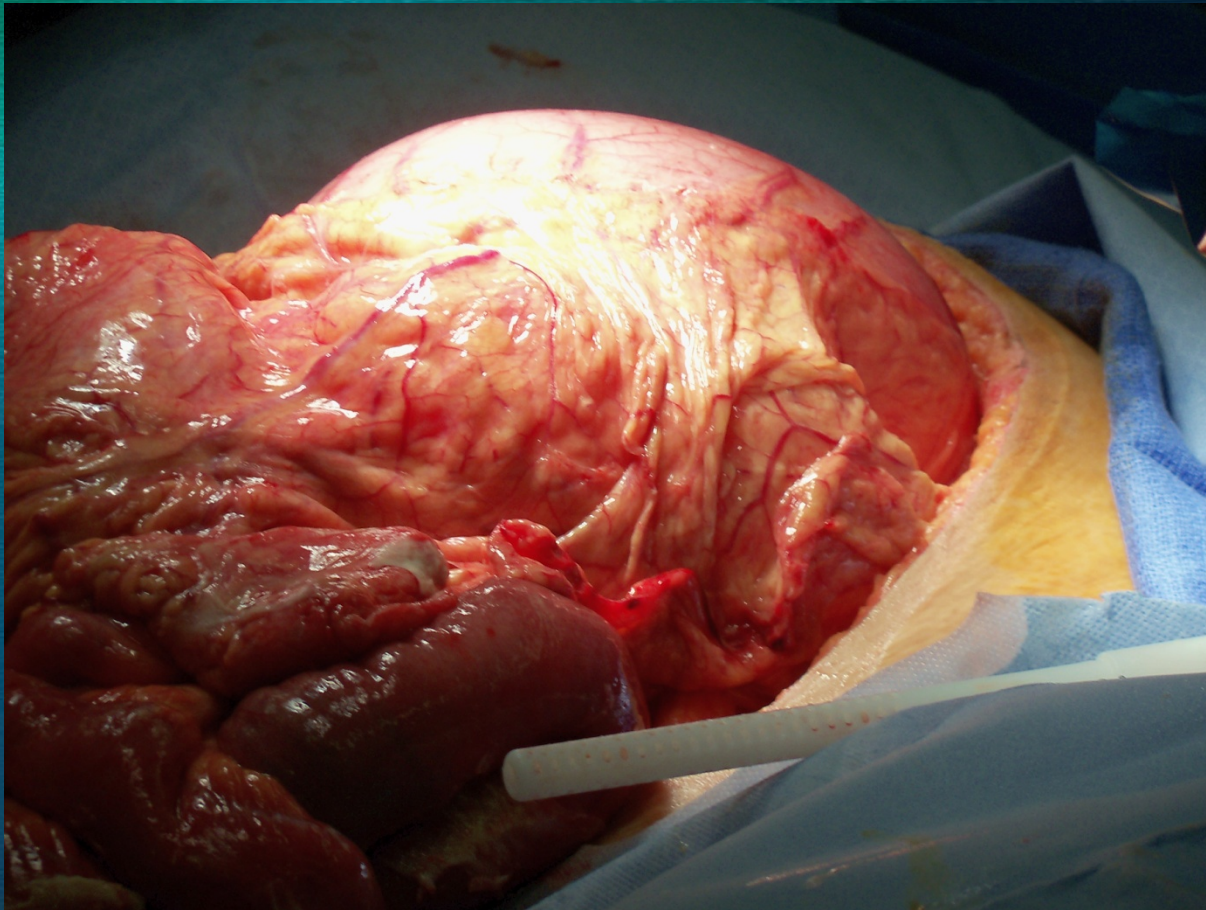
Coiled NG Tube



NG in the esophagus



What is this?



Nursing Interventions

- Monitor for daily bowel movement/ prevent constipation
 - Adequate fluid intake
 - Stool softeners
 - Laxatives
 - Enemas



Case in point

- 49 y/o female admitted with c/o SOB & palpitations.
- PMH – morbid obesity, HTN, A. Fib, COPD, HIV
- In the ED –
 - Respiratory failure - intubated
 - Afib with RVR – Diltiazem drip
 - Hypotension - requiring fluids & vasopressors

Case in point

- Admitted to ICU
- Screened for IAH risk
 - Risk factors present:
 - Respiratory failure
 - Morbid obesity
 - Hypotension
 - > 5L IV fluid within 24 hours



Case in point

- IAP's approximately 12-14 when initiated
- Gradually rose to 22 over 4 days
- KUB negative for bowel obstruction or ileus
- Nurses identified no bowel movements since admission
- Laxatives & stool softeners ordered & given

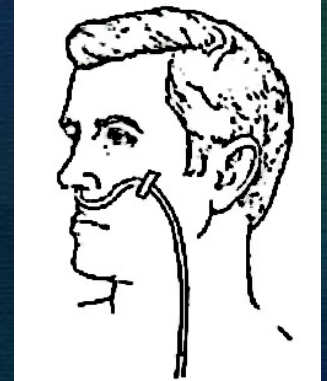
Case in point



- Later that day (at change of shift) we had a very large CODE BROWN
- IAP's now averaging 12-15mmHg



Nursing Interventions



- Evacuate Intraluminal Contents

- Enteral nutrition

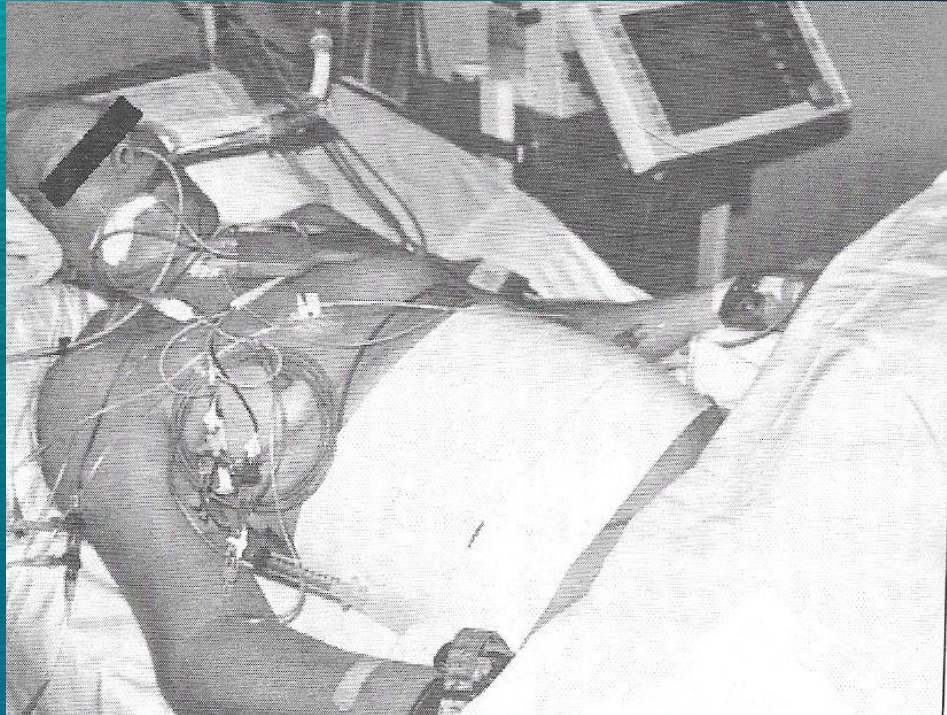
- Discuss with physician to initiate gastro/ colo prokinetic agents
 - Metoclopramide (Reglan)
 - Erythromycin
 - Cisapride
 - Discuss with dietitian minimizing or discontinuing enteral nutrition



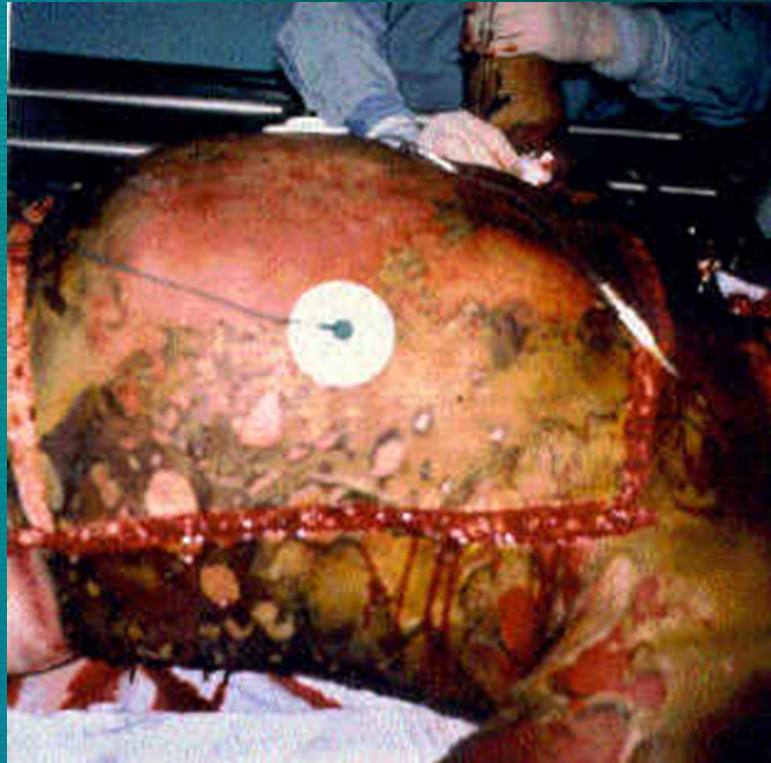
Nursing Interventions

- Improve Abdominal Wall compliance
 - Remove constrictive clothing, binders, dressings
 - Titrate sedation and/ or analgesia to promote abdominal wall relaxation
 - Discuss with provider initiating neuromuscular blockade for the vented patient
 - Assess burn patients with abdominal and flank eschar tightness and prepare for escharotomy if indicated

Unbind me!!

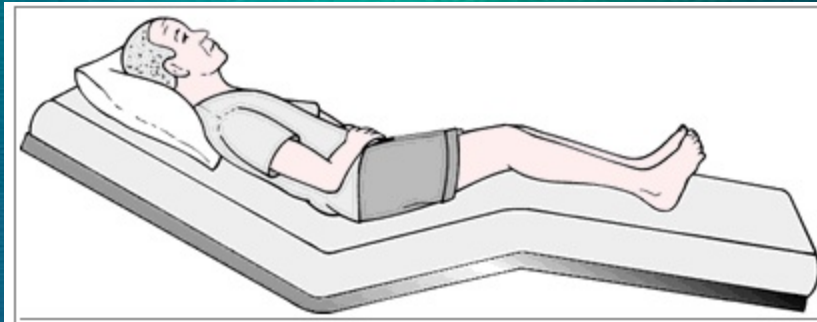


Burns


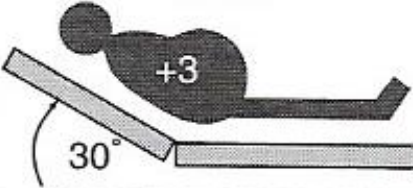
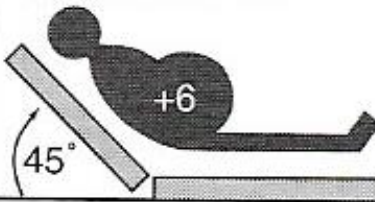
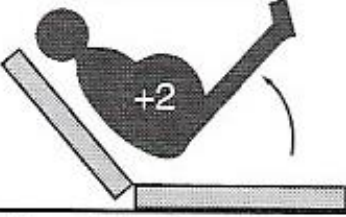
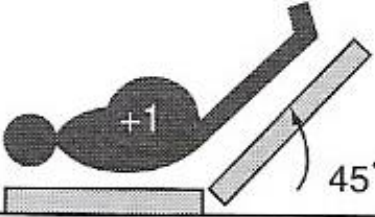
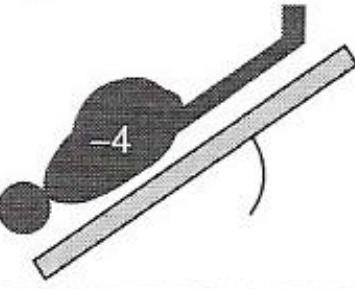
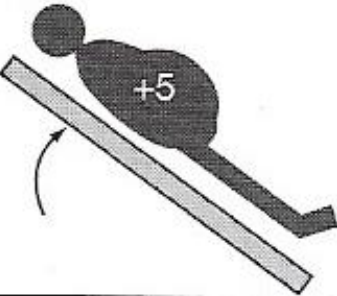



Nursing Interventions

- Improve Abdominal Wall compliance
 - Positioning
 - Keep HOB < 20 degrees



Effects of Positioning on IAP

<p>Supine</p>  <p>IAP</p>	<p>Head of bed 30°</p>  <p>+3</p> <p>30°</p>	<p>Head of bed 45°</p>  <p>+6</p> <p>45°</p>
<p>Feet up and head of bed elevated</p>  <p>+2</p>	<p>Feet up and supine</p>  <p>+1</p> <p>45°</p>	
<p>Trendelenburg 45°</p>  <p>-4</p>	<p>Anti-Trendelenburg 45°</p>  <p>+5</p>	<p>Prone</p>  <p>+3</p>

Prone Position

- If prone position is required, ensure that the pelvis and ribcage are supported so the abdomen is not compressed.
- Outcome data as to the prone position in patients at risk for IAP is limited



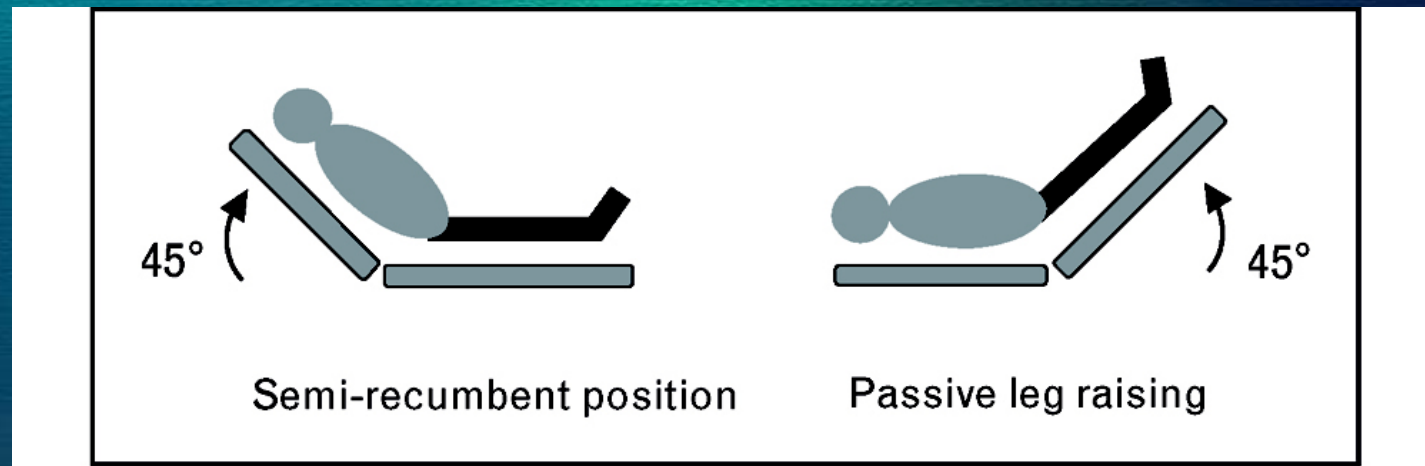
Nursing Interventions



- Optimize fluid resuscitation
 - Monitor strict I & O
 - Assess patient response to fluid resuscitation
 - Passive leg raise test not a valid indicator of fluid responsiveness if IAP is 12mmHg or greater
 - Assess patient's response to diuretics
 - Goal of zero or negative fluid balance by day 3

Passive Leg raises to assess for fluid responsiveness

Not valid when IAH is present



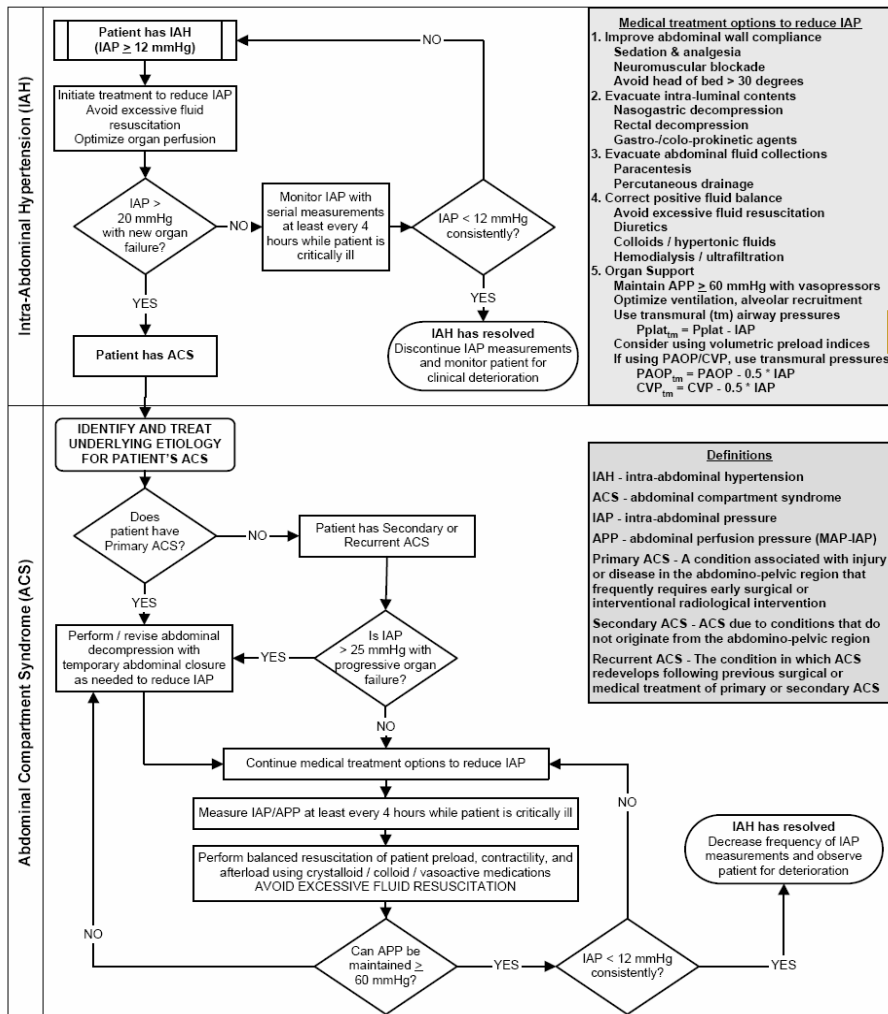
Beurton et al (2019) *CCM* 47: (publish ahead of print)

Mahjoub et al (2010) *CCM* 38(9) 1824-1829

Nursing Interventions

- Optimize Systemic/ Regional Perfusion
 - Goal directed fluid resuscitation
 - Request parameters for fluids
 - CVP
 - Stroke Volume Variation (SVV)
 - CO/ CI
 - SV/SVI
 - SCVO2
 - MAP
 - PCWP
 - Titrate fluids/ vasopressors

INTRA-ABDOMINAL HYPERTENSION (IAH) / ABDOMINAL COMPARTMENT SYNDROME (ACS) MANAGEMENT ALGORITHM



Adapted from *Intensive Care Medicine* 2006;32(11):1722-1732 & 2007;33(6):951-962
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World Society of the Abdominal Compartment Syndrome (WSACS)
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 Website: <http://www.wsacs.org>

Hemodialysis / ultrafiltration

5. Organ Support

Maintain APP ≥ 60 mmHg with vasopressors

Optimize ventilation, alveolar recruitment

Use transmural (tm) airway pressures

$P_{plat_{tm}} = P_{plat} - IAP$

Consider using volumetric preload indices

If using PAOP/CVP, use transmural pressures

$PAOP_{tm} = PAOP - 0.5 \cdot IAP$

$CVP_{tm} = CVP - 0.5 \cdot IAP$

Examples:

- Stroke Volume/ Stroke Volume index
- Stroke Volume Variation
- Pulse Pressure variation

Don't forget Family Education



Fertile ground for Nursing Research

- Further research needed on patient positioning
- What is it that nurses do or don't do that affect the intra-abdominal pressure?
- What are the outcomes of patients who are treated with the Medical & Nursing Guidelines as to those that do not?
- What is the effect of enteral nutrition on IAP?

Questions??



Thank You from the Bottom of my Guts!!



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