Clinical Practice Guidelines:
Environmental/Diving emergencies

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<th>Date</th>
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<tr>
<td>Purpose</td>
<td>To ensure consistent management of Diving emergencies.</td>
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<td>Scope</td>
<td>Applies to all QAS clinical staff.</td>
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<td>Clinical Quality &amp; Patient Safety Unit, QAS</td>
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Diving emergencies result from changes in ambient pressure, encompassing: decompression illness (decompression sickness and arterial gas embolism), barotrauma and hypoxic blackouts.[1-5]

- **Decompression sickness (DCS)**
  Occurs if a diver is unable to perform a slow controlled ascent. Inhaled nitrogen is unable to leave the body naturally, causing bubbles to form in the diver’s blood and tissues. These bubbles cause a reduction in blood flow and subsequent end tissue/organ cellular ischaemia.

- **Arterial gas embolism (AGE)**
  Results from pulmonary barotrauma when expanding gas within the alveoli ruptures the alveoli/capillary membrane allowing bubbles to enter the arterial circulation via the lungs.

- **Barotrauma**
  Occurs when trapped air expands during the diver’s ascent, due to decreasing pressure, causing trauma. This can occur in any gas filled space including the pulmonary system, ears, eyes, sinuses, dental structures, gastrointestinal tract and even the dive mask or dive suit.

- **Hypoxic/shallow water blackout**
  Is a loss of consciousness that may occur during free diving near the surface or just after surfacing. This is commonly due to hypoxia secondary to relative hypocapnia from hyperventilating prior to the dive.

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### Diving Emergencies relative to type of diving

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<tr>
<th>Type of Diving</th>
<th>Description</th>
<th>Conditions/Complications</th>
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<td><strong>Free Diving</strong></td>
<td>No form of diving equipment. Divers simply hold their breath.</td>
<td>- hypoxic/shallow water blackout</td>
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<tr>
<td><strong>SCUBA Diving</strong></td>
<td>Self Contained Underwater Breathing Apparatus or ‘dive set’ that consists of a buoyancy vest, regulator and compressed air cylinder</td>
<td>- DCS &amp; AGE</td>
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<tr>
<td><strong>Surface Supplied Breathing Apparatus</strong></td>
<td>Diver breathes compressed air through a helmet or regulator via an umbilical air line attached to a wharf or boat</td>
<td>- DCS &amp; AGE, Severed or contaminated umbilical air line</td>
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<tr>
<td><strong>Rebreather Diving</strong></td>
<td>Expired gas is recycled through a breathing loop and granular CO₂ absorbent. Use various gas mixtures including Helium-Oxygen, Nitrogen-Oxygen or Oxygen.</td>
<td>- DCS &amp; AGE, CO₂ build up – hypercarbia, Caustic steam airway burns from water contamination in CO₂ absorbent</td>
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<td><strong>Saturation Diving</strong></td>
<td>Chamber/bell pressurised to a set depth that can be rapidly raised or lowered from a ship, allowing divers to remain at ‘depth’ for up to four weeks</td>
<td>- Explosive decompression, Other cardiac/medical/respiratory problems</td>
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Clinical features

Neurological:
- headache
- visual changes
- motor/sensory deficit
- cranial nerve palsies
- seizures
- paralysis
- ALOC

Respiratory:
- dyspnoea
- haemoptysis
- chest pain
- APO
- pulmonary barotrauma
  - pneumothorax
  - pneumomediastinum
  - subcutaneous emphysema

Cardiac:
- chest pain
- cardiac arrest

Clinical features (cont.)

Localised symptoms:
- skin itch and/or rash
- pain in the joints (the ‘bends’) and/or muscles (especially shoulders/elbows)
- tremors

Risk Assessment

- Onset of DCI symptoms may occur > 24 hours after any form of deep diving.

Additional information

- Presentations may be subtle and ALL symptoms should be considered relevant and discussed with an expert OR require medical attention.
- The Diving Emergency Services (DES) – 1800 088 200, is a 24-hour emergency service providing advice for all diving related illnesses.
Manage as per:

- CPG: Resuscitation (age specific)
- CPG: Resuscitation – Special circumstances

Consider:

- Position patient supine
- Oxygen

Transport to hospital
Pre-notify as appropriate

Note: Officers are only to perform procedures for which they have received specific training and authorisation by the QAS.

Cardiac arrest?

Unconscious or respiratory distress?

Consider:

- IPPV
- IV fluid
- LMA/ETT
- Maintain normothermia

Position patient supine (without leg elevation)
Oxygen (high flow)