Great Ormond Street Hospital for Children NHS Trust

Shock

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Associated clinical guidelines/protocols:

- Meningococcal septicaemia

Fundamental Knowledge:

List of topics relevant to PIC that will have been covered in membership examinations. They will not be repeated here.

Pathophysiology:

- Age specific definitions.
- Aetiologic classification.
- Simple clinical features

Information for Year 1 ITU Training (basic):

Year 1 ITU curriculum

Pathophysiology:

- Concepts in the pathogenesis of shock
- Sequelae of shock, relationship to multi organ dysfunction syndrome (SIRS, septic shock and MODS covered in detail in separate module)

Clinical skills:

- Clinical recognition of shock and assessment of severity.
- Management of shock according to aetiology, in response to haemodynamic & physiological data.
- Use of intravenous fluids: colloids, crystalloids & blood products.

Curriculum Notes for Year 1:

Many of the papers I have supplied are review articles. They will discuss recent advances and sentinel works. They can give you an overview of the subject, but should never replace the original work. I encourage you to critically read the original research.

Pathophysiology of shock:

- **Basics** are covered in the following 2 papers:
  1. Hameed SM, Aird WC, Cohn SM. Oxygen delivery. *Crit Care Med.* 2003;**31**:S658-S667.
  2. Duke T. Dysoxia and lactate. *Arch.Dis.Child* 1999;**81**:343-50.

  There is some repetition between them.

- **Sequaelae of shock & Relationship to MODS**:
  1. Review paper by Donald Fry:

Fry DE. Microcirculatory Arrest Theory of SIRS and MODS. In Baue AE FE, Fry DE, eds. *Multiple organ failure. Pathophysiol;ogy, prevention and Therapy.*, pp 92-100. London: Springer, 2000.
2. Rivers P. Clinical Manifestations of disordered microcirculatory perfusion in sepsis. *Crit Care* 2005 9 (supp 4) S20 – S26.
3. Acid base abnormailities in shock: This review covers the fundamentals of acid-base abnormalities. You will need a more in-depth understanding. Kaplan LJ, Frangos S. Clinical Review: Acid-Base abnormalities in the Intensive care unit – part II. Critical Care 2004, *(DOI 10.1186/cc2912)

Classification of shock:

Shock has traditionally been classified as described below. While the trigger initiating shock may fall within one category, the shock episode will have elements conforming to all categories. This limits the usefulness of such a classification.

Hypovolaemic shock
- *Fluid loss*
- *Blood loss*
- *Capillary leak syndrome*

Distributive shock (n or ↑ CO)
- *Anaphylaxis*
- *Sepsis*

Cardiogenic shock
- *Reduced contractility*

Obstructive shock
- *Thrombosis/embolism*

Cytotoxic shock

Septic Shock:
Management guidelines were discussed in the module “Sepsis, SIRS & MODS”
The following are important papers.

1. Rivers E, Nguyen B, Havstad S, Ressler J, Muzzin A, Knoblich B *et al*. Early goal-directed therapy in the treatment of severe sepsis and septic shock. *N.Engl.J.Med.* 2001;**345**:1368-77.
2. Carcillo J. Clinical practice parameters for haemodynamic support of paediatric and neonatal patients in septic shock. *Crit Care Med* 2002;30:1365-78
3. Dellinger RP, Carlet JM, Masur H, Gerlach H, Calandra T, Cohen J *et al*. Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. *Crit Care Med.* 2004;**32**:858-73.
4. Dellinger RP. Cardiovascular management of septic shock. *Crit Care Med* 2003;31:946- 955.
5. Parillo JE. Vasopressor and inotropic support in septic shock.An evidence based review. *Crit Care Med* 2004;32[supp]:S455-S465.
6. Gerlach H Fluid resuscitation in severe sepsis: An evidence based review. *Crit Care Med* 2004;32[supp]:S451-S454.
7. Annane D, Sebille V, Charpentier C, Bollaert PE, Francois B, Korach JM *et al*. Effect of treatment with low doses of hydrocortisone and fludrocortisone on mortality in patients with septic shock. *JAMA* 2002;288:862-71

Cardiogenic shock:
See cardiac modules.

Spinal Shock:
Review article: Stevens RD, Bhardwaj Anish, Kirsch JR, Mirski MA. Critical Care and Perioperative management in traumatic spinal cord injury. J of Neurosurg Anaesthesiology. 2003, 15:215 – 229.

Information for Year 2 ITU Training (advanced):

Year 2 ITU curriculum

Pathophysiology:

- Knowledge of clinical research in the area, potential therapies related to immune and inflammatory pathway modulation

Clinical skills:

- Outcome prediction in shock states.

Curriculum Notes for Year 2:

More Pathophysiology:

1. Aird WC. Endothelium as an organ system. *Crit Care Med.* 2004;**32**:S271-S279.
2. Sharpe M. The microcirculation as a functional system. *Crit Care* 2005;9[supp]:S4-S8.
3. Vincent JL. Oxygen transport- the oxygen delivery controversy. *Intensive Care Med* 2004;30:1990-96.
4. Vallet B. Endothelial cell dysfunction and abnormal tissue perfusion. *Crit Care Med.* 2002;**30**:S229-S234.

More Therapeutic concepts:

1. Moore FA, McKinley BA, Moore EE. The next generation in shock resuscitation. *Lancet* 2004;**363**:1988-96.
2. Walley K. Microvascular resuscitation as a therapeutic goal in severe sepsis. Crit Care Med 2004; 9[supp4]:S27-S32.
3. Finfer S, Bellomo R, Boyce N, French J, Myburgh J, Norton R. A comparison of albumin and saline for fluid resuscitation in the intensive care unit. *N.Engl.J.Med.* 2004;**350**:2247-56.
4. Harma M. a rational approach to the treatment of acute heart failure: current strategies and future options. Curr Opin Cardiol 2004;19(3):254-263.
5. Martin C. Clinical review: vasopressin & terlipressin is septic shock patients.Crit Care 2005;9:212-222.

Outcomes:

1. Greenwald B. Mortality rates in paediatric septic shock; with and without multiple organ dysfunction syndrome. Ped Crit Care Med. 2003;4:333-337.