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ICU (Case discussions)

Objectives:

1. None mentioned.

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Editing File

Color Index

- Slides / Reference Book
- Doctor notes
- OnlineMeded / Amboss
- Important
- Extra

Case 1

A 44 year-old male presents to emergency department with the chief complain of feeling unwell for 3 weeks. He endorses general malaise, cough, shortness of breath and chest pressure. In addition, he complains of chills, myalgias and loose stools during this time. He denies any travel or sick contacts.

Past medical history

is remarkable for;

- hypertension for which he is no longer taking medication.
- He has a 20 pack-year history of smoking cigarettes
- He also admits to heavy alcohol use.
- He denies IV drug use or history of HIV or Hepatitis.

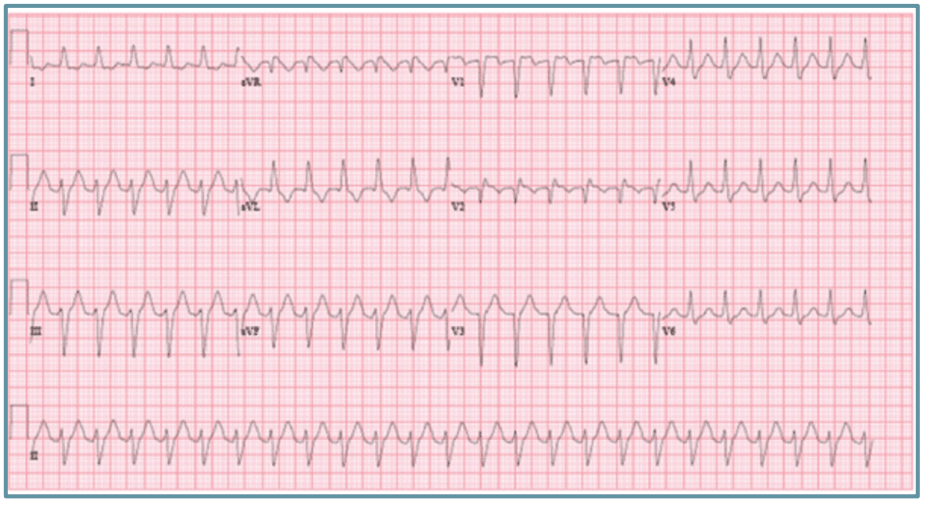
Examination

- he appears quite anxious and has increased work of breathing.
- Vitals are: BP 100/43, HR 140-170, RR 36-40, , temperature 38.0 , oxygen saturation 95% room air.
- Heart sounds are normal. JVP is flat.
- There is reduced air entry bilaterally but the lungs are clear. Abdomen is soft, ENT exam unremarkable. No signs of IV drug use.

What further information you need to know ?

Initial Investigations are obtained:

a. ECG

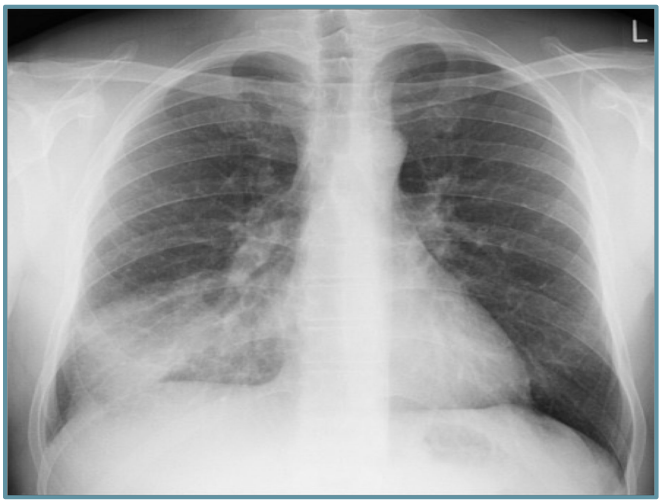


Initial Investigations are obtained:

B. Labs

Hb	141	Billi	16	K	4.4	Na	125	pH	7.16
ALP	102	Cl	86	Plt	133	K	4.3	pCO2	42
LDH	546	Cr	148	GGT	54	Cl	90	HCO3	15
Glc	10.3	Lipase	17	Trop	50	HCO3	15	pO2	20
WBC	15	HB	10	plt	500	Glc	10.6	Lactate	8.8
						Base Excess	– 13		

C. Initial CXR



What further Investigations ?

The Bedside nurse calling you;

- The repeated Vitals
- BP 80/50
- pulse 150 regular
- Sats 88% in room air
- T 39.8

What is your DDX ?

- Sepsis = 2 SIRS + Infection
- Severe Sepsis = Sepsis + New or Acute Organ Dysfunction
- Septic Shock = Severe Sepsis + Persistent Hypotention OR lactate ≥ 3.6
- **Bundle Elements**
  - Blood Cultures x 2 sets
  - Lactate and Repeat Lactate
  - IV Broad Spectrum Abx
  - IVF Bolus
  - Vasopressors
  - Tissue Perfusion Assessment

SIRS criteria (two or more)	qSOFA criteria (two or more)
36 > Temperature >38	Systolic blood pressure <100 mmHg
Respiratory rate > 22/min	Respiratory rate >20/min
Heart rate > 90 bpm	Glasgow Coma Scale ≤14
4000> White cell count >12,000	

SIRS: Systemic Inflammatory Response Score; qSOFA: quick Sequential Organ Failure Assessment.

Shock:

Shock is defined as a state of cellular and tissue hypoxia due to reduced oxygen delivery and/or increased oxygen consumption or inadequate oxygen utilization.

WHEN TO SUSPECT SHOCK?

- Hypotension
- Tachycardia
- Oliguria
- Abnormal mental status
- Tachypnea
- Cool, clammy, cyanotic skin
- Metabolic acidosis
- Hyperlactatemia

Clinical Approach:

A multidisciplinary, team-based approach is preferred because it allows the simultaneous evaluation and administration of therapy to patients with hypotension and shock.

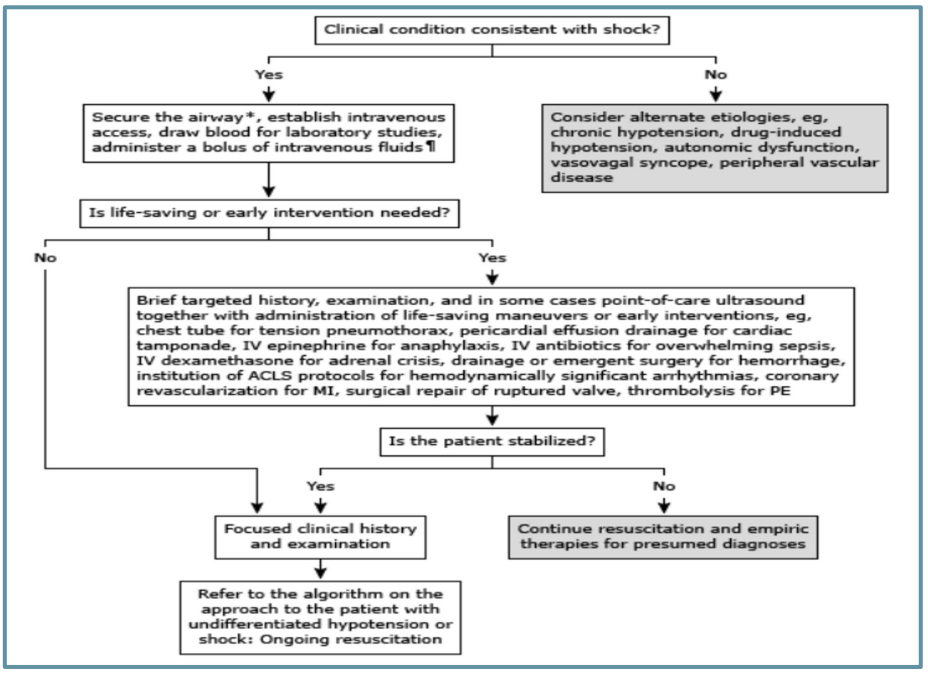
1- **ABC** and actively treating and reassessing.

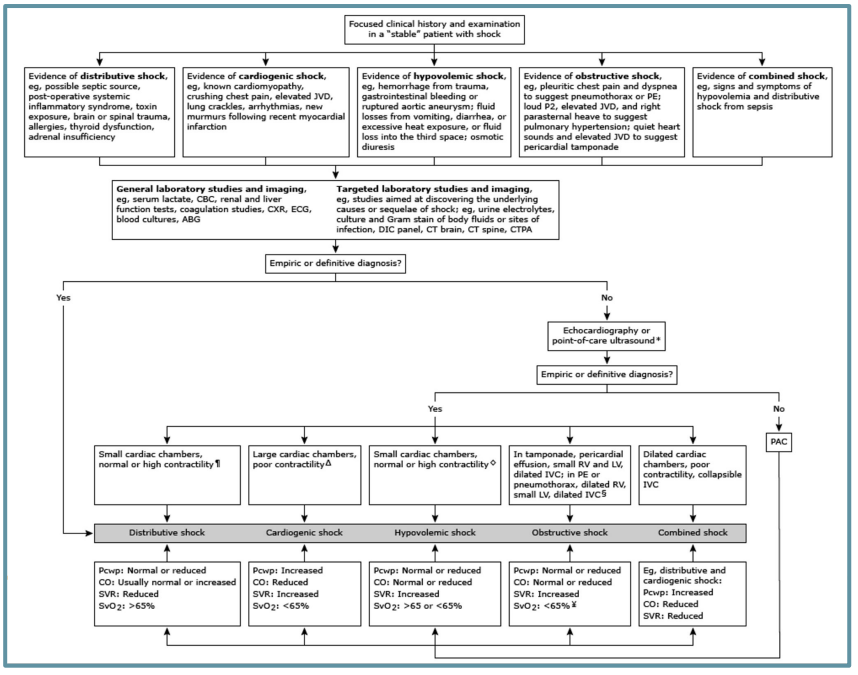
2- Patients should be assessed for the need for an immediate or early intervention so that **lifesaving therapies** can be administered promptly.

3- Critically ill patients who have been stabilized and patients with mild hypotension or early shock should undergo a more **formal diagnostic approach** while initial resuscitative therapies are ongoing.

ABC

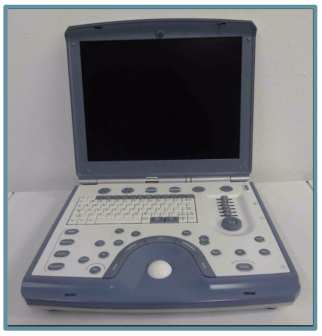
- The first priorities are to stabilize the airway and breathing with oxygen and/or mechanical ventilation.
- Intravenous access should be secured so that patients can be immediately treated with intravenous fluids to restore adequate tissue perfusion.
- Peripheral venous access (14 to 18 gauge catheters) or intraosseous access is sufficient for the initial evaluation and management of many patients with undifferentiated shock and hypotension. However, central venous access should be obtained in those in whom peripheral access cannot be obtained, in those who need infusions of large volumes of fluids and/or blood products, or in those who need prolonged infusions of vasopressors.





Point-of-care (POC) ultrasonography

- Are more frequently used as portable, **bedside** diagnostic tools in patients with undifferentiated shock and hypotension
- POC ultrasonography is typically used in patients in whom an empiric diagnosis has not been achieved with clinical and laboratory evaluation or in those in whom definitive imaging is unsafe
- Complementary tool to examine fluid responsiveness
- Multiorgan ultrasonography (RUSH, ACES) examines the heart first, followed by ultrasound of the chest and abdomen and major blood vessels
- Focused cardiac ultrasound (FOCUS) examines the heart only.



Back to the case

How far we should give Fluids ?

Which pressors we should start ?

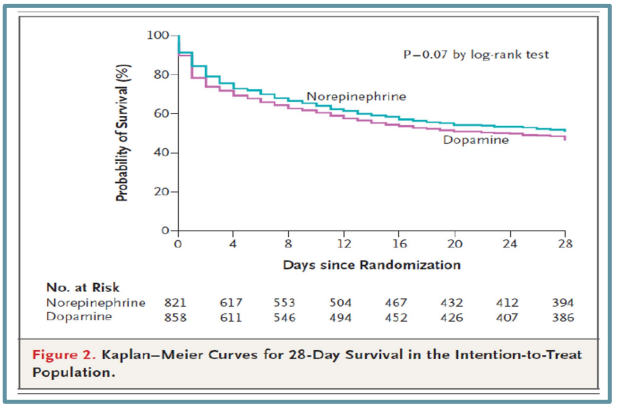


Figure 2. Kaplan–Meier Curves for 28-Day Survival in the Intention-to-Treat Population.

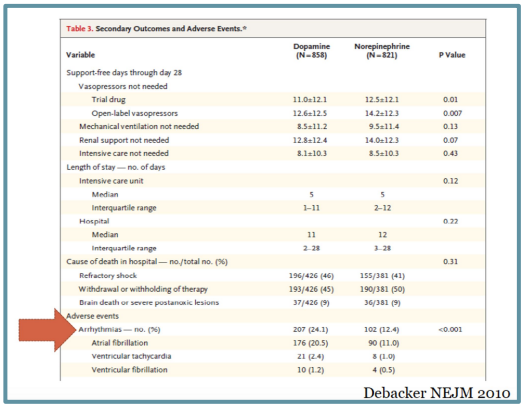
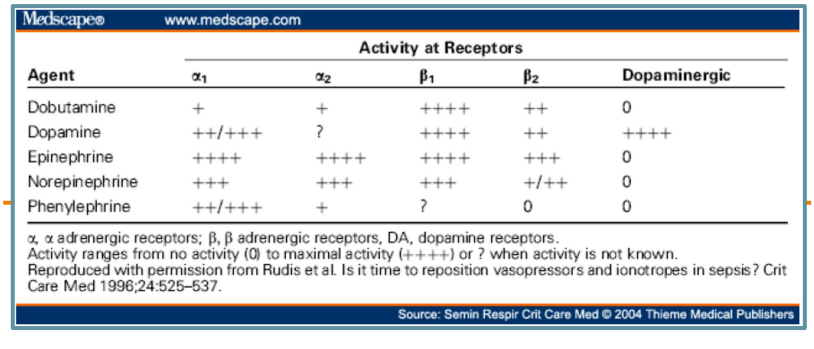


Table 3. Secondary Outcomes and Adverse Events.*

Variable	Dopamine (N=858)	Norepinephrine (N=821)	P Value
Support-free days through day 28			
Vasopressors not needed			
Trial drug	11.0±12.1	12.5±12.1	0.01
Open-label vasopressors	12.6±12.5	14.2±12.3	0.007
Mechanical ventilation not needed	8.5±11.2	9.5±11.4	0.13
Renal support not needed	12.8±12.4	14.0±12.3	0.07
Intensive care not needed	8.1±10.3	8.5±10.3	0.43
Length of stay — no. of days			
Intensive care unit			0.12
Median	5	5	
Interquartile range	1–11	2–12	
Hospital			0.22
Median	11	12	
Interquartile range	2–28	3–28	
Cause of death in hospital — no./total no. (%)			0.31
Refractory shock	196/426 (46)	155/381 (41)	
Withdrawal or withholding of therapy	193/426 (45)	190/381 (50)	
Brain death or severe postanoxic lesions	37/426 (9)	36/381 (9)	
Adverse events			
Arrhythmias — no. (%)	207 (24.1)	102 (12.4)	<0.001
Atrial fibrillation	176 (20.5)	90 (11.0)	
Ventricular tachycardia	21 (2.4)	8 (1.0)	
Ventricular fibrillation	10 (1.2)	4 (0.5)	

Debacker NEJM 2010



Medscape® www.medscape.com

Activity at Receptors

Agent	α_1	α_2	β_1	β_2	Dopaminergic
Dobutamine	+	+	++++	++	0
Dopamine	++/+++	?	++++	++	++++
Epinephrine	++++	++++	++++	+++	0
Norepinephrine	+++	+++	+++	+/++	0
Phenylephrine	++/+++	+	?	0	0

α, α adrenergic receptors; β, β adrenergic receptors, DA, dopamine receptors.
Activity ranges from no activity (0) to maximal activity (++++) or ? when activity is not known.
Reproduced with permission from Rudis et al. Is it time to reposition vasopressors and ionotropes in sepsis? Crit Care Med 1996;24:525–537.

Source: Semin Respir Crit Care Med © 2004 Thieme Medical Publishers

So what to use ?

- Norepinephrine is the first line agent
  - Lower Arrhythmias and mortality vs Dopamine
- Vasopressin can reduce Norepi doses
  - Reasonable and safe 2nd line pressor
- Third line pressor
  - No good evidence here. Suggest tailoring to individual patient hemodynamics
- If absolute or relative bradycardia
  - Dopamine
- If dealing with atrial or ventricular tachycardias
  - Phenylephrine

Case 2

40 years old female with known lymphoma actively being treated with chemo has been in the hospital for almost 1 month

- **Now with worsening respiratory failure being admitted to ICU as HAP**
- **Cxr showing bilateral infiltrates**
- **ABG pO2 49 PCO2 46 PH 7.32 Hco3 20**

Respiratory failure: Diagnosis and management

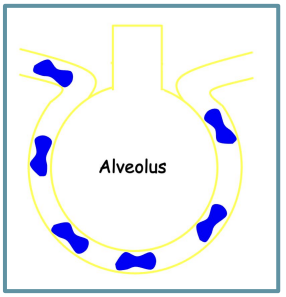
Overview:

Assessing respiratory failure
Hypoxaemic respiratory failure
Hypercapnic respiratory failure

Simplest method to differentiate – do an ABG
Type I = hypoxaemic
Type II = hypercapnic = ventilatory failure = respiratory acidosis

Respiratory failure – Type I -> Hypoxaemic

- Differentials
  - Alveolar problem: fluid, pus, destruction, collapse
  - Circulation problem: V/Q mismatch, PE, shunt, Destruction
  - Interstitial problem: fibrosis, infiltration



By definition there is no problem with ventilation

- Options:
  - High flow oxygen
  - CPAP – for pulmonary oedema +/- atelectasis
  - Bi-level – immunocompromised with LRTI (ICU)
  - Invasive ventilation – where above fails (and failure can occur very quickly!)

Respiratory failure – Type II

- Evaluating ventilatory (type 2) failure

Excess load or reduced capacity (=can't breathe)
- Lung problem
- Chest wall problem
- Muscle problem

Reduced drive (=won't breathe)
- Drugs
- Central pathology
- Sleep problem (usually have load/capacity problem too)

- Ventilatory failure (T2RF)

PaCO2>45mmHg

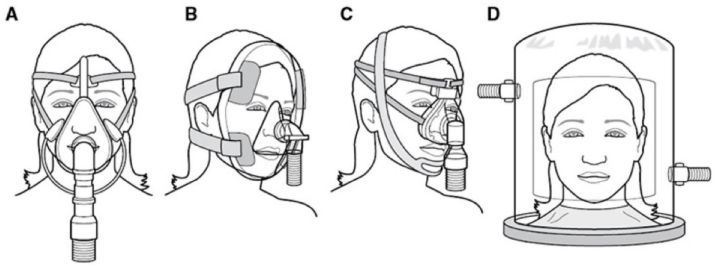
- **Exacerbation of COPD**
- **Obesity hypoventilation syndrome**
- **Chest wall/neuromuscular** – respiratory muscle weakness
- **Progression of Type I cause** (prior to respiratory arrest)
- **Central** – CNS depression/trauma/medications (opioid/BZDs)
-

- Ventilatory failure → needs ventilation

Exclude reversible causes (particularly drugs, oxygen)

Ventilate – invasive vs non-invasive (Bi-level)

Invasive vs Non -Invasive: Positive Ventilation



Examples of noninvasive positive pressure ventilation delivery devices: **A**, face mask; **B**, total face mask; **C**, nasal mask with chin strap; and **D**, helmet.

Table 5-3 Respiratory Conditions Likely to Respond to Noninvasive Positive Pressure Ventilation

Hypoxemic Respiratory Failure

- Cardiogenic pulmonary edema without hemodynamic instability
- Respiratory failure in patients with mild to moderate *Pneumocystis* pneumonia
- Respiratory failure in immunocompromised patients (especially in hematologic malignancies and transplant patients)
- Respiratory failure of likely reversible cause within 48–72 hours

Hypercapnic Respiratory Failure

- Acute exacerbation of chronic obstructive pulmonary disease
- Acute exacerbation of asthma
- Respiratory failure in patients with cystic fibrosis

Table 5-2 Advantages and Disadvantages of Noninvasive Positive Pressure Ventilation

Advantages	Disadvantages
• Reduced need for sedation	• Claustrophobia
• Preservation of airway-protective reflexes	• Increased workload for respiratory practitioner
• Avoidance of upper airway trauma	• Facial/nasal pressure lesions
• Decreased incidence of nosocomial sinusitis	• Unprotected airway and pneumonia
• Improved patient comfort	• Inability to suction deep airway
• Shorter length of stay in ICU and hospital	• Gastric distension with use of face mask or helmet
• Improved survival	• Possible upper-extremity edema, axillary vein thrombosis, tympanic membrane dysfunction, and intrahelmet noise with use of helmet
	• Delay in intubation

Table 5-5 Contraindications to Use of Noninvasive Positive Pressure Ventilation

- Cardiac or respiratory arrest
- Hemodynamic instability
- Myocardial ischemia or arrhythmias
- Patient who is unable to cooperate
- Inability to protect the airway
- High risk for aspiration
- Active upper gastrointestinal hemorrhage
- Severe hypoxemia
- Severe encephalopathy
- Facial trauma, recent surgery, and/or burns
- Significant agitation

Indications for Invasive positive pressure ventilation

Unable to tolerate NIV or NIV failure
Respiratory or cardiac arrest
Respiratory pauses with loss of consciousness or gasping for air
Diminished consciousness, psychomotor agitation inadequately controlled by sedation
Massive aspiration
Persistent inability to remove respiratory secretions
Heart rate <50 min^{-1} with loss of alertness
Severe hemodynamic instability without response to fluids and vasoactive drugs
Severe ventricular arrhythmias
Life-threatening hypoxemia in patients unable to tolerate NIV

Complications of invasive mechanical ventilation

Short-term

- Increase in complications
  - VAP
  - Sepsis
  - Acute respiratory distress syndrome (ARDS)
  - Pulmonary embolism
  - Barotrauma
  - Pulmonary edema
- Increase in health care costs
- Increase in length of stay

Long-term

- Slower overall recovery time
- Debilitating physical disabilities
- Lingering cognitive dysfunction
- Psychiatric issues, including anxiety, depression, and post-traumatic stress disorder

Good luck !

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