Intermediate Life Support

(ILS)

For Stage 3 Medical Students

Reading Materials and Resources

Nathan Moore and Andrew Coggins (SILECT Instructors)
Introduction

During the Stage 3 of the University of Sydney Graduate Medical Program there has been student feedback that they would like further teaching of Advance Life Support (ALS) Skills. While an ALS ‘qualification’ requires the participation in an accredited 2 day course (and on ongoing training) we have been presented with an ideal opportunity to cover some of the basic concepts that underpin the teachings of ALS in a 4 hour program at Westmead Hospital. This Intermediate Life Support (ILS) course aims to deliver short clinically relevant training sessions for Stage 3 medical students to gain further ALS skills. In the program we will use short didactic lectures and tutorials to teach the concepts from the 2010 ALS guidelines. Further learning will be provided by the participation in simulated clinical scenarios using a high fidelity training environment. In these scenarios we will cover common ALS scenarios encountered on the ward. Participants are expected to read though some pre-reading materials to get the most out of the 4 hour session. Participants will be given laminated cards and encouraged to use check-lists and cognitive aids in the simulations and on the ward. Good communication and teamwork will be encouraged during in the session.

Learning Objectives

- Basic Life Support (Review) and Advanced Life Support (Introduction)
- Teamwork
- Communication and the importance of Clinical Handover (ISBAR).
- When to call for help and Criteria for Escalation (e.g. PACE, MET and ALS calls)
- How to call for help
- The Importance of Local Guidelines (e.g. Sepsis)
- ECG and Arrhythmia Interpretation
- Arterial Blood Gas analysis
- Introduction to the approach to the deteriorating patient on the ward
Target group

These sessions are targeted at STAGE 3 University of Sydney Medical Students.

Overview

Time Allowance

This program will take approximately 4 hours to complete.

There will be groups of 5-10 students.

Other medical students can observe but not participate in the scenarios.

The second 2 hours of the program will be combined with Junior Medical Officer Teaching where possible.
Program Aims and Delivery

The main aims of the program are:

- To provide **training and education** for future medical staff
- To provide a ‘**safe**’ simulation environment for participant questions and practice of clinical scenarios
- To increase the student’s confidence in knowledge and application of basic ALS concepts
- To provide information on the Ministry of Health’s **policies** and educational **resources** associated with the patient care including Sepsis Kills, Deteriorating Patients (Between the Flags), ACS and ISBAR.

**Delivery of the ILS program:**

The program has been designed to be delivered in a combination of both workshops and simulation based modalities. SILECT will aim to provide accommodating faculty and a comfortable venue.

**Face to face workshops**

All workshops are designed to be delivered as interactive

**Simulation sessions**

All simulation sessions will be run with an approximately 5 minute introduction discussion related to the topic followed by a 25 minute simulation session. The simulation component will be conducted as per SILECT debriefing practice aiming to spend no less than twice the length of scenario time spent in debriefing. ‘Good judgement’ in debriefing should be undertaken and there must be a SILECT accredited instructor in attendance for the debriefing. Appropriate methods of debriefing used include advocacy/inquiry and plus delta techniques.

**Evaluation**

Course participants are encouraged to evaluate the program and offer suggestions for future programs

Presenters and facilitators will evaluate the sessions and offer suggestions for future programs
### (1) Suggested Approach to the Deteriorating Patient

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td><strong>Airway</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B</strong></td>
<td><strong>Breathing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C</strong></td>
<td><strong>Circulation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td><strong>Disability</strong>&lt;br&gt;(neurological assessment)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>E</strong></td>
<td><strong>Exposure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>F</strong></td>
<td><strong>Fluids</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>G</strong></td>
<td><strong>Glucose</strong></td>
<td></td>
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</tr>
</tbody>
</table>

**GIVE OXYGEN**

**POSITION YOUR PATIENT**

- Call for help if you can't manage
- Establish IV if not present +/- fluids

**Never leave a deteriorating patient without a priority management and review plan**

Detect Me.
Basic Life Support (BLS)

D
Dangers?

R
Responsive?

S
Send for help

A
Open Airway

B
Normal Breathing?

C
Start CPR
30 compressions : 2 breaths
if unwilling / unable to perform rescue breaths continue chest compressions

D
Attach Defibrillator (AED)
as soon as available and follow its prompts

Continue CPR until responsiveness or normal breathing return
(3) The Advanced Life Support (ALS) Algorithm
Key Steps in the Chain of Survival

See - http://emergencypedia.com/2014/01/17/push-my-buttons-mechanical-cpr

In Hospital ALS Team Actions
**MET (PACE) Call Criteria**

<table>
<thead>
<tr>
<th>MET calling criteria</th>
<th>Airway</th>
<th>Threatened</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breathing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All respiratory arrests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory rate (&lt; 5 \text{ min}^{-1})</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory rate (&gt; 36 \text{ min}^{-1})</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All cardiac arrests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse rate (&lt; 40 \text{ min}^{-1})</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse rate (&gt; 140 \text{ min}^{-1})</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic BP (&lt; 90 \text{ mmHg})</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neurology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sudden decrease in level of consciousness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decrease in GCS of (&gt; 2) points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeated or prolonged seizures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any patient causing concern who does not fit the above criteria</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**When to Worry**

<table>
<thead>
<tr>
<th>Score</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse (min⁻¹)</td>
<td>≤ 40</td>
<td>41 - 50</td>
<td>51 - 90</td>
<td>91 - 110</td>
<td>111 - 130</td>
<td>≥ 131</td>
<td></td>
</tr>
<tr>
<td>Respiratory rate (min⁻¹)</td>
<td>≤ 8</td>
<td>9 - 11</td>
<td>12 - 20</td>
<td>21 - 24</td>
<td>≥ 25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>≤ 35.0</td>
<td>35.1 - 36.0</td>
<td>36.1 - 38.0</td>
<td>38.1 - 39.0</td>
<td>≥ 39.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic BP (mmHg)</td>
<td>≤ 90</td>
<td>91 - 100</td>
<td>101 - 110</td>
<td>111 - 249</td>
<td>≥ 250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxygen saturation (%)</td>
<td>≤ 91</td>
<td>92 - 93</td>
<td>94 - 95</td>
<td>≥ 96</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspired oxygen</td>
<td>Air</td>
<td></td>
<td></td>
<td></td>
<td>Any oxygen therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVPU</td>
<td>Alert (A)</td>
<td>Voice (V)</td>
<td>Pain (P)</td>
<td>Unresponsive (U)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 3.1 Example of early warning scoring (EWS) system**

*From Prytherch et al. VIEWS - Towards a national early warning score for detecting adult in-patient deterioration. Resuscitation. 2010;81(8):932-7*
The Sepsis Pathway

Key Concept - Sepsis is a leading cause of admission to ICU and has a high mortality.

**ADULT SEPSIS PATHWAY**

Does your patient have risk factors, signs or symptoms of infection?

- Immune compromised
- Indwelling medical device
- Recent surgery/invasive procedure
- History of fever or rigors
- Red Flags in ambulance handover
- Skin: cellulitis, wound
- Urine: dysuria, frequency, odour
- Abdomen: pain, peritonism
- Chest: cough, shortness of breath
- Neuro: decreased mental alertness, neck stiffness, headache

**AND**

Does your patient have 2 or more yellow criteria?

- Respirations ≤ 10 or ≥ 25 per minute
- $SpO_2 < 95$
- Systolic blood pressure ≤ 100 mmHg
- Pulse ≤ 50 OR ≥ 120 per minute
- Altered LOC or change in cognitive status
- Temp ≤ 35.5 or ≥ 38.5°C

**YES**

Perform venous blood gas if available

**NO**

Re-assess

- Treat and re-assess simultaneously: Sepsis may still be a concern

Does your patient have any red criteria?

- $SBP ≤ 90\text{ mmHg}$
- Lactate ≥ 4 mmol/L
- Base Excess < -5.0
- Age > 65 years
- Immunocompromised

**NO**

**YES**

This patient may have SEPSIS:

- Inform the doctor-in-charge
- Monitor vital signs & fluid balance
- Obtain blood cultures x 2 sets
- Investigate source of infection: e.g. urinalysis, urine M/C/S, chest x-ray
- Obtain IV access and start IV fluids
- Administer empiric antibiotics within one hour unless another diagnosis is more likely

Refer to Therapeutic Guidelines: Antibiotic, version 14


- Refer / communicate with admitting team

This patient has SEVERE SEPSIS or SEPTIC SHOCK until proven otherwise:

- Inform the doctor-in-charge
- Expedite transfer to a resuscitation area or equivalent
- Turn over page for Resuscitation Guideline

**CONSIDER ELIGIBILITY for ARISE**
SEPSIS PATHWAY: Resuscitation Guideline

Does the patient have an Advance Care Directive? Are there treatment limitations?
- Patient assessment and treatment proceeds simultaneously
- Maintain $\text{SpO}_2 \geq 95\%$
- Monitor respiratory rate, $\text{SpO}_2$, heart rate and rhythm, blood pressure, temp, fluid balance
- Obtain intravenous access
  - Take two sets of blood cultures, FBC including lactate or venous blood gas for lactate,
  - EUC, LFT, coagulation & glucose (glucometer or formal)
- Fluid resuscitation
  - i. Give 20mL/kg of 0.9% sodium chloride STAT fluid challenge
  - ii. If no response, repeat 20mL/kg once (unless there are signs of pulmonary edema)
  - iii. If no response, insert IDC and commence vasopressors (as per local protocol) to achieve a MAP of $\geq 65\text{mmHg}$ in consultation with Doctor-in-Charge

Start IV antibiotics within 60 minutes
  ** Do not wait for results of investigations **
- Investigate source of infection e.g. urine M/C/S, chest x-ray, sputum, wound
- Refer/communicate with admitting team and ICU

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**IS YOUR PATIENT RESPONDING TO RESUSCITATION?**

<table>
<thead>
<tr>
<th>Signs of improvement</th>
<th>If improving take the following action:</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAP $\geq 65\text{mmHg}$</td>
<td>• Continue monitoring vital signs closely</td>
</tr>
<tr>
<td>Urine Output $&gt; 0.5\text{mL/kg/hr}$</td>
<td>• Strict monitoring of fluid balance</td>
</tr>
<tr>
<td>$\text{SpO}_2 \geq 95%$</td>
<td>• Investigate and treat the source of infection</td>
</tr>
<tr>
<td>Decreasing serum lactate level</td>
<td></td>
</tr>
<tr>
<td>Improving LOC</td>
<td></td>
</tr>
</tbody>
</table>

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**IF NO IMPROVEMENT INTENSIVE CARE MANAGEMENT IS REQUIRED**

1. Reassess suitability to continue resuscitation
2. Request review by ICU doctor to occur within 30 minutes
3. If you do not have an ICU at your facility, seek advice immediately from the
   ADULT MEDICAL RETRIEVAL SERVICE 1800 650 004 or the local Critical Care Advisory Service

Minimum requirements for patient monitoring:
- Continuous blood pressure, continuous urine output via IDC
- Repeat serum lactate every 4 hours
The ABG Framework
Adapted from Adult Life Support Workbook 2013

Key Concept - Respiratory Failure is a leading cause of admission to the ICU and a leading cause of mortality. Early recognition using blood gases and appropriate actions following their interpretation are important.

(For more on ABGs go to - http://emergencypedia.com/2013/05/23/the-ed-arterial-blood-gas-abg)

1. How is the patient?

All ABG’s should be interpreted in the context of the patients’ current condition and past medical history

2. Is the patient hypoxic?

Major principles when managing hypoxia:

- If the patient requires ≥50% oxygen to keep SpO₂ ≥90%, an ALS call must be made, and the patient should be managed on HDU or ICU.
- PaO₂ should be 3.5 – 5 times the FiO₂.
- Elevated PaCO₂ in the context of Acute Respiratory Failure indicates the patient is tiring until proven otherwise. Any patient with elevated PaCO₂ and low pH has an acute respiratory acidosis and may need ventilatory support. These patients need an ALS call.
- Don’t take off the mask to take an ABG on room air.
- Rapid removal of supplemental O₂ in the context of high PaCO₂ leads to rapid and dangerous hypoxia.

3. Is the patient acidaemic or alkalaemic?

The pH of the body is maintained within a narrow range (7.35 – 7.45) by 3 main homeostatic mechanisms:

1. Lungs/Respiratory centre
2. Kidneys & Liver handling of HCO₃⁻
3. Buffer systems

The most important buffer system by far is the Bicarbonate-Carbonic Acid system, which links the Respiratory and HCO₃⁻ systems and is represented by the equation:

\[ \text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{H}_2\text{CO}_3 \leftrightarrow \text{H}^+ + \text{HCO}_3^- \]

4. What has happened to the CO₂?

Is the abnormality due wholly or partially to a defect in the respiratory system?

If the pH < 7.35 (acidaemia):

Is the PaCO₂ increased (>45mmHg)? If so, there is a respiratory acidosis that may account for all or part of the derangement. This is most common in patients with COPD, sedated patients, and in patients with Acute Respiratory Failure who are tiring.
This causes a *compensatory metabolic alkalosis* – in the acute stage, the HCO$_3^-$ increases a small amount by a shift in the balance of the Bicarbonate-Carbonic Acid relationship to the right. Over several days, the kidneys/liver retain HCO$_3^-$ to provide compensation.

**If the pH is > 7.45 (alkalaemia):**

Is the PaCO$_2$ reduced (< 35mmHg)? If so, there is a *respiratory alkalosis* that may account for all or part of the derangement. This is most common in patients with Acute Respiratory Failure with tachypnoea.

This causes a *compensatory metabolic acidosis* – in the acute stage the HCO$_3^-$ decreases a small amount by a shift in the balance of the Bicarbonate-Carbonic Acid relationship to the left. Over several days, the kidneys/liver excrete HCO$_3^-$.

5. **What has happened to the base excess and bicarbonate?**

Is the abnormality due wholly or partially to a defect in the metabolic system?

**If the pH < 7.35 (acidaemia):**

Is the HCO$_3^-$ reduced (< 22 mmol/L) or Base Excess reduced (more negative than -2)? If so, there is a *metabolic acidosis* accounting for all or part of the derangement.

Compensatory respiratory alkalosis: Respiratory centre is stimulated and minute ventilation increases, with a fall in PaCO$_2$.

**If the pH is > 7.45 (alkalaemia):**

Is the HCO$_3^-$ increased (> 26mmol/L) or Base Excess increased (> +2mmol/L)? If so, there is a *metabolic alkalosis* accounting for all or part of the derangement.
6. **Is there a mixed disorder present?**

Sometimes this is easy – with a normal compensatory response, we expect the PaCO₂ and HCO₃⁻ to have moved in the same direction, in other words, both up or both down. So if these two variables have moved in **opposite directions**, then a mixed disorder **must** be present.

7. **What other clues are present on the ABG?**

Other clues and results to assess on an ABG include:

- Serum lactate – an important indicator of peripheral perfusion and O₂ delivery. *Causes include hypoxia, anaemia, shock, sepsis and regional hypoperfusion. It is a useful measure in the context of an acidosis, as it points immediately to inadequate tissue oxygenation as at least part of the cause.*
- Haemoglobin
- Blood sugar level – consider diabetic ketoacidosis
- Electrolytes
- Anion gap – helpful in determining the cause of a Metabolic Acidosis
Example ABG 1

**On 28% Oxygen**

<table>
<thead>
<tr>
<th>Blood Gas Values</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>↑ pH</td>
<td>7.451</td>
<td>[7.350 - 7.450]</td>
</tr>
<tr>
<td>↑ pCO₂</td>
<td>54.5 mmHg</td>
<td>[35.0 - 45.0]</td>
</tr>
<tr>
<td>↓ pO₂</td>
<td>58.3 mmHg</td>
<td>[75.0 - 100]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acid Base Status</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>cHCO₃⁻(P,st)₀</td>
<td>35.6 mmol/L</td>
<td></td>
</tr>
<tr>
<td>cBase(Ecf)₀</td>
<td>12.7 mmol/L</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oximetry Values</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>↓ sO₂</td>
<td>88.5 %</td>
<td>[95.0 - 100.0]</td>
</tr>
<tr>
<td>↓ cHb</td>
<td>99 g/L</td>
<td>[130 - 180]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrolyte Values</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>↓ cK⁺</td>
<td>2.9 mmol/L</td>
<td>[3.5 - 5.0]</td>
</tr>
<tr>
<td>cNa⁺</td>
<td>144 mmol/L</td>
<td>[136 - 146]</td>
</tr>
<tr>
<td>↓ cCa²⁺</td>
<td>1.14 mmol/L</td>
<td>[1.15 - 1.30]</td>
</tr>
<tr>
<td>cCa²⁺(7.4)₀</td>
<td>1.17 mmol/L</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metabolite Values</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>cGlu</td>
<td>5.4 mmol/L</td>
<td></td>
</tr>
<tr>
<td>cLac</td>
<td>1.5 mmol/L</td>
<td>[0.5 - 2.0]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature Corrected Values</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>pH(T)</td>
<td>7.451</td>
<td></td>
</tr>
<tr>
<td>pCO₂(T)</td>
<td>54.5 mmHg</td>
<td></td>
</tr>
</tbody>
</table>
### Example ABG 2
**On 50% Oxygen**

<table>
<thead>
<tr>
<th>Blood Gas Values</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>↓ pH</td>
<td>7.282</td>
<td></td>
<td>[ 7.350 - 7.450 ]</td>
</tr>
<tr>
<td>↑ pCO₂</td>
<td>55.1 mmHg</td>
<td></td>
<td>[ 35.0 - 45.0 ]</td>
</tr>
<tr>
<td>↓ pO₂</td>
<td>69.7 mmHg</td>
<td></td>
<td>[ 75.0 - 100 ]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acid Base Status</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>cHCO₃⁻(P,st)c</td>
<td>23.3 mmol/L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cBase(B)c</td>
<td>-1.2 mmol/L</td>
<td></td>
<td>[-3.0 - 3.0 ]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrolyte Values</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>cK⁺</td>
<td>4.6 mmol/L</td>
<td></td>
<td>[ 3.4 - 5.5 ]</td>
</tr>
<tr>
<td>cNa⁺</td>
<td>137 mmol/L</td>
<td></td>
<td>[ 136 - 146 ]</td>
</tr>
<tr>
<td>↓ cCa²⁺</td>
<td>1.08 mmol/L</td>
<td></td>
<td>[ 1.15 - 1.30 ]</td>
</tr>
<tr>
<td>cCa²⁺(7.4)c</td>
<td>1.01 mmol/L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cCl⁻</td>
<td>100 mmol/L</td>
<td></td>
<td>[ 9.4 - 107 ]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metabolite Values</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>↑ cGlu</td>
<td>6.0 mmol/L</td>
<td></td>
<td>[ 3.9 - 5.8 ]</td>
</tr>
<tr>
<td>↑ cLac</td>
<td>2.7 mmol/L</td>
<td></td>
<td>[ 0.5 - 2.0 ]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oxygen Status</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>↓ cHb</td>
<td>86 g/L</td>
<td></td>
<td>[ 130 - 180 ]</td>
</tr>
<tr>
<td>↓ sO₂</td>
<td>92.8 %</td>
<td></td>
<td>[ 95.0 - 100.0 ]</td>
</tr>
<tr>
<td>p50c</td>
<td>28.21 mmHg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pO₂(a/A)₂</td>
<td>10.5 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FMetHb</td>
<td>1.0 %</td>
<td></td>
<td>[ 0.0 - 1.5 ]</td>
</tr>
<tr>
<td>FCOHb</td>
<td>0.8 %</td>
<td></td>
<td>[ 0.0 - 1.5 ]</td>
</tr>
<tr>
<td>p50(st)c</td>
<td>25.15 mmHg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FShunt₂</td>
<td>33.4 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FO₂Hb</td>
<td>91.1 %</td>
<td></td>
<td>[ 90 - 92.5 ]</td>
</tr>
<tr>
<td>Hctc</td>
<td>26.7 %</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Example ABG 3
### On Oxygen – Non Re-breather Mask (15 Litres/min)

#### Blood Gas Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.277</td>
<td>[7.350 - 7.450]</td>
</tr>
<tr>
<td>pCO₂</td>
<td>31.3 mmHg</td>
<td>[35.0 - 45.0]</td>
</tr>
<tr>
<td>pO₂</td>
<td>245 mmHg</td>
<td>[75.0 - 100]</td>
</tr>
</tbody>
</table>

#### Acid Base Status

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>cHCO₃⁻(P,st)ₖ</td>
<td>15.5 mmol/L</td>
<td></td>
</tr>
<tr>
<td>cBase(Ecf)ₖ</td>
<td>-11.3 mmol/L</td>
<td></td>
</tr>
</tbody>
</table>

#### Oximetry Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>sO₂</td>
<td>99.6%</td>
<td>[95.0 - 99.0]</td>
</tr>
<tr>
<td>cHb</td>
<td>89 g/L</td>
<td>[135 - 160]</td>
</tr>
</tbody>
</table>

#### Electrolyte Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>cK⁺</td>
<td>4.6 mmol/L</td>
<td>[3.5 - 5.0]</td>
</tr>
<tr>
<td>cNa⁺</td>
<td>139 mmol/L</td>
<td>[136 - 146]</td>
</tr>
<tr>
<td>cCa²⁺</td>
<td>1.19 mmol/L</td>
<td>[1.15 - 1.29]</td>
</tr>
<tr>
<td>cCa²⁺(7.4)ₖ</td>
<td>1.11 mmol/L</td>
<td></td>
</tr>
</tbody>
</table>

#### Metabolite Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>cGlu</td>
<td>7.2 mmol/L</td>
<td>[3.9 - 5.8]</td>
</tr>
<tr>
<td>cLac</td>
<td>0.9 mmol/L</td>
<td>[0.5 - 1.6]</td>
</tr>
</tbody>
</table>

#### Temperature Corrected Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH(T)</td>
<td>7.277</td>
<td></td>
</tr>
<tr>
<td>pCO₂(T)</td>
<td>31.3 mmHg</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**
### Example ABG 4
#### On Room Air

<table>
<thead>
<tr>
<th>Blood Gas Values</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>↓ pH</td>
<td>7.206</td>
</tr>
<tr>
<td>pCO₂</td>
<td>37.8 mmHg</td>
</tr>
<tr>
<td>↓ pO₂</td>
<td>46.8 mmHg</td>
</tr>
<tr>
<td>cHCO₃⁻(P) c</td>
<td>14.3 mmol/L</td>
</tr>
<tr>
<td>cBase(Ecf) c</td>
<td>-12.1 mmol/L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oximetry Values</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FCO₂-Hb</td>
<td>1.4 %</td>
</tr>
<tr>
<td>FMet-Hb</td>
<td>0.4 %</td>
</tr>
<tr>
<td>↓ chHb</td>
<td>10.8 g/dL</td>
</tr>
<tr>
<td>↓ sO₂</td>
<td>73.0 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrolyte Values</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>K⁺</td>
<td>7.8 mmol/L</td>
</tr>
<tr>
<td>↓ Cl⁻</td>
<td>98 mmol/L</td>
</tr>
<tr>
<td>↓ Na⁺</td>
<td>130 mmol/L</td>
</tr>
<tr>
<td>↓ Ca²⁺</td>
<td>1.03 mmol/L</td>
</tr>
<tr>
<td>Arterial Gap</td>
<td>16.9 mmol/L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metabolite Values</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>↑ cGlu</td>
<td>6.1 mmol/L</td>
</tr>
<tr>
<td>↑ cLac</td>
<td>1.8 mmol/L</td>
</tr>
<tr>
<td>cCreatine</td>
<td>11.85 μmol/L</td>
</tr>
<tr>
<td>GFR if nonAA₂c</td>
<td>3 mL/min/1.73 m²</td>
</tr>
<tr>
<td></td>
<td>[ - ]</td>
</tr>
<tr>
<td>GFR if AA₂c</td>
<td>3 mL/min/1.73 m²</td>
</tr>
<tr>
<td></td>
<td>[ - ]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature Corrected Values</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>pH(T)</td>
<td>7.205</td>
</tr>
<tr>
<td>pO₂(T)</td>
<td>46.8 mmHg</td>
</tr>
<tr>
<td>pCO₂(T)</td>
<td>37.8 mmHg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oxygen Status</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>pO₂(a/A) g</td>
<td>43.7 %</td>
</tr>
<tr>
<td>↑ cO₂(a)</td>
<td>10.9 Vol%</td>
</tr>
<tr>
<td>pCO₂</td>
<td>32.63 mmHg</td>
</tr>
</tbody>
</table>

### Notes
- ↑ Value(s) above reference range
- ↓ Value(s) below reference range
- c Calculated value(s)
- e Estimated value(s)

### Change Log
- 24/01/2012 21:05 (Renate Garko) Sampler ID: -> 2183853
- 24/01/2012 21:05 (Renate Garko) Patient Last Name: Lim -> LIM
- 24/01/2012 21:05 (Renate Garko) Patient First Name: boo a -> BOO
- 24/01/2012 21:05 (Renate Garko) Patient Last Name: LIM -> Lim
- 24/01/2012 21:07 (Renate Garko) Sample type: Not specified -> Arterial
- 24/01/2012 21:07 (Renate Garko) pO₂(a/A): -> 43.7
Management of Acute Hypoxia

1. Is patient’s condition LIFE-THREATENING?
   - Call ALS
   - High flow O₂
   - High flow O₂

2. If SpO₂ < 90%
   - Call PACE
   - Supplemental O₂
   - Reverse hypoxia in 5min
   - Target SpO₂ ≥ 94%
   - Target not met: High flow O₂ & call ALS
   - Reverse sedative agent

3. If patient requires FiO₂ ≥ 50%
   - For > 30mins
   - Call ALS
   - Consider HDU or ICU

4. Obtain ABG (DO NOT REMOVE O₂ THERAPY)
   - Call ALS & Respiratory Failure Reg (pH 7.325 24hrs)
   - Titrated O₂ if risk of CO₂ retention
     - Target SpO₂ 88–92%
     - Otherwise target SpO₂ 94–98%
   - NOCO₂, pH

5. REVIEW Within 30–60mins
   - STABLE PATIENT
     - No respiratory distress
     - No need for O₂ escalation
   - STABLE PATIENT
     - With risk of CO₂ retention
     - No respiratory distress
     - No need for O₂ escalation
   - DETERIORATING
     - Respiratory Distress
     - Increasing O₂ requirements
     - Increasing Respiratory Rate
     - RED ZONE criteria
     - PACE/ALS
     - ABG
     - Return to step 1
Oxygen Therapy

- All Critically Unwell and Deteriorating Patients require Oxygen Therapy and Optimum Positioning

- “Failure to correct hypoxia for fear of causing hypoventilation and CO₂ retention, is unacceptable clinical practice.” (Bateman & Leach, BMJ)

- Patients with COPD are at risk of oxygen induced hypoventilation.

- However, it must be remembered hypoxia kills in minutes hypercarbia kills in hours

- In COPD patients O2 should never be suddenly removed as this may precipitate a rapid fall in SaO2

- When ‘unwell’ these patients should receive titrated oxygen aiming for a saturation of 88-92%

Relative Hypoxia and the Alveolar Gas Equation

How sick is your patient? - Think about the concept of ‘relative hypoxia’ when looking at ABG:

- In a healthy individual breathing air normal PaO₂ is over 75 mmHg

- In other words - 3.5 to 5 times the inspired oxygen concentration

- For Example: at 40% FiO₂ your PaO₂ should be 140-200 mmHg

Initial Actions in the patient with Respiratory Distress

- ABCDEFG
- Give Oxygen
- Sit the patient up
- Call for Help
- Reassure and Commutate with Patient
- Consider bronchodilators
- Consider reversing opiates
- Consider need to call for help for ventilation support
ECG Rhythm Interpretation

Six step approach to rhythm interpretation:

Confirm normal breathing and pulse is present

1. Is there electrical activity present?
2. What is the QRS ventricular rate: Fast or Slow?
3. What is the QRS ventricular rhythm: Regular or Irregular?
4. Is the QRS complex width narrow or prolonged? 0.12 secs/3 small squares
5. Is atrial activity present?
6. Is atrial activity related to ventricular activity and what is the relationship?

Tip for Managing Arrhythmias

- When Dealing with Bradycardia always think of “DIE”
  - Drugs (therapeutic and overdose)
    - Ischaemia
  - Electrolytes (especially postassium)
- Don’t worry about the Rhythm – focus on the patient
- Ensure the patient has “IV O2 MONITOR”
ECG Interpretation

For further reading see - http://emergencypedia.com/ecg/

Use of a System and Checklists

If you are new to ECG interpretation, using a methodical approach at first helps develop the pattern recognition abilities that are common in experienced doctors and nurses... (i.e. a good example of pattern recognition in clinical practice would be a nurse's "endofthebedogram" or "gestalt" suggesting that the patient is in hypovolaemic shock - she knew this was likely to be the problem because she had seen it many times before in her career).

There are lots of examples of checklists in medicine (e.g. Intensive Care, Theatre and Intubation) and the experienced clinician can also make use of checklists and templates.

It is often said that the most commonly missed injury is said to be the "second injury". This second injury or problem often goes unnoticed due to a sense of 'relief' or 'satisfaction' which comes from the practitioner discovering the first abnormality... Human errors (that we are all at risk of making) are common and often predictable. Some of the common error producing pitfalls have been described as 'Search Satisfaction', 'Confirmation Bias', 'Anchoring' and 'Premature Closure'. These pitfalls are summarised in the following link and picture:

Dr Chris Nickson's Cognitive Pitfalls
How is all this relevant to ECG interpretation and this course?

We believe that the error producing pitfalls can occur in simple tasks like ECG interpretation as well as complex team tasks such as Managing ALS Emergencies on the Ward.

In ECG interpretation jumping to (and fixing early) on a diagnosis without a checklist or systematic approach could be perilous as significant pathology could be missed.

Look at the following ECG as an example:

![ECG Image]

You might notice that on the ECG Shown that the patient is in 'Rapid Atrial Fibrillation' just by a cursory glance.

However, it would be easy to miss the 'Inferior Myocardial Infarction' if you were distracted by the first (most obvious) abnormality... If you saw the Myocardial Infarction did you notice the Rapid Atrial Fibrillation?

This is a good example of how even is something as simple and focussed as an ECG interpretation it is very easy to miss things. In a complex ALS call with challenges in communication as well as clinical skills and medical decision making problems are enviable…

The PRINT Term ACTS course will discuss the concept of Human Factors and Crew resource management and we will discuss the Pros and Cons of Checklists and Guidelines.
The ECG Checklist

An ECG checklist or template, not only serves as a good learning tool for the novice ECG reader, but also should be useful for more experienced clinicians who are aware of ‘human factors’ and don’t want to miss significant abnormalities on the ECG. We will be giving you other laminated checklists for you in your work as an Intern...

<table>
<thead>
<tr>
<th>ECG TEMPLATE</th>
<th>Findings: Description of The ECG</th>
<th>Interpretation (Conclusions, Implications and Differential Diagnosis) of Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Patient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>When Taken</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper Speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Context</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rhythm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-P Segment (Baseline)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P waves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PR Interval</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q waves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QRS Complexes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any Bundle Branch Block?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST segments (J-point)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T waves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QT interval</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (U, J or Epsilon Waves)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
We found the process of learning ECGs frustrating at times. Despite many books and apps reassuringly titled along the lines of 'the ECGs made Easy' there is, in fact, often a significant degree of difficulty when starting learning about ECGs.

Rest assured, time and patience will get you to your goals eventually...

We suggest you practice as many ECGs as you can both from books and on the wards.

**An ECG System**

- Identify **Demographics** (name of patient, time take, old ECG for comparison)
- Identify as a Complete 12 lead ECG (e.g. not a derived ECG from a monitoring system)
- Check Paper speed (25mm/s)
- Standard Calibration is 5mm by 10mm
- On the ECG look at the bottom centre (paper speed) and bottom right (calibration 'vertical block' of 10mm) for these details

We have circled the key areas to check in the following ECG portion:

- At a paper speed of 25mm/s:
  - A 'BIG' square is 0.2 seconds in duration and a 'SMALL' square is 0.04 seconds

**Click Here for more on ECG Basics**

- **RATE, RHYTHM and AXIS**
  - Rate (Big Squares are 0.2 seconds at a paper speed of 25mm/s) = 300/R-R interval squares
  - Rhythm (Card Method)
  - Axis
    - Lies at 90 degrees to Isoelectric Lead
    - This AXIS is Normal if I and II have a positive deflection and AVR is negative
- **Define the Baseline**
  - Look at the ‘TP’ Segment – use this to define ‘ST segment elevation’ and ‘PR depression’
    - The importance of this is described by Brady and Mattu in the following figure:

![Image of ECG with annotations](image1)

The small arrows point to the ST-segments and the large arrows at the T-P segments. Using the T-P segments, one notices that there is no ST segment elevation, only PR-segment depression.

- **P waves**
  - P waves correlate with Atrial electrical activity arising in the Sino-atrial (SA) Node
  - The P wave is marked with the Red Arrow:

![Image of ECG with annotations](image2)

P wave marked with Red Arrow
- Ask yourself:
  - Does each QRS complex have an associated P wave?
  - Is the rhythm Nodal in origin (Narrow Complex, No P Waves) or Ventricular in origin (wide complex and No P wave)

- Types of P wave:

  **A Bifid P wave** - May suggest Left Atrial Enlargement

  **Peaked P wave** = P-pulmonale

  This can represent Right Atrial Hypertrophy or represent ‘a pseudo peak’ (Hypokalaemia)

- **Absent P Waves** - Think of AF (most common), sinoatrial blocks, junctional and ventricular rhythms

- **PR interval**
  - What is the PR interval?
    - It should be 0.12 to 0.2 seconds
    - It is measured from the start of the P wave to the start of the QRS complex
  - Is the interval constant?
  - Is there a QRS complex for every P wave?

  **Specific PR Interval Problems**

  Is there a 1st degree heart block?
Wolf-Parkinson-White Syndrome (WPW) type I is Upright Delta Wave in V1

WPW type II is Down-going Delta Wave in V1

If increasing PR interval – Consider Wenkebach’s Phenomenon (AKA Mobitz I)

If constant but a QRS is dropped regularly – Consider Mobitz Type 2 Heart Block

P waves seen but NO association – this may be 3rd degree (complete) Heart Block
- **PR Segments**
  - Depression in most leads or elevation of the PR segment in AVR is suggestive of Pericarditis when associated with concave up ST elevations globally

- **Q waves**
  - Non pathological waves are common
    - These represent normal L-R depolarization in the septum
  - Pathological is likely with the following:
    - Q waves more than 40ms (1mm) wide
    - Q waves more than 25% of R wave or Q waves more than 2mm deep

- **QRS Complex**
  - The QRS Complex (marked with the Red Arrow) should be less than 0.12 seconds or 3 small boxes
  - When prolonged suggests a conduction delay as depolarization occurs across the Myocardium (There is the bundle of His which becomes a right bundle, a left bundle with 2 fascicles (anterior and posterior) – these can become ‘blocked’ as a result of conduction delay due to Myocardial Ischaemia, Drugs or Electrolyte Abnormalities
  - Look at the Chest leads V1 – V6
    - If shaped as an ‘M’ in V1 (that is mostly positive RSR pattern in lead V1) and ‘W’ in lead V6 think **MARROW** – Right Bundle Branch Block
    - If shaped as W in V1 and M in V6 thing **WILLIAM** – Left Bundle Branch Block
  - You can have Unifascicular Block (that is an isolated BBB), Bifascicular Block (classically RBBB with Left Axis Deviation) and Trifascicular (RBBB, LAD, Heart block)

- **ST segments** (depression or elevation)
  - Elevation or depression of the ST segments classically represents Ischaemic Heart Disease and/or Myocardial Ischaemia. The elevation or depression is measured from the J point
  - **J Point** (the junction of the QRS complex and beginning of the ST segment)
How much is too much? This depends on the lead – in the Chest lead 2mm of elevation in 2 leads if significant, in the limb leads (further away) 1mm is significant

![Heart leads diagram]

**QT interval**

- Represents Potassium channels – i.e. a marker of repolarisation
  - Drugs or disease that cause QT interval prolongation can lead to sudden syncope or sudden death due to an arrhythmia called Torsades de Pointes (Twisting around the point). This is also known as Polymorphic Ventricular Tachycardia.
  - While rare QT prolongation is a concern. Treatment includes Magnesium and Potassium infusions.
- Consider using the QT nomogram to estimate risk of Torsades:
• T waves
  o If peaked think about Hyperkalaemia. If Inverted (outside of III and AVR) think about Paediatrics (T wave inversions are normal in Kids) and young females (also normal variant). Pathological Causes of T wave inversion include Myocardial Ischaemia, Pulmonary Embolism, Cardiomyopathy, Electrolytes Disturbances and Stroke (especially Haemorrhagic)

• U waves (and T-U fusion)
  o Can be seen when the K is low – an ‘extra’ wave ‘blip’ after the T wave

• J waves (Osborn)
  o When seen are suggestive of Hypothermia

• Epsilon Wave
  o Rare finding that suggests Arrhythmogenic Right Ventricular Dysplasia

• Check for Pacemaker
  o Various problems and presence of a pacemaker are detected on the ECG

ECG interpretation is about pattern recognition. However, so as not to miss subtle abnormalities, and to gradually build up to an adequate level of expertise we need to practice.

In doing this it is best to use a systematic approach such as the approach outlined above. The best way to learn is to go through lots of sample ECGs (the textbooks below are good resources for this) and take a problem based approach to learning the theory...
ECG 1 – Anterior STEMI
ECG 3 – Hyperkalaemia 1
ECG 4 – Hyperkalaemia 2
ECG 5 – Bradycardia (Mobitz II)
ECG 6 – Narrow Complex Tachycardia
ECG 7 – Wide Complex Tachycardia
General Tips Making a Referral to a Senior Colleague

- **Prepare** your information and resources before you call
- **Anticipate** information you’ll need for the call (e.g. results)
- Consultation when you **Need Something** or have a **Specific Clinical Question**
- **Be nice** (kill them with kindness)
- Don’t respond in a passive or rude manner (even if the consultant you are calling is coming across as rude – you may have interrupted their dinner and they are a human being so give them the benefit of the doubt).
- **Listen** Carefully to advice from the Specialist
- This involves you being brief with your explanation
- **Use** The I S B A R Framework

Don’t talk for too long – it’s not a long case presentation…

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**COMMUNICATING WITHIN YOUR HEALTH CARE TEAM**

<table>
<thead>
<tr>
<th>CLINICAL DETERIORATION</th>
<th>CLINICAL HANDOVER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INTRODUCTION</strong></td>
<td><strong>INTRODUCTION</strong></td>
</tr>
<tr>
<td>Introduce yourself, your role and location</td>
<td>Introduce yourself, your role and location</td>
</tr>
<tr>
<td>Identify the patient</td>
<td>Identify team leader</td>
</tr>
<tr>
<td></td>
<td>Clearly identify patient and family and carer if present</td>
</tr>
<tr>
<td><strong>SITUATION</strong></td>
<td><strong>SITUATION</strong></td>
</tr>
<tr>
<td>State the immediate clinical situation</td>
<td>State the immediate clinical situation</td>
</tr>
<tr>
<td></td>
<td>State particular issues, concerns or risks</td>
</tr>
<tr>
<td><strong>BACKGROUND</strong></td>
<td><strong>BACKGROUND</strong></td>
</tr>
<tr>
<td>Provide relevant clinical history and background</td>
<td>Provide relevant clinical history referring to medical record and/or eMR</td>
</tr>
<tr>
<td>Presenting problems and clinical history</td>
<td></td>
</tr>
<tr>
<td><strong>ASSESSMENT</strong></td>
<td><strong>ASSESSMENT</strong></td>
</tr>
<tr>
<td>Work through A-G physical assessment</td>
<td>Work through A-G physical assessment</td>
</tr>
<tr>
<td>What clinical observations are of particular concern?</td>
<td>Refer to observations, medication and other patient charts</td>
</tr>
<tr>
<td>What do you think the problem is?</td>
<td>Summarise current risk management strategies</td>
</tr>
<tr>
<td>Remember to have current observations and information ready!</td>
<td>Have observations breached CERS criteria?</td>
</tr>
<tr>
<td><strong>RECOMMENDATION</strong></td>
<td><strong>RECOMMENDATION</strong></td>
</tr>
<tr>
<td>What do you want the person you have called to do?</td>
<td>Recommendations for the shift</td>
</tr>
<tr>
<td>What have you done?</td>
<td>Refer to medical record or eMR</td>
</tr>
<tr>
<td>Be clear about what you are requesting and the timeframe</td>
<td>Provide expected date of discharge</td>
</tr>
<tr>
<td>Repeat to confirm what you have heard</td>
<td>What further assessments and actions are required by who and when</td>
</tr>
<tr>
<td></td>
<td>State expected frequency of observations</td>
</tr>
<tr>
<td></td>
<td>Request that receiver read back important actions required</td>
</tr>
</tbody>
</table>

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**Health Services Royal Australasian College**

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ILS Pre reading and Materials
• **Use Negotiation Skills** (see below)
  • “Credibility, authority, and being LIKED are powerful persuasion tools” Cliff Reid (2013)

• Show a genuine respect for the colleagues opinion – show respect for their point of view even if you don’t agree with them…

• Compromise

• Be specific about your concerns and questions

• It may take a few calls to get what you need

• “If I send that D-dimer off straight away are you happy to have a look at the patient for me? I think they’d benefit from you having a look.”

• Close the loop – repeat back what has been discussed – cross-check what will happen with the patient

• Ask a helpful senior colleague for help early if things are not going as planned…

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### Negotiation Strategies

- **Authority**
  Individuals are more likely to comply with experts/authority – you may not have this as an intern but you may be able to call on the help of someone who has…

- **Reciprocity**
  (“Do us a favour”)
  If you give something to people, they feel compelled to return the favour.
  - e.g. It sounds like the d-dimer sounds like an important test for you to have – I’ll make sure that gets done right now if you wouldn’t mind seeing the patient in the next 20 mins or so?

- **Scarcity**
  This is less applicable to medicine – i.e. rare items are more valuable to people

- **Liking**
  We are more inclined to follow the lead of someone who is similar to us rather than someone who is dissimilar

- **Consistency**
- **Commitment**
- **Social Proof**
  We view a behaviour as correct if others are performing in a similar manner.
**Essential Crisis Management Skills**

- Know your environment
- Anticipate and plan
- Effective team leadership
- Active team membership
- Effective communication
- Be situational aware
- Manage your resources
- Avoid and manage conflicts
- Be aware of potential errors

**The Concept of Human Factors**

We suggest you think about management of the **TEAM, YOURSELF** and the **ENVIRONMENT** in order to remain in control when managing difficult situations:

- **YOU** – Are you H.A.L.T?
  Hungry, Angry, Late or Tired – ‘stop yourself’ making a mistake if you are

- **ENVIRONMENT** – Are you familiar? Noise Levels (patient, team)? Distractions?
  Use Checklists to control the Emergency and free up your brain to think clearly

- The highly functioning **TEAM** requires good leadership and followership to move forward effectively and efficiently towards shared common goals. As the team leader it is important to continuously allow for feedback, share your thought processes and summarise at regular intervals. As a team member it is important to provide feedback and support for the team dynamics to work well…

**Elements of Good Teamwork**

- A Clear Team Structure
- Adequate plan and preparation
- Skilled Members – (recognition of extra needs is part of good team work – call for help early)
- Effective Team Leadership
- Good Team Communication
- Full utilization of resources
- Wise management of people
- Share Common Goals
- Collaboration
- Regular Education and Training
Other Tips for Communication Skills

When managing an Emergency Share your goals with the rest of the team (rather than a list of tasks).

Communicate using names and closed loop communication.

Debrief after Difficult cases and Emergencies and reflect on what went well and what could go better.

Try to share your thoughts and learning points with seniors as well as other Team Members (e.g. Nurses).

You should never feel completely isolated at a big hospital – there’s support available so pick up the phone!

Graded Assertiveness

Having and bringing up a concern about a Senior’s actions in an Emergency can be very difficult and can feel like an impossible task.

One suggested method of bringing to attention a potential error is Graded Assertiveness – we suggest you gently “Cuss your Consultant”:

• C – CONCERN - I am concerned that we haven’t checked for allergies

• U – UNSURE - I am uncertain that this Augmentin duo forte medicine can be given to someone with a possible penicillin allergy

• S – SAFETY – I am really worried it is UNSAFE to give this patient a penicillin like drug given his known allergy. I think this is a patient safety issue…

• S – STOP – Please stop – we need to take a timeout and discuss this further…
General Resources

  - http://www.resus.org.au
- Westmead Postgraduate Medical Education Centre (2013) Advanced Life Support Workbook. Westmead Hospital
  - A copy can be borrowed by attending the Post Graduate Education Centre (PMEC) during office hours Monday to Friday or emailing andrewrcoggins@gmail.com

Specific Resources

- The use of a systematic approach in assessment of the deteriorating patient
- Basic Life Support (Review) and Advanced Life Support (Introduction)
  - ARC Website (See above)
  - Westmead ALS Team video - http://www.youtube.com/watch?v=KzA-7o6IdyM
- Teamwork and an Introduction to the Concept of Human Factors
  - Westmead Team Training - http://emergencypedia.com/2013/05/02/human-factors-and-team-training/
- Communication and an Introduction to the Concept of Crew Resource Management (CRM)
  - Human Factors in Medicine: Lessons from Commercial Aviation
    - http://www.youtube.com/watch?v=OevZsR6mwZc
• Handover (ISBAR)
  o http://nswhealth.moodle.com.au/DOH/DETECT/content/00_worry/when_to_worry_06.htm

• Criteria for Escalation at Westmead Hospital (PACE and ALS calls)
  o This will be discussed in our introductory facilitated discussions

• Local Guidelines

• ECG and Arrhythmia Interpretation
  o http://www.resus.org.uk/pages/alsabgGd.pdf

• Arterial Blood Gas analysis
  o http://emergencypedia.com/2013/05/23/the-ed-arterial-blood-gas-abg/

• Management of the Patient with Acute Respiratory Distress
Appendix

Changes to the 2010 ALS Guidelines

Adapted from http://lifeinthefastlane.com/education/ccc/ilcor-guideline-changes-2010

(1) An Emphasis on Good Compressions

- Make sure good BLS is occurring
- CAB rather than ABC
- Minimise interruptions
- Allow complete chest recoil
- At least 100/min rather than approximately 100/min
- Compression depth: at least 5cm in adults and 4cm in infants
- No change in ratios: 30:2 adults and children (with children can go to 15:2)
- Avoid excessive ventilation

(2) Basic Life Support

- Immediate recognition of unresponsiveness and activation of emergency response services
- Initiation of CPR if unresponsive or not breathing normally
- Look-listen-feel removed
- Good quality CPR (push hard, push fast)

(3) Advanced Life Support

- Emphasis in minimising duration of pre & post shock pauses (we teach COACH at Westmead)
- CPR should not stop > 5 seconds
- Early defibrillation (1 better than 3 stacked shocks)
- AED’s in hospitals as well as for children and infants
- If initial shock is unsuccessful -> give same or greater energy
- No CPR device has been shown to be superior to manual CPR
- Precordial thump only for witnessed arrest - should not delay defibrillation or CPR
- Early intubation with minimal disruption to CPR (then continuous CPR with breaths 10/min)
- Capnography recommended: ET tube placement, quality of CPR and detection of ROSC

ALS Drug Changes:

- Atropine not recommended for PEA/asystole
- Adrenaline 1mg every 4 minutes during CPR
- Amiodarone 300mg after 3rd shock
- Don’t use ETT for drugs (IV or IO)
• Adenosine used for diagnosis and treatment of unstable, undifferentiated, regular, monomorphic wide-complex tachycardia (don’t use in irregular wide-complex tachycardia)

**Cardioversion:**

• AF: 120-200J (biphasic), 200J (monophasic)
• Atrial flutter: 50-100J (bi or monophasic)
• Stable VT: 100J (bi or monophasic)

**(4) Post Cardiac Arrest Care**

• Optimise cardiopulmonary function and perfusion
• Transport to appropriate hospital (cath lab, neurological care, goal directed critical care, hypothermia)
• Identify and treat precipitating causes
• Avoid hyperoxia (SpO2 >94% but not 100%)
• Primary PCI is appropriate in the comatosed with ROSC
• Glucose < 10mmol/L
• Therapeutic hypothermia
• Traditional measures of prognosis @ 72 hrs are now not as predictive given benefits seen of therapeutic hypothermia.
• Monitor for and treat seizures

**(5) Acute Coronary Syndromes**

• Out of hospital 12 lead ECG: reduce time to thrombolysis and PCI
• Cardiac arrest and ACS if ischaemic in origin -> requires PCI (coma is not a contraindication)
• If saturations > 94% don’t require O2
• Chest pain: use nitrates, use morphine cautiously (associated with increased mortality)