DIRECT PERITONEAL RESUSCITATION

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RIDGEVIEW

Allina Health

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OBJECTIVES

Upon completion of this presentation, participants should be able to:

1. Discuss the clinical management and medical interventions for IAH/ACS.
2. Describe the role of Direct Peritoneal Resuscitation (DPR) in reducing complications associated with IAH/ACS.
3. Analyze preliminary data and outcomes from the use of DPR following abdominal catastrophes.

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Case Study

- A 61-year-old male presents to an OSH with a one-day history of abdominal pain
- ED workup identified new renal failure, hyperkalemia, and lactic acidosis
- CT Abdomen: suggests pancreatitis

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Intraabdominal Catastrophe

- ❑ Vascular
- ❑ Perforation
- ❑ Inflammatory conditions
- ❑ Trauma

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Case Study

- Transferred to a metro ICU.
- Intubated due to altered mental status.
- Abdominal assessment: severely distended, firm with + bowel sounds
- RN concerned for intra-abdominal hypertension

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Intra-abdominal Pressure

Intra-abdominal pressure (IAP)	Sustained pressure within the abdominal cavity Normal IAP 5 – 7 mm Hg in critically ill patients
Intra-abdominal hypertension (IAH)	Sustained or repeated increase in IAP ≥ 12 mm Hg
Abdominal perfusion pressure (APP)	MAP – IAP = APP Aim > 60 mm Hg
Abdominal compartment syndrome (ACS)	Sustained IAP ≥ 20 mm Hg, with or without an APP < 60 mm Hg, that is associated with a new organ dysfunction/failure

(Kirkpatrick et al., 2013)

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Intra-abdominal Pressure

50-80% of critically ill patients will develop IAH and 2.7% to 51.7% will develop ACS, depending on the patient population.

Surgical and trauma patients develop IAH and ACS more frequently, but medical patients develop more severe cases of IAH and ACS, resulting in higher mortality.

(Lee et al., 2020)

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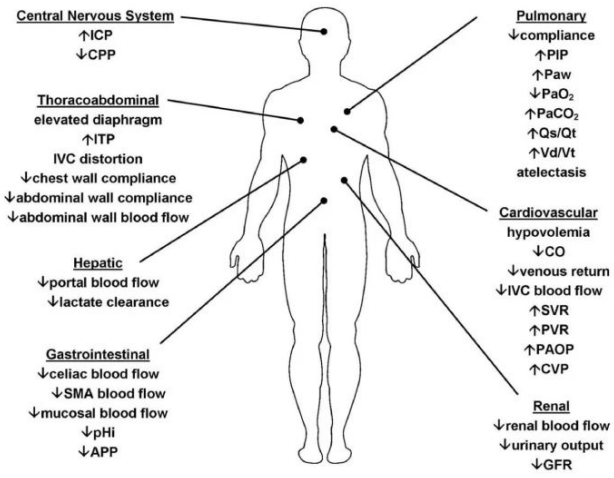
Detrimental Impact of IAH/ACS



(Cheatham, 2009)

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Case Study

- The RN discussed the assessment findings with the provider. Received an order for an intra-abdominal pressure assessment.
- Initial intra-abdominal pressure is 24.

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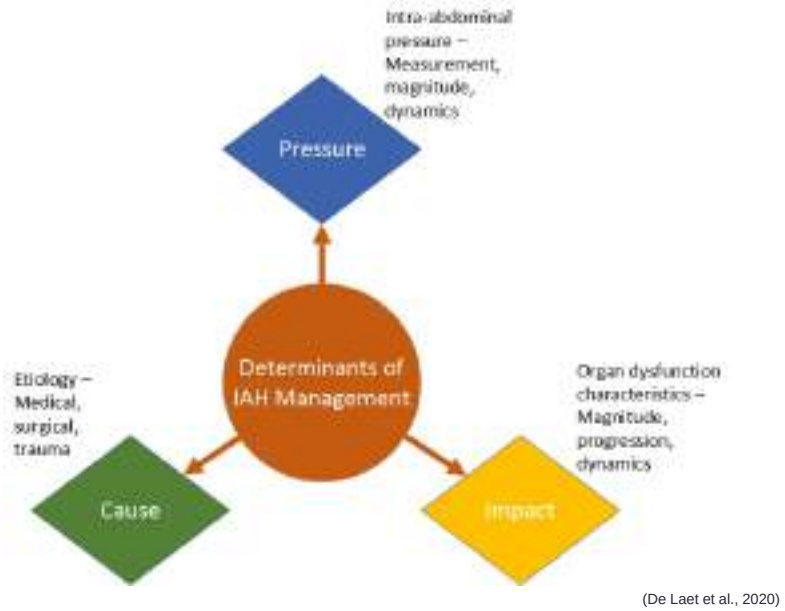
Management

Some cases of ACS can be managed conservatively.

Other cases of IAH may require immediate aggressive treatment before reaching a pressure of 20 mm HG.



(De Laet et al., 2020)

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Medical Management Interventions

- Clinical Goal: Prevent progression by initiating interventions.

Increased Intraluminal Contents	Increased Intra-abdominal Contents	Decreased Abdominal Wall Compliance
Insert nasogastric tube	Imaging – US, CT	Ensure adequate analgesia and sedation
Administer enemas	Percutaneous catheter drainage	Consider neuromuscular blockade
Prokinetic agents	Surgical evaluation	Remove constrictive dressings, binders, eschars
Colonoscopic decompression		Avoid prone position or HOB > 20°

(Kirkpatrick et al., 2013, Lee et al., 2020)

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Medical Management Interventions

Clinical Goal: Prevent progression by initiating interventions.

Optimize Fluid Balance	Optimize Perfusion	Assessments for further patient deterioration
Avoid positive fluid balance/excessive resuscitation	Goal-directed fluid resuscitation	If IAP is > 25 mm Hg and new organ dysfunction/failure is present, IAH/ACS is refractory to medical management.
Aim for zero to negative fluid balance by Day 3	Hemodynamic monitoring (SV, SVI, SVV > than CVP)	Strongly consider surgical abdominal decompression.
Resuscitate using hypertonic or colloid fluids	• Note passive leg raise may not be reliable if IAP ≥ 12	
Diuresis once stable or consider ultrafiltration		

(Kirkpatrick et al., 2013, Lee et al., 2020)

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Case Study

Surgical Consult
▲ White blood cell count
▲ Lactic acidosis
▲ Lipase
▲ Hyperkalemia.
▼ Renal function
▼ Platelets

Cause

+

IAP 24 mm Hg

Pressure

+

MAP 83mm Hg
APP 59 mm Hg

Impact

=

Damage Control Surgery

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Damage Control Surgery

Definition/Rational:

- Initial operative control of life-threatening condition (hemorrhage and/or contamination) and delay definitive surgery
- Allows for resuscitation to normal physiology
  - Correction of coagulopathy
  - Maintain perfusion and normalize acid-base balance
  - Achieve/maintain normothermia
- Insufficient physiologic reserve to tolerate prolonged surgery time
- Reduced OR time with resuscitation efforts linked to improved post-operative outcome and mortality

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Damage Control Surgery

History:

- Origin 1983 laparotomy
- 1993 demonstrated increased survival using damage control surgery in trauma patients
- Principles now used in all trauma and surgery as it's shown significant reduction in morbidity and mortality

Fun Fact:

- The term "damage control" was borrowed from the US Navy to refer to special teams responsible for keeping a severely damaged ship afloat until it can be returned to port for repair.

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Damage Control Phases

Phase 0	• Rapid transport and treatment triage
Phase 1	• Surgery aims - stop hemorrhage, limit contamination, eliminate pressure to improve blood flow • OR time limited- prevents further hypothermia, coagulopathy, acidosis
Phase 2	• ICU resuscitation- IV fluids, normothermia, tissue perfusion/oxygenation, resolve acidosis and coagulopathy
Phase 3	• Definitive repair surgery/s
Phase 4	• Closure

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Open Abdomen

- Leaving the abdominal facial edges of the paired rectus abdominus muscles un-approximated
  - Shorten operation
  - Prevent IAH/ACS
  - Unable to close due to visceral edema
  - Facilitate re-exploration or further surgical repair
- Indications:
  - Trauma- the presence of persistent hypotension, acidosis (<7.2), hypothermia, coagulopathy
  - Non-trauma-
    - ACS if medical treatment has failed
    - Severe peritonitis and septic shock
    - Consider post-management of ruptured abdominal aortic aneurysm
    - Severe acute pancreatitis unresponsive to conservative management

(Coccolini, F., et. al., 2018)

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Open Abdomen and Shock

Risk of complications

- Bowel hypoperfusion- prolonged inflammatory response- edema (ACS)
- Fluid and protein loss
- Fistula formation – as high as 20% risk
- Ventral hernia- lateral forces of abdominal wall retract fascia leading to inability to achieve closure
- Prolonged mechanical ventilation and ICU/hospital LOS

Temporary abdominal closure used to protect the abdominal viscera when fascia is open

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Direct Peritoneal Resuscitation to Reduce Complications

Direct Peritoneal Resuscitation

- Augments conventional IV resuscitation by lavaging the peritoneal cavity with 2.5% glucose, hypertonic peritoneal dialysate solution

Why: Gut hypoperfusion can persist post laparotomy and shock resuscitation, leading to multisystem organ failure

- Corrects reperfusion-related intestinal ischemia by improved splanchnic & hepatic blood flow and decreased bowel edema

Potential benefits:

- reduce time to fascial & abdominal wall closure
- Reduce the production of inflammatory mediators
- Helps maintain intestine permeability and decrease release of inflammatory mediators

(Ribeiro-Junior, M., et. al., 2021)

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Case Study

A hospital patient speaking with a surgeon, Microsoft Designer

Patient went to the OR for surgical management of ACS with respiratory failure and worsening renal function.

Decompressive Laparotomy with placement of Abthera temporary closure device.

DPR was initiated shortly after surgery.

On Day 1, CRRT was initiated for dialysis, hyperkalemia, and oliguria.

Ongoing supportive care by the critical care team.

Day 3, return to the OR.

Reopening of recent laparotomy.

Abdomen was open with DPR treatment for 2.6 days.

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DPR procedure/process development in critical care

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Quality Improvement Project

- Develop procedure
- Create orders
- Identify/obtain supplies
- Ensure safety
- Education/training
- Monitor outcomes

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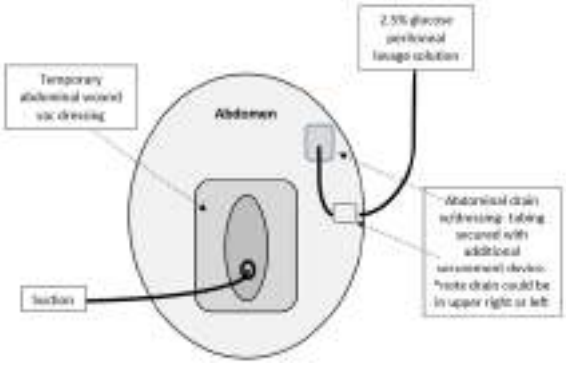
DPR Setup



- Abdominal channel drain to deliver the hypertonic peritoneal solution (400mL/hr) into the peritoneal cavity
- Wound vacuum-assisted closure (VAC) dressing to continuous suction, used to remove solution

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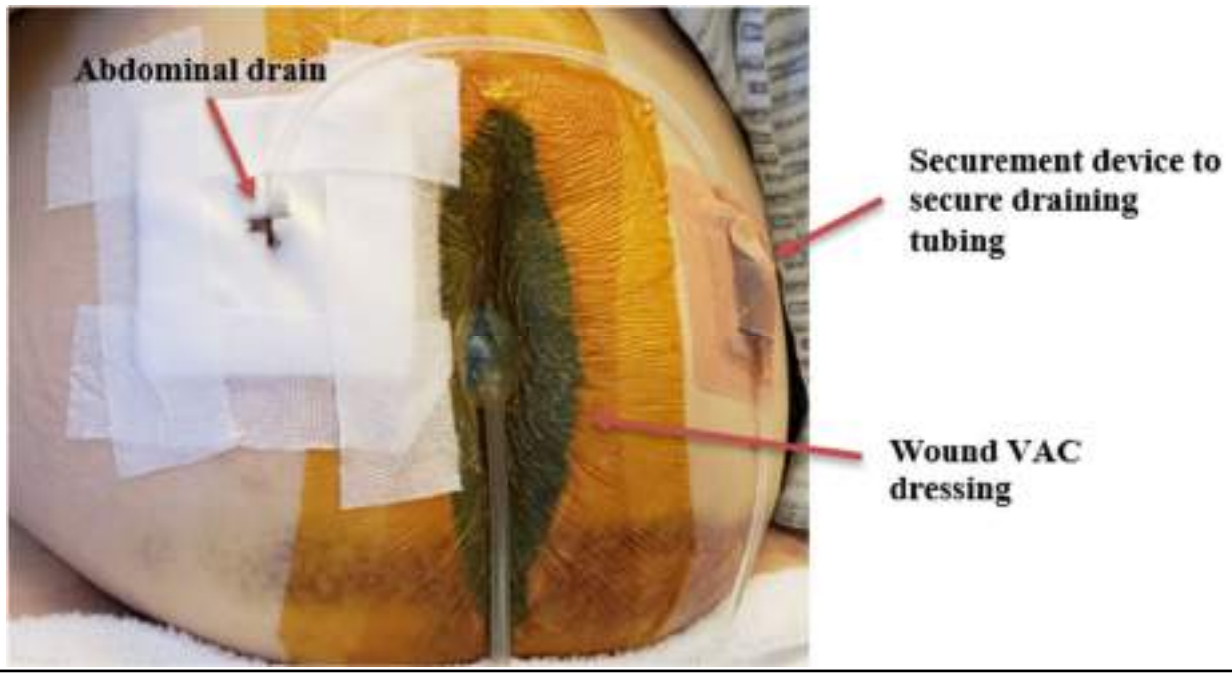

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DPR Setup Challenges

- Premade 2.5% dextrose peritoneal dialysis solution (5L bag) used for a hypertonic solution
  - **Challenge:** hooking IV tubing to a bag made to connect to peritoneal dialysis tubing
- IV pump utilized to infuse hypertonic solution into a drainage catheter
  - **Challenge:** connecting IV tubing to a channel drain
  - **Safety:** risk of IV tubing being reconnected to an intravenous line
- Wound VAC dressing suction source
  - **Challenge:** wound VAC machine canisters only hold 500mL

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Safety

NOT FOR INTRAVENOUS USE

Peritoneal solution ran through IV tubing & infusion pump into the abdominal drain

- **Pink** 'Not for Intravenous Use' labels (solution bag, IV pump, distal end of IV tubing)
- Designated IV pole, positioned on the opposite side of the bed from other IV pumps
- Narcotic IV tubing used for no extra infusion ports
- Picture setup part of procedure & tip sheet
- Route for the solution on MAR in EHR listed as intra-peritoneal

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Other Considerations

- I & O documentation:
  - Identify EHR rows to flow to the correct location on the intake and output reports
- Supplies:
  - 2L suction canister vs 1L
  - Supply kit for setup with a tip sheet
  - Adequate supply of peritoneal dialysis solution (bag lasts ~12hrs)
- Transport:
  - Stop hypertonic solution infusion and disconnect, transition suction to wound VAC machine
- CRRT:
  - Worked with nephrology on how to manage fluids in CRRT patients

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Orders

Panel order within EHR:

- Dextrose peritoneal dialysis solution: intra-peritoneal route

- Wound VAC dressing order:
  - Guided in suction levels
  - Assessment
  - Transport
- Abdominal drain:
  - Indication (instillation of solution)
  - Management for transport
- Automatic warming device
  - Utilize to maintain normothermia

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Post-implementation Data

- 08/2020 – 02/2023
- 51 patients

	Initial Laparotomy to Facial Closure	DPR to Facial Closure	ICU Length of Stay	Mechanical Ventilator Duration
Average (days)	3.7	2.5	12.8	9.1
Median (days)	2.6	1.8	9.7	5.7

- Mortality 35% (18/51)
- Fascia not closed 12
  - Transition to comfort care (9)
  - Mesh implant (3)

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What's Next with Direct Peritoneal Resuscitation at Abbott Northwestern

- Continued use of therapy
- Ongoing expansion into the vascular surgery program
- Dedicated medical quality improvement evaluation resources

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Resources


ABBOTT NORTHWESTERN HOSPITAL

Department-wide Procedure (Critical Care)

Direct Peritoneal Resuscitation (DPR)


Direct Peritoneal Resuscitation (DPR) Tip Sheet

Supplies:

Orders:

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