SUPRAVENTRICULAR TACHYCARDIA

MODULE: CARDIOLOGY

TARGET: ALL PAEDIATRIC TRAINEES; NURSING STAFF

BACKGROUND:

The Royal College of Paediatrics and Child Health (RCPCH) has set standards for training; by the completion of level one training, all trainees are expected to be able to recognise and treat simple SVT.

INFORMATION FOR FACULTY

LEARNING OBJECTIVES

At the end of the session participants should:

1. Have a structured ABCD approach to the acutely ill child
2. Recognise symptoms and signs of SVT
3. Construct a differential diagnosis
4. Know when to call for help
5. Understand need for rapid IV or IO access
6. Know how to perform non-pharmacological methods of reversing SVT
7. Know how to safely administer incremental doses of adenosine
8. Be able to discuss further management strategies should SVT fail to reverse
9. Construct a plan for post-stabilisation management
**FACULTY INFORMATION**

Infant presents in SVT (unmonitored). Participant should assess infant, apply monitoring and form a differential diagnosis – including SVT, sepsis, hypovolaemia, cardiac failure.

If requested, a bowl with large ‘bubble wrap’ packaging can represent ice blocks. If real ice/water to be used, use low-fidelity (e.g. doll or ALS mannequin) to immerse. **Do not allow high-fidelity mannequin to be immersed in water or ice.**

There is no response to immersion, so participants should move onto adenosine in incremental doses. Rhythm only responds to THIRD dose of adenosine.

If participants resort to early use of defibrillator without sedation, stop scenario – ‘pause and perfect’.

**SCENE SETTING**

Location: Children’s Assessment Unit

Expected duration of scenario: 15 mins

Expected duration of debriefing: 30 mins

**EQUIPMENT AND CONSUMABLES**

- Mannequin (infant)
- Monitoring
- Resuscitation trolley
- O₂ facemask
- Bag and mask
- IV cannula and sticker fixation
- ‘Ice’ (can use large bubble wrap as substitute) in bucket
- Dry towels x 2
- Simulated drugs
  - 0.9% saline
  - IV adenosine
- Drug chart
- Obs chart
- SORT Emergency drug chart (if requested – see appendix 5)

**PERSONNEL-IN-SCENARIO**

ST1-3 doctor
ST4-8 doctor
Paediatric/ED nurse
Parent

Consultant Paediatrician and Cardiologist available by phone
Re: Ella Johnstone
8 months old
5kg

Dear Doctor

Many thanks for agreeing to see this lovely little girl with a one day history of poor feeding.

She was pale and irritable today and despite the lack of fever, I wondered whether she had an underlying infection.

Thank you for seeing and treating.

Yours sincerely

John Bedford

Dr J Bedford
MRCGP
**FACULTY BRIEFING**

**IN-SCENARIO PERSONNEL BRIEFING (PARENT)**

Ella is your 8-month-old daughter. She has been unwell since yesterday with poor feeding. She is irritable and difficult to settle. She looks pale to you.

She was born two weeks early by emergency caesarean section because she was breech. She has been well since, and has had all her immunisations up to date. She is on no regular medications, and there is no family history of note.

**IN-SCENARIO PERSONNEL BRIEFING (NURSE)**

You triaged 8-month-old Ella and when doing her observations noted that she was pale and tachycardic, but afebrile. You have called the doctor to review her urgently.

You have not seen a child with SVT before. You can assist with whatever the participants ask for, but you have never seen a baby ‘dunked’ in ice so cannot lead on this. You have seen adults treated with adenosine, and you know that it requires a rapid push into a large vein of increasingly larger doses. If necessary, guide the participants on this.
CONDUCT OF SCENARIO

PRESENTATION
(and during vagal manoeuvres)

ADENOSINE 100

ADENOSINE 200

ADENOSINE 500

SINUS

*Pause and Perfect* principle – to be used at any time during the scenario if lack of progress or significantly inappropriate management:

Pause scenario and review lack of patient improvement, discussing possible causes and solutions. Then restart scenario and allow participant to manage patient.

Version 9 – May 2015
Editor: Dr Andrew Darby Smith
Original Author: Dr R Furr (adapted from Bristol Key Competencies)
PRESENTATION

VITAL SIGNS

<table>
<thead>
<tr>
<th>Rhythm</th>
<th>SVT</th>
<th>HR</th>
<th>229/min</th>
<th>BP</th>
<th>60/42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resp rate</td>
<td>42/min</td>
<td>SaO₂</td>
<td>92% (improve with facemask O₂)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp</td>
<td>35.9</td>
<td>AVPU</td>
<td>V</td>
<td>Pupils</td>
<td>4 ERL</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ASSESSMENT

<table>
<thead>
<tr>
<th>Pulses</th>
<th>Thready</th>
<th>Cap refill</th>
<th>3-4 sec</th>
<th>Skin</th>
<th>Cool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airway</td>
<td>Normal</td>
<td>Breathing</td>
<td>Erratic</td>
<td>Breath sounds</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work of breathing</td>
<td>Intermittent grunting</td>
<td>Recession</td>
<td>Nil</td>
<td>Neuro</td>
<td>Irritable</td>
</tr>
<tr>
<td>Other</td>
<td>Liver edge 2cm below costal margin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EXPECTED OUTCOMES

Participants should:

- Apply facemask O₂
- Apply monitoring
- Brief history (poor feeding, difficult to settle)
- Examination: tachypnoea, tachycardia, prolonged cap refill, liver edge 2cm below costal margin
- Recognise signs of shock with disproportionate tachycardia
- Formulate differential diagnosis including SVT
- Call for senior help
- ECG: narrow-complex tachycardia without p waves
- Ask for iced water, and elicit ‘diving reflex’

Facilitators should:

Provide further information if requested:
Blood gas, emergency drug chart, sinus tachyarrhythmia guideline, ECG CR 3-4 seconds (deteriorates to 5-6 seconds immediately after ice)

Provide further equipment if requested:
‘Iced water’ in bucket; 2 x dry towels

Progression:
- Remains in ‘Presentation’ state despite vagal manoeuvres
- When adenosine 100mcg/kg given go to ‘Adenosine 100’.
- If fails to diagnose/manage SVT, use ‘Pause and Perfect’ principle.
# ADENOSINE 100

## VITAL SIGNS

<table>
<thead>
<tr>
<th>Rhythm</th>
<th>SVT</th>
<th>HR</th>
<th>229 – 186 – 233 (during adenosine push)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resp rate</td>
<td>38/min</td>
<td>SaO₂</td>
<td>98%</td>
</tr>
<tr>
<td>Temp</td>
<td>35.9</td>
<td>AVPU</td>
<td>P</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## ASSESSMENT

<table>
<thead>
<tr>
<th>Pulses</th>
<th>Thready</th>
<th>Cap refill</th>
<th>3-4 sec</th>
<th>Skin</th>
<th>Cool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airway</td>
<td>Normal</td>
<td>Breathing</td>
<td>Erratic</td>
<td>Breath sounds</td>
<td>Normal</td>
</tr>
<tr>
<td>Work of breathing</td>
<td>Intermittent grunting</td>
<td>Recession</td>
<td>Nil</td>
<td>Neuro</td>
<td>Irritable</td>
</tr>
<tr>
<td>Other</td>
<td>Liver edge 2cm below costal margin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## EXPECTED OUTCOMES

**Participants should:**
- Continue facemask O₂
- Give 100mcg/kg adenosine as rapid push into large vein
- Reassess after 100mcg/kg adenosine given
- Note failure to respond
- Plan for 200 mcg/kg adenosine

**Facilitators should:**
Provide further information if requested:
- Blood gas, emergency drug chart, sinus tachyarrhythmia guideline, ECG
- CR 3-4 seconds

**Progression:**
- When administering adenosine 200mcg/kg go to ‘Adenosine 200’.
- If fails to manage SVT appropriately, use ‘Pause and Perfect’ principle.
## ADENOSINE 200

### VITAL SIGNS

<table>
<thead>
<tr>
<th>Rhythm</th>
<th>SVT</th>
<th>HR</th>
<th>233 – 132 – 4 – 237 (during adenosine push)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resp rate</td>
<td>39/min</td>
<td>SaO₂</td>
<td>98%</td>
</tr>
<tr>
<td>Temp</td>
<td>35.9</td>
<td>AVPU</td>
<td>P</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ASSESSMENT

<table>
<thead>
<tr>
<th>Pulses</th>
<th>Thready</th>
<th>Cap refill</th>
<th>3-4 sec</th>
<th>Skin</th>
<th>Cool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airway</td>
<td>Normal</td>
<td>Breathing</td>
<td>Erratic</td>
<td>Breath sounds</td>
<td>Normal</td>
</tr>
<tr>
<td>Work of breathing</td>
<td>Intermittent grunting</td>
<td>Recession</td>
<td>Nil</td>
<td>Neuro</td>
<td>Irritable</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### EXPECTED OUTCOMES

**Participants should:**
- Continue facemask O₂
- Give 200mcg/kg adenosine as rapid push into large vein
- Reassess after 200mcg/kg adenosine given
- Note failure to respond
- Plan for 500 mcg/kg adenosine

**Facilitators should:**
- Provide further information if requested: Blood gas, emergency drug chart, sinus tachyarrhythmia guideline, ECG
- CR 3-4 seconds

**Progression:**
- When administering adenosine 500mcg/kg go to ‘Adenosine 500’.
- If fails to manage SVT appropriately, use ‘Pause and Perfect’ principle.
## Adenosine 500

### VITAL SIGNS

<table>
<thead>
<tr>
<th>Rhythm</th>
<th>SVT</th>
<th>HR</th>
<th>237 – 154 – 11 – 174 (back into sinus)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resp rate</td>
<td>38/min</td>
<td>SaO₂</td>
<td>98%</td>
</tr>
<tr>
<td>Temp</td>
<td>35.9</td>
<td>AVPU</td>
<td>P</td>
</tr>
</tbody>
</table>

### ASSESSMENT

<table>
<thead>
<tr>
<th>Pulses</th>
<th>Thready</th>
<th>Cap refill</th>
<th>3-4 sec</th>
<th>Skin</th>
<th>Cool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airway</td>
<td>Normal</td>
<td>Breathing</td>
<td>Erratic</td>
<td>Breath sounds</td>
<td>Normal</td>
</tr>
<tr>
<td>Work of breathing</td>
<td>Intermittent grunting</td>
<td>Recession</td>
<td>Nil</td>
<td>Neuro</td>
<td>Irritable</td>
</tr>
</tbody>
</table>

### Expected Outcomes

| Participants should: | • Continue facemask O₂  
  • Give 500mcg/kg adenosine as rapid push into large vein  
  • Reassess after 500mcg/kg adenosine given  
  • Note response: back into sinus rhythm  
  • Plan post-stabilisation management |

| Facilitators should: | Provide further information if requested:  
  Blood gas, emergency drug chart, sinus tachyarrhythmia guideline, ECG  
  CR 3-4 seconds  
  Progression:  
  - After 500 mcg/kg given, go to ‘sinus’.  
  - If fails to manage SVT appropriately, use ‘Pause and Perfect’ principle. |
## SINUS

### VITAL SIGNS

<table>
<thead>
<tr>
<th></th>
<th>SR</th>
<th>HR</th>
<th>174</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rhythm</strong></td>
<td>SR</td>
<td>HR</td>
<td>174</td>
</tr>
<tr>
<td><strong>Resp rate</strong></td>
<td>36/min</td>
<td>SaO₂</td>
<td>98%</td>
</tr>
<tr>
<td><strong>Temp</strong></td>
<td>35.9</td>
<td>AVPU</td>
<td>V</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>4 ERL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ASSESSMENT

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Cap refill</th>
<th>2-3 sec</th>
<th>Skin</th>
<th>Cool</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pulses</strong></td>
<td>Normal</td>
<td>Cap refill</td>
<td>2-3 sec</td>
<td>Skin</td>
<td>Cool</td>
</tr>
<tr>
<td><strong>Airway</strong></td>
<td>Normal</td>
<td>Breathing</td>
<td>Erratic</td>
<td>Breath sounds</td>
<td>Normal</td>
</tr>
<tr>
<td><strong>Work of breathing</strong></td>
<td>Normal</td>
<td>Recession</td>
<td>Nil</td>
<td>Neuro</td>
<td>Settled</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### EXPECTED OUTCOMES

- Continue facemask O₂
- Note response: back into sinus rhythm
- Plan post-stabilisation management

**Facilitators should:**

- Provide further information if requested:
  - Blood gas, emergency drug chart, sinus tachyarrhythmia guideline, ECG
  - Pulse volume improved; baby more settled; cap refill improving

Participants should:

- Continue facemask O₂
- Note response: back into sinus rhythm
- Plan post-stabilisation management
## APPENDIX 1 – BLOOD GAS – IN SVT

### RADIOMETER ABL SIMULATION SERIES

<table>
<thead>
<tr>
<th>ABL725 ICU</th>
<th>Syringe - S 195uL</th>
<th>20-12-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>PATIENT REPORT</td>
<td>Sample#</td>
<td>90396</td>
</tr>
</tbody>
</table>

### Identifications
- **Patient ID**: 10183761
- **Patient First Name**: Ella Johnstone
- **Patient Last Name**: Johnstone
- **Date of Birth**: 04/04/2012
- **Sample type**: Venous
- **Operator**: Intensive Care

### Blood Gas Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.22</td>
<td>[7.340 - 7.450]</td>
</tr>
<tr>
<td>$\rho CO^2$</td>
<td>6.4 kPa</td>
<td>[4.70 - 6.00]</td>
</tr>
<tr>
<td>$\rho O^2$</td>
<td>7.4 kPa</td>
<td>[10.0 - 13.3]</td>
</tr>
<tr>
<td>$\rho O^2(A-a)$</td>
<td>kPa</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>ctHb</td>
<td>12.0 g/dL</td>
<td>[12.0 - 16.0]</td>
</tr>
<tr>
<td>sO²</td>
<td>%</td>
<td>[95.0 - 98.0]</td>
</tr>
<tr>
<td>FO²Hb</td>
<td>%</td>
<td>[94.0 - 99.0]</td>
</tr>
<tr>
<td>FC OHb</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>PHHb</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>FmethylHb</td>
<td>%</td>
<td>[0.2 - 0.6]</td>
</tr>
<tr>
<td>Hctc</td>
<td>%</td>
<td></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>3.7 mmol/L</td>
<td>[3.0 - 5.0]</td>
</tr>
<tr>
<td>cNa⁺</td>
<td>136 mmol/L</td>
<td>[136 - 146]</td>
</tr>
<tr>
<td>cCa²⁺</td>
<td>1.1 mmol/L</td>
<td>[1.15 - 1.29]</td>
</tr>
<tr>
<td>cCl⁻</td>
<td>103 mmol/L</td>
<td>[98 - 106]</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>6.4 mmol/L</td>
<td>[3.5 - 10.0]</td>
</tr>
<tr>
<td>cLac</td>
<td>4.3 mmol/L</td>
<td>[0.5 - 1.6]</td>
</tr>
</tbody>
</table>

### Oxygen Status

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>cO²c</td>
<td></td>
<td>vol%</td>
</tr>
<tr>
<td>$\rho 50c$</td>
<td></td>
<td>kPa</td>
</tr>
</tbody>
</table>

### Acid Base Status

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>cBase(Ecf)c</td>
<td></td>
<td>mmol/L</td>
</tr>
<tr>
<td>cHCO³-(P,st)c</td>
<td>15.4 mmol/L</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX 2 – BLOOD GAS – IN SINUS RHYTHM (SLIGHT IMPROVEMENT)

RADIOMETER ABL SIMULATION SERIES

ABL725 ICU
PATIENT REPORT
Syringe – S 195uL
Sample# 90396

Identifications
Patient ID 10183761
Patient First Name Ella Johnstone
Patient Last Name Johnstone
Date of Birth 04/04/2012
Sample type Venous
Operator Intensive Care

Blood Gas Values

\[ \text{pH} \] 7.24 \[ (7.340 - 7.450) \]
\[ \text{pCO}^2 \] 5.8 kPa \[ (4.70 - 6.00) \]
\[ \text{pO}^2 \] 7.4 kPa \[ (10.0 - 13.3) \]
\[ \text{pO}^2(A-a)e \]

Oximetry Values

\[ \text{cHb} \] 12.0 g/dL \[ (12.0 - 16.0) \]
\[ \text{SO}^2 \] \% \[ (95.0 - 98.0) \]
\[ \text{PO}^2\text{Hb} \] \% \[ (94.0 - 99.0) \]
\[ \text{PC OHb} \] \% \[ \text{-} \]
\[ \text{PHb} \] \% \[ \text{-} \]
\[ \text{FmHb} \] \% \[ 0.2 - 0.6 \]
\[ \text{Hct} \% \]

Electrolyte Values

\[ \text{cK}^+ \] 3.7 mmo1/L \[ (3.0 - 5.0) \]
\[ \text{cNa}^+ \] 136 mmo1/L \[ (136 - 146) \]
\[ \text{cCa}^2+ \] 1.1 mmoq/L \[ (1.15 - 1.29) \]
\[ \text{cCl}^- \] 105 mmo1/L \[ (98 - 106) \]

Metabolite Values

\[ \text{cGlu} \] 6.6 mmo1/L \[ (3.5 - 10.0) \]
\[ \text{cLac} \] 2.7 mmo1/L \[ (0.5 - 1.6) \]

Oxygen Status

\[ \text{cO}^2c \] vol\%
\[ \rho50c \] kPa

Acid Base Status

\[ \text{cBase(Ecf)c} \] -7.6 mmo1/L
\[ \text{cHCO}^3-(P,st)c \] 16.4 mmo1/L
APPENDIX 4 – ECG AFTER ADENOSINE 500
### APPENDIX 5 – EMERGENCY DRUG CALCULATOR

**Southampton Oxford Retrieval Team**

**Drug Calculator**

<table>
<thead>
<tr>
<th>Weight</th>
<th>5 Kg</th>
</tr>
</thead>
</table>

**Emergency**

- **Adrenaline 1:10,000**
  - 0.5 ml (0.1 ml/kg)
- **Atropine 600mcg/ml**
  - 0.17 ml (20mcg/kg, min 100mcg)
- **Atropine 100mcg/ml**
  - 1 ml (20mcg/kg, min 100mcg)
- **Sodium Bicarbonate 8.4%**
  - 5 ml (1 ml/kg)
- **Calcium Gluconate 10%**
  - 2.5 ml (0.5 ml/kg)

**Respiratory**

- **Magnesium Sulphate**
  - 200 mg (40 mg/kg over 20 minutes)
- **Salbutamol load**
  - 75 mcg (15 mcg/kg over 10 minutes)
- **Hydrocortisone**
  - 20 mg (4 mg/kg, max 100mg)
- **Aminophylline load**
  - 25 mg (5 mg/kg over 20 minutes)
- **Adrenaline 1:1000 Nebulised**
  - 2.5 ml (0.5 ml/kg, max 5 ml)
  - Make up to 5 ml with saline

**Cardiac**

- **Cardioversion (sync)**
  - 5 Joules (1J/kg) (use 2J/kg if fails)
- **Shockable rhythm (async)**
  - 20 Joules (4J/kg)
- **Adenosine**
  - 500 mcg (100 mcg/kg)
- **Amiodaron Load**
  - 25 mg (5 mg/kg over 30 minutes to 4hrs)

**Neuro**

- **Lorazepam**
  - 0.5 mg (0.1 mg/kg)
- **Midazolam Buccal**
  - 0.5 mg (0.1 mg/kg)
- **Phenyltoin**
  - 100 mg (20 mg/kg over 20 minutes)
- **Phenobarbitone**
  - 100 mg (20 mg/kg)
- **Paraldehyde PR**
  - 2 ml (0.4 ml/kg, mix 1:1 with oil)
- **3% Saline**
  - 15 ml (3ml/kg)
- **Mannitol 10%**
  - 25 ml (5ml/kg, equivalent to 0.5g/kg)

**Anaesthesia**

- **Ketamine**
  - 10 mg (2mg/kg)
- **Thiopentone**
  - 5 to 10 mg (1-3mg/kg)
- **Fentanyl**
  - 10 to 25 mcg (2-5mcg/kg)
- **Morphine**
  - 0.5 mg (0.1mg/kg)
- **Rocuronium**
  - 5 mg (1mg/kg)
- **Atracurium**
  - 2.5 mg (0.5mg/kg)
- **Vecuronium**
  - 5 mg (1mg/kg)
- **Suxamethonium**
  - 7.5 mg (1.5mg/kg)

**Anaphylaxis**

- **Adrenaline IM**
  - 0.15 ml of 1:1000

**Infusions**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Calculation</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dopamine (central)</td>
<td>75 mg in 50ml of 0.9% Saline or 5% Glucose</td>
<td>1 ml/hr = 5 mcg/kg/min</td>
</tr>
<tr>
<td>Dopamine (peripheral)</td>
<td>7.5 mg in 50ml of 0.9% Saline or 5% Glucose</td>
<td>1 ml/hr = 0.5 mcg/kg/min</td>
</tr>
<tr>
<td>Adrenaline</td>
<td>1.5 mg in 50ml of 0.9% Saline or 5% Glucose</td>
<td>1 ml/hr = 0.1 mcg/kg/min</td>
</tr>
<tr>
<td>Noradrenaline</td>
<td>1.5 mg in 50ml of 0.9% Saline or 5% Glucose</td>
<td>1 ml/hr = 0.1 mcg/kg/min</td>
</tr>
<tr>
<td>Milrinone</td>
<td>10 mg in 50ml of 0.9% Saline or 5% Glucose</td>
<td>0.75 ml/hr = 0.5 mcg/kg/min</td>
</tr>
<tr>
<td>Dinoprostone (Prostin E2)</td>
<td>50 mcg in 50ml of 0.9% Saline or 5% Glucose</td>
<td>1.5 ml/hr = 5 mg/kg/min</td>
</tr>
<tr>
<td>Morphine</td>
<td>5 mg in 50ml of 0.9% Saline or 5% Glucose</td>
<td>1 ml/hr = 20 mcg/kg/hr</td>
</tr>
<tr>
<td>Midazolam</td>
<td>5 mg in 0.9% Saline or 5% Glucose</td>
<td>1 ml/hr = 20 mcg/kg/hr</td>
</tr>
<tr>
<td>Salbutamol</td>
<td>10 mg in 50ml of 0.9% Saline or 5% Glucose</td>
<td>1.5 ml/hr = 1 mcg/kg/min</td>
</tr>
<tr>
<td>Aminophylline</td>
<td>250 mg in 250ml of 0.9% Saline or 5% Glucose</td>
<td>5 ml/hr = 1 mcg/kg/hr</td>
</tr>
</tbody>
</table>

*It is the prescriber's responsibility to ensure the correct dose is prescribed* 

Compiled by Tom Bennett - May 2012
# APPENDIX 6 – GUIDELINE FOR TACHYARRHYTHMIAS

## Management of Tachyarrhythmias with a pulse

**Patients at risk**
- Congenital cardiac disease
- FH of sudden death or long QT
- Previous episode of unexplained collapse

**Arrhythmia suspected?**
- Call for help
- ABC
- High flow oxygen
- IV access
- IF PULSELESS FOLLOW APLS PROTOCOL

**Exclude Sinus Tachycardia**

**Be suspicious of arrhythmia if:**
- Neonate HR > 200
- Toddler HR > 180
- School age HR > 160
- HR > 220 (suspect SVT)
- Do 12 lead ECG

## IF PULSE PRESENT ASSESS FOR CIRCULATORY SHOCK

- Respiratory distress, poor peripheral pulses, hypotension, prolonged CRT, altered conscious level

### NO CIRCULATORY SHOCK
- Contact Paediatric Cardiology and Fax 12 lead ECG

### CIRCULATORY SHOCK
- Follow algorithm below
- Urgent 12 lead ECG

## BROAD COMPLEX
- Amiodarone 5 mg/kg
- Over 30 min

### CONSIDER
- Synchronous DC Shock (Seek advice)

## NARROW COMPLEX
- Vagal Manoeuvre

### Adenosine 100mcg/kg
- **YES**
- IV access present
- **NO**

## Administering Adenosine
- Central access if available
- Attach 3 way tap with 5 ml flush on one port and adenosine on the other
- Ensure that ECG is recording

### Adenosine 200mcg/kg

### Adenosine 300mcg/kg

### Consider:
- Synchronous DC shock
- In children >1 month Adenosine 500 mcg/kg (Max 12mg)
- Amiodarone/ other antiarrhythmics (Seek advice)

### Vagal Manoeuvres
- Cold facial stimulus
- Valsalva
- Unilateral carotid sinus massage

### Electrolyte Management
- Correct K+, Ca²⁺ and Mg²⁺
- Consider Mg²⁺ bolus for Torsades
DEBRIEFING

POINTS FOR FURTHER DISCUSSION

A. VAGAL MANOEUVERS
For each of these, continuous ECG monitoring must be in place (ideally with a ‘record’ or ‘print’ facility).

1. Diving reflex
   - Must have continuous ECG monitoring throughout
   - Wrap baby in towel/sheet leaving just face exposed, and immerse face in iced water for up to 5 seconds.
   - Facial immersion only – not whole body!
   - IV access is advisable prior to ‘dunking’
   - Babies often look worse immediately afterwards, even if in sinus rhythm!
   - Have dry towels available, as clothing/towels often become wet during procedure, and babies can become hypothermic very quickly

2. Valsava manoeuvre
   - Older children can blow into a 10ml syringe to increase vagal tone

3. One-sided carotid massage (less frequently used)
   - Must not do bilateral carotid massage
   - Locate the carotid pulse near the angle of the jaw using the flat side of two fingers, and press firmly against the carotid artery towards the cervical vertebrae
   - Massage the area using either a circular or vertical motion until the heartrate starts to slow, or for a maximum of 1 minute
   - The maximum number of attempts using carotid sinus massage is three – using the same side only

4. Ocular pressure – NEVER use in paediatrics (risk of damage)

B. ADENOSINE
   Need to give into a large vein as a fast push with large flush. Incremental doses minimum 2 min apart.

C. DC SHOCK
   Only to be used if patient sedated/anaesthetised, or if profound shock present.
   Always use SYNCHRONISED DC shock at 1 J/kg (increased to 2J/kg if necessary)
KEY POINTS

A. VAGAL MANOEUVERS
For each of these, continuous ECG monitoring must be in place (ideally with a ‘record’ or ‘print’ facility).

1. Diving reflex
   - Must have continuous ECG monitoring throughout
   - Wrap baby in towel/sheet leaving just face exposed, and immerse face in iced water for up to 5 seconds.
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   Only to be used if patient sedated/anaesthetised, or if profound shock present.
   Always use SYNCHRONISED DC shock at 1 J/kg (increased to 2J/kg if necessary)

FURTHER RESOURCES

1. SORT guideline for tachyarrhythmias with pulse
   http://www.sort.nhs.uk/Media/Guidelines/ManagementofTachyarrhythmiaswithapulse.pdf
Management of Tachyarrhythmias with a pulse

**Patients at risk**
- Congenital cardiac disease
- FH of sudden death or long QT
- Previous episode of unexplained collapse

**Arrhythmia suspected?**
- Call for help ABC
- High flow oxygen IV access
- IF PULSELESS FOLLOW APLS PROTOCOL
- EXCLUDE SINUS TACHYCARDIA

**Be suspicious of arrhythmia if:**
- Neonate HR > 200
- Toddler HR > 180
- School age HR > 160
- HR > 220 [suspect SVT]
- Do 12 lead ECG

**IF PULSE PRESENT ASSESS FOR CIRCULATORY SHOCK**
- Respiratory distress, poor peripheral pulses, hypotension, prolonged CRT, altered conscious level

**NO CIRCULATORY SHOCK**
- Contact Paediatric Cardiology and Fax 12 lead ECG

**BROAD COMPLEX**
- Amiodarone 5 mg/kg
- Over 30 min
- CONSIDER Synchronous DC Shock (Seek advice)

**NARROW COMPLEX**
- Vagal Manoeuvre

- **Adenosine 100mg/kg**

**CIRCULATORY SHOCK**
- Follow algorithm below
- Urgent 12 lead ECG

**BROAD COMPLEX**
- **Synchronous DC shock 1.1/kg**

**NARROW COMPLEX**
- **Vagal Manoeuvre (if no delays)**

- **Synchronous DC shock 2.1/kg**

- **Adenosine 200mg/kg**

- **Synchronous DC Shock 1.1/kg**

- **Adenosine 300mcg/kg**

- **Adenosine 300mcg/kg**

**Consider:**
- Synchronous DC shock
- In children >1 month Adenosine 500 mcg/kg [Max 12mg]
- Amiodarone/other antiarrhythmics (Seek advice)

**Electrolyte Management**
- Correct K⁺, Ca²⁺ and Mg²⁺
- Consider Mg²⁺ bolus for Torades

**Vagal Manoeuvres**
- Cold facial stimulus
- Valsalva
- Unilateral carotid sinus massage

**SORT May 2012 Review 2014**
www.sort.nhs.uk

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Editor: Dr Andrew Darby Smith

Original Author: Dr R Furr (adapted from Bristol Key Competencies)
## RELEVANT AREAS OF THE CURRICULUM

### Level One

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>L1_GEN_STA_02</td>
<td>Effective responses to challenge, complexity and stress in paediatrics</td>
</tr>
<tr>
<td>L1_GEN_STA_03</td>
<td>Advanced neonatal and paediatric life support skills</td>
</tr>
<tr>
<td>L1_GEN_STA_05</td>
<td>Effective skills in paediatric assessment</td>
</tr>
<tr>
<td>L1_GEN_STA_06</td>
<td>Skills in formulating an appropriate differential diagnosis in paediatrics</td>
</tr>
<tr>
<td>L1_GEN_STA_07</td>
<td>Effective initial management of ill-health and clinical conditions in paediatrics seeking additional advice and opinion as appropriate</td>
</tr>
<tr>
<td>L1_GEN_STA_09</td>
<td>Safe practical skills in paediatrics</td>
</tr>
<tr>
<td>L1_GEN_STA_15</td>
<td>Knowledge of common and serious paediatric conditions and their management</td>
</tr>
<tr>
<td>L1_GEN_STA_29</td>
<td>Effective communication and interpersonal skills with colleagues</td>
</tr>
<tr>
<td>L1_GEN_STA_30</td>
<td>Professional respect for the contribution of colleagues in a range of roles in paediatric practice</td>
</tr>
<tr>
<td>L1_GEN_STA_32</td>
<td>Effective handover, referral and discharge procedures in paediatrics</td>
</tr>
<tr>
<td>L1_GEN_STA_34</td>
<td>Ethical personal and professional practice in providing safe clinical care</td>
</tr>
<tr>
<td>L1_GEN_STA_35</td>
<td>Reliability and responsibility in ensuring their accessibility to colleagues and patients and their families</td>
</tr>
<tr>
<td>PAED_L1_CARD_GEN_01</td>
<td>Have the knowledge and skills to be able to assess and initiate management of babies and children presenting with cardiological disorders</td>
</tr>
<tr>
<td>PAED_L1_CARD_GEN_03</td>
<td>Be able to formulate a differential diagnosis</td>
</tr>
<tr>
<td>PAED_L1_CARD_GEN_06</td>
<td>Understand the life threatening nature of some of these conditions and when to call for help</td>
</tr>
<tr>
<td>PAED_L1_CARD_GEN_08</td>
<td>Know when referral for specialist paediatric cardiology assessment for further management is appropriate</td>
</tr>
<tr>
<td>PAED_L1_CARD_ACU_ARRAY_01</td>
<td>Know the causes of arrhythmias</td>
</tr>
<tr>
<td>PAED_L1_CARD_ACU_ARRAY_02</td>
<td>Be able to recognise common dysrhythmias on ECG</td>
</tr>
<tr>
<td>PAED_L1_CARD_ACU_ARRAY_03</td>
<td>Be able to initiate emergency treatment in arrhythmias such as tachycardia</td>
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### Level Two (as above plus):

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>L2_GEN_STA_02</td>
<td>Increasing credibility and independence in response to challenge and stress in paediatrics</td>
</tr>
<tr>
<td>L2_GEN_STA_03</td>
<td>Leadership skills in advanced neonatal and paediatric life support</td>
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<tr>
<td>L2_GEN_STA_04</td>
<td>Responsibility for conducting effective paediatric assessments and interpreting findings appropriately</td>
</tr>
<tr>
<td>L2_GEN_STA_06</td>
<td>Improving skills in formulating an appropriate differential diagnosis in paediatrics</td>
</tr>
<tr>
<td>L2_GEN_STA_09</td>
<td>Effective skills in performing and supervising practical procedures in paediatrics</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2_GEN_STA_15</td>
<td>Extended knowledge of common and serious paediatric conditions and their management</td>
</tr>
<tr>
<td>L2_GEN_STA_29</td>
<td>Skill in ensuring effective relationships between colleagues</td>
</tr>
<tr>
<td>L2_GEN_STA_32</td>
<td>Effective skills in ensuring handover, referral and discharge procedures in paediatrics</td>
</tr>
<tr>
<td>L2_GEN_STA_34</td>
<td>Sound ethical, personal and professional practice in providing safe clinical care</td>
</tr>
<tr>
<td>L2_GEN_STA_35</td>
<td>Continued responsibility and accessibility to colleagues, patients and their families</td>
</tr>
<tr>
<td>PAED_L2_CARD_GEN_01</td>
<td>Be able to provide advanced life support and lead the team at a cardiac arrest</td>
</tr>
<tr>
<td>PAED_L2_CARD_GEN_02</td>
<td>Be able to identify common ECG abnormalities</td>
</tr>
<tr>
<td>PAED_L2_CARD_ACU.ARRY_01</td>
<td>Be able to initiate emergency treatment in arrhythmias such as paroxysmal supraventricular tachycardia</td>
</tr>
</tbody>
</table>

**Level Three (as above plus):**

<table>
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<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>L3_GEN_STA_02</td>
<td>Responsibility for an effective response to complex challenges and stress in paediatrics</td>
</tr>
<tr>
<td>L2_GEN_STA_03</td>
<td>Leadership skills in advanced neonatal and paediatric life support</td>
</tr>
<tr>
<td>L3_GEN_STA_06</td>
<td>Effective skills in making safe decisions about the most likely diagnoses in paediatrics</td>
</tr>
<tr>
<td>L3_GEN_STA_07</td>
<td>Leadership skills in the management of common and complex conditions in general paediatrics and paediatric subspecialties seeking additional advice and opinion as appropriate</td>
</tr>
<tr>
<td>L3_GEN_STA_09</td>
<td>Expertise in a range of practical procedures in paediatrics specific to general and sub-specialist training</td>
</tr>
<tr>
<td>L3_GEN_STA_15</td>
<td>Detailed knowledge of common and serious paediatric conditions and their management in General Paediatrics or in a paediatric subspecialty</td>
</tr>
<tr>
<td>L3_GEN_STA_29</td>
<td>Positive and constructive relationships form a wide range of professional contexts</td>
</tr>
<tr>
<td>L3_GEN_STA_32</td>
<td>Effective leadership skills in the organisation of paediatric team-working and effective handover</td>
</tr>
<tr>
<td>L3_GEN_STA_34</td>
<td>Exemplary professional conduct so as to act as a role model to others in providing safe clinical care</td>
</tr>
<tr>
<td>L3_GEN_STA_35</td>
<td>Responsibility for ensuring their own reliability and accessibility and that of others in their team</td>
</tr>
<tr>
<td>PAED_L3_CARD_GEN_01</td>
<td>Be able to identify ECG abnormalities</td>
</tr>
</tbody>
</table>
PARTICIPANT REFLECTION

What have you learned from this experience? (Please try and list 3 things)

How will your practice now change?

What other actions will you now take to meet any identified learning needs?
PARTICIPANT FEEDBACK

Date of training session: .................................................................

Profession and grade: .................................................................

What role(s) did you play in the scenario? (Please tick)

Primary/Initial Participant

Secondary Participant (e.g. ‘Call for Help’ responder)

Other health care professional (e.g. nurse/ODP)

Other role (please specify):

Observer

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither agree nor disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I found this scenario useful</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I understand more about the scenario subject</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>I have more confidence to deal with this scenario</td>
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<tr>
<td>The material covered was relevant to me</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Please write down one thing you have learned today, and that you will use in your clinical practice.

How could this scenario be improved for future participants? This is especially important if you have ticked anything in the disagree/strongly disagree box.
FACULTY DEBRIEF – TO BE COMPLETED BY FACULTY TEAM

What went particularly well during this scenario?

What did not go well, or as well as planned?

Why didn’t it go well?

How could the scenario be improved for future participants?