Clinical Deterioration Pre Arrest

Relates to HLT404C Apply Advanced Resuscitation Techniques
ALS Module 3
Clinical Deterioration
Pre Arrest
Objectives

- To understand the significance and the consequences of altered observations and the underlying physiology
- To recognise and interpret abnormal values
- To assess and match “observations” to the patient’s condition in line with local charts and protocols
- To understand that timely communication and escalation when clinical deterioration is identified is important
Introduction

Early recognition of clinical deterioration, followed by prompt and effective action, can minimise the occurrence of adverse events such as cardiac arrest and may mean that a lower level of intervention is required to stabilise a patient.
Introduction

In the early stages of deterioration there are often changes in the vital signs that go unrecognised. These key warning signs include:

- Respiratory Rate
- Oxygen saturation
- Heart rate
- Blood Pressure
- Temperature
- Conscious State
- Blood Glucose Level
Introduction

There is strong evidence demonstrating the association between abnormal physiological observations, assessment, critical illness and serious adverse events.

**Individually**, observations can have a simple explanation **but together** they could indicate that a patient, especially a critically ill patient, is in trouble and is **compensating**. Changes in physiological parameters **must** trigger an action.
Introduction

Early signs of clinical and physiological instability are key indicators of pre arrest. In many cases these events may be prevented if the cause of the deterioration is recognised early and acted upon before the patient deteriorates beyond the point of reversibility.
Vitals Signs

Respiratory Rate
Oxygen delivery depends on adequate ventilation (arterial oxygen content), gas exchange (arterial oxygen content) and effective circulatory distribution (cardiac output).
Respiratory Rate

Inadequate oxygen delivery at the tissue level

⇒

Anaerobic metabolism

⇒

Lactate production

⇒

Metabolic Acidosis

⇒

Stimulates respiratory drive

⇒

Increases the respiratory rate

This is why respiratory rate is important to monitor, record and action
Respiratory Rate

More Pathophysiology

• Type I respiratory failure (hypoxaemic - \( \text{PaO}_2 \geq 60 \text{ mmHg} \)) - Clinical features include hypoxia with a normal or low \( \text{CO}_2 \), and is primarily due to pathology affecting oxygenation alone.

• Type II respiratory failure (hypercapneic - \( \text{PaCO}_2 \geq 50 \text{ mmHg} \)) - Includes problems resulting in retained carbon dioxide (hypercapnia), acidaemia (low pH) and a low \( \text{PaO}_2 \) and in the majority of cases is due to respiratory muscle failure.
Oxygen Saturations

The amount of oxygen carried on the haemoglobin is termed the oxygen saturation (SaO$_2$ or SpO$_2$).

When considering oxygen delivery in the acutely unwell patient, remember to consider the haemoglobin level, as this determines the oxygen carrying capacity of the blood.
Oxygen Saturations

Although pulse oximetry provides monitoring of oxygenation, it does not measure the adequacy of ventilation, as carbon dioxide levels are not measured nor does it determine the adequacy of oxygen delivery to the tissues.
Heart Rate and Blood Pressure

Adequate blood supply to the organs is essentially related to three physiological relationships:

- The Cardiac output (CO)
- Systemic vascular resistance (SVR)
- Stroke volume (SV)

Therefore any factors affecting CO, SV or SVR will impact on BP

\[
BP = CO \times SVR \quad \quad CO = SV \times HR
\]
Heart Rate and Blood Pressure

The generally acceptable definition of hypotension in adults is:

- A drop of more than 20% from “usual” blood pressure OR
- Systolic blood pressure of less than 90mmHg

Hypotension is a late sign of a compromised circulatory system – preceded by increase in respiration and heart rate
Temperature

Damage to the brain stem or the hypothalamus can cause irregularities in temperature control, however, non-neurological reasons for changes in temperature such as infection, hypothermia, hyperthermia must also be considered.
Level Of Consciousness

It is absolutely imperative to ensure that an accurate evaluation of the level of consciousness (LOC) is carried out and documented. A baseline assessment of the patient is useful in establishing whether alterations are indeed an acute deterioration or is in keeping with that which is considered normal for a patient.
Level Of Consciousness

The most common causes are associated with respiratory, cardiovascular and metabolic compromise.

When oxygen supply is inadequate cellular functions fail leading to symptoms of confusion and decreased level of consciousness.
Blood Glucose Level

Many cells in the body use glucose, fats or proteins as substrates for energy production. However, neurones can only use glucose as their substrate for energy production. Therefore, if serum glucose levels fall too low, cellular function will be compromised. Thus, confusion or depressed level of consciousness could also result from hypoglycaemia.
Primary Survey - ABCD Approach

Clinical deterioration warrants a full assessment of the patient, using a structured and prioritised approach.

• Assessment should be done using the ABCD approach
• Look, listen and feel technique
• So look, listen and feel for signs of a blocked airway, respiratory distress, poor cardiac output, altered level of consciousness and perform a head to toe examination
Primary Survey - ABCD Approach

A – **Airway** with cervical spine control

B – **Breathing** with oxygen

C – **Circulation** with haemorrhage control

D – **Disability** with blood glucose management

Remember that any problems affecting **Airway** will affect **Breathing**, which will affect **Circulation** and so on…
Airway

In order for oxygen to reach the tissues at a cellular level, the first entry point into the body is through a patent airway.

A *decreasing level* of oxygen saturations may indicate a worsening airway obstruction and a priority in escalating care.
Airway

Assessment
- LOOK
- LISTEN
- FEEL

Management
- Head tilt/Chin Lift, Jaw Thrust
- Suction
- Airway Adjuncts – Oro/Nasopharyngeal
- Advanced Airway – LMA’s and ETT
Breathing

Signs and Symptoms

- Speech Pattern
- Confusion / Agitation
- Pattern of Respiration
- Tachypnoea
- Exhaustion
- Hypoventilation
- Cheyne-Stokes
- Pursed-lip Breathing
- Peripheral and Central Cyanosis
Breathing

Assessment
- LOOK
- LISTEN
- FEEL

Management
- Apply ABCD
- Oxygenation
- Position
- Rest and Reassurance
- Review charts and notes

Recommended O₂ Sats
Hypercapnic Failure – 88-92%
Acutely unwell – 94-98%
Circulation

Alteration or failure of one or more of the above will result in inadequate tissue perfusion and oxygenation. If untreated it can lead to multi organ dysfunction/failure. This clinical emergency is known as "Shock"
Circulation

Shock can be classified as being due to changes in:

• The Fluid (hypovolaemic)
• The Heart (cardiogenic)
• The Vascular/Circulatory System (distributive; includes sepsis, anaphylaxis and neurogenic)

Hypotension and shock are caused by a problem with the heart rate, stroke volume and/or systemic resistance.
## Circulation Assessment

<table>
<thead>
<tr>
<th></th>
<th>Preload</th>
<th>Contractility</th>
<th>Afterload</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>↑ respiratory rate</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>↑ heart rate</strong></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>• Weak thready pulse</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Bounding pulse</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>↓ CVP / JVP</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Peripheral shutdown</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• ↑ capillary refill time (&gt;2 sec)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Pale, cool and clammy</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Altered level of consciousness</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Reduced BP</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Peripheral vasodilatation</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>• ↓ capillary refill time (&lt;2 sec)</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>• Flushed, hot and sweaty</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
## Circulation Assessment

<table>
<thead>
<tr>
<th></th>
<th>Preload</th>
<th>Contractility</th>
<th>Afterload</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>↑ respiratory rate</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>↑ heart rate</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Weak thready pulse</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>• Bounding pulse</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>↓ CVP / JVP</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Peripheral shutdown</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• <strong>↑ capillary refill time (&gt;2 sec)</strong></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>• Pale, cool and clammy</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Altered level of consciousness</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Reduced BP</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Peripheral vasodilatation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• <strong>↓ capillary refill time (&lt;2 sec)</strong></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• Flushed, hot and sweaty</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Circulation Management

It is important to remember what generates a blood pressure:

- Cardiac Output (stroke volume x heart rate)
- Systemic Vascular Resistance

It is essential to determine from history and clinical examination, which of these two has decreased leading to a fall in blood pressure to ensure appropriate management plan is in place.
Circulation

Management (Cont…)

• Fluid management
  ➔ Administer 250mls bolus of crystalloid/colloid and assess clinical response. Repeat as necessary

• Titrate further fluid in accordance with clinical response – HR/RR/BP/Urine output

• Failure to respond to treatment requires further medical review/orders and transfer

• Observe for excessive fluid loss from wounds, drains, catheters and any fistulae
Disability

**AEIOU TIPS** - Useful mnemonic to look at causes of ALOC

- **A** Alcohol or Acidosis
  - Endocrine, Environmental and electrolyte disorders
- **E** Insulin – hypoglycaemia
- **I** Oxygen (hypoxia) and opiates
- **O** Uraemia (renal failure)
- **U** Trauma, toxidromes and temperature
  - Infection
- **P** Poisoning, Psychogenic and pharmacological
- **S** Seizures, syncope, stroke, shock and space-occupying lesions
Disability

Tools to assessing level of consciousness

Blood Glucose

- Check a blood glucose level

AVPU

- A Alert
- V Responds to Voice
- P Responds to Pain
- U Unresponsive
Disability

Tools for assessing level of consciousness

Glasgow Coma Scale

• Severe Head Injury GCS < 9
• Moderate Head Injury GCS 9 - 13
• Mild Head Injury GCS 14 - 15

A deterioration of 1 point in the motor response or an overall deterioration of 2 points in the GCS score is clinically significant and must be escalated immediately for medical review.
Disability

Assessment

The most common cause of airway compromise in the critically ill is reduced conscious level. The airway MUST be protected in the unconscious patient.

• LOOK
• LISTEN
• FEEL
Disability Management

- ABCD algorithm
- AVPU to ascertain conscious level
- Ensure airway is patent
- Supplemental oxygen
- Intravenous access and a check of blood sugar level are indicated
- Reverse any drug-induced CNS depression
- Consider blood and urine screening to assist identifying causes
Following assessment of ABCD it is important to undertake a full systematic patient examination (Secondary Survey).

This ensures that nothing has been missed which may account for or contribute to the patients’ current situation.

Information gained through the secondary survey will help inform further management/required.
Case Study

Tom, a 61-year-old male came to the clinic/health service with a three day history of increased sputum production and shortness of breath. In the last hour he has been feeling increasingly short of breath.

On examination you find the following -

- A thin male sitting upright in a chair, using accessory muscles of breathing.
- He is speaking in phrases only and he appears distressed.
- You note he is diaphoretic/sweating and has cool peripheries, but is not cyanosed.
Case Study

Observations taken are as follow – RR is 27, $O_2$ sats 86% on room air (RA), BP is 160/96 mmHg, HR is 108, 38.1, AVPU

His past medical history is of COPD, hypertension and gout. Current medications are: Prednisolone 5 mg daily, Salbutamol TDS and Prazosin 2 mg BD. He quit smoking 3 months ago – he used to smoke 30 - 40 per day since he was 20 years of age. He has had numerous admissions to hospital in the past. His last admission was 4 months ago.
Case Study

Based on his observations what is your next step?
Case Study

Tom’s RR, BP and HR observations should trigger escalation of care with medical review/consultation.

Doctor’s orders include and are confirmed:

- Oxygen – 10 -15L via NRBM to maintain $O_2$ sats 92%
- Fluids – 250ml bolus
- Cultures – sputum and blood cultures
- Blood gases - to guide oxygen therapy
PLAN OF ASSESSMENT

Immediate Assessment
Primary – ABCD

Call for Help

Airway
Airway Adjuuncts

Breathing
Support oxygenation and ventilation

Circulation
IV Access and Initial Fluid Resuscitation

Disability
AVPU and BGL

Is the patient stable?
No – Return and Reassess ABCD
Yes - Secondary Survey – EFGHI

Call for Help

Exposure
Full set of observations. If appropriate then consider:
Five Interventions - Cardiac Monitor, 12 Lead ECG, IDC – Monitor U/O, Nasogastric tube
Blood Specimens
Family – get them in
Head to Toe Examination and History - Review results of routine investigations and patient’s notes
Give Pain Relief
Inspection Posterior Surfaces

Monitor all closely

Decisions and Planning

Is the patient improving?

YEEs

Do you have a diagnosis?

NO

Reassess ABCD’s

YES

Call for Help

Definitive Care

Management Plan
Summary

Early recognition of clinical deterioration, followed by prompt and effective action, can minimise the occurrence of adverse events such as cardiac arrest and may mean that a lower level of intervention is required to stabilise a patient.
## Circulation Assessment

<table>
<thead>
<tr>
<th></th>
<th>Preload</th>
<th>Contractility</th>
<th>Afterload</th>
</tr>
</thead>
<tbody>
<tr>
<td>→ respiratory rate</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>↑ heart rate</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• Weak thready pulse</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>• Bounding pulse</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>↓ CVP / JVP</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Peripheral shutdown</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• ↑ capillary refill time (&gt;2 sec)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• Pale, cool and clammy</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Altered level of consciousness</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Reduced BP</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Peripheral vasodilatation</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>• ↓ capillary refill time (&lt;2 sec)</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• Flushed, hot and sweaty</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>