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Week 1

Session 1 - Cardiac Arrest

Pre-class work

Adult Cardiac Arrest

- Definition – cessation of any clinically detectable cardiac output: no palpable pulse
- Treatment – early CPR, early Defibrillation, focus on airway management is not a priority
- Focus
 - Early access to patient
 - Early CPR initiated
 - Early defibrillation where appropriate
 - Focus on effective CPR technique with mandatory change in operator after 2/60
 - Minimal hands-off chest time
 - Compression depth and recoil
 - Call for back-up/MICA/Air support early
 - Apply a systematic approach to cardiac arrest management to ensure we provide best clinical practice.

Compression : Ventilation

| | Basic Airway | Advanced Airway |
|------------------------------|---------------------|-------------------------------|
| Single Operator | 30:2 | - |
| Dual Operator | 30:2 | 15:1 |
| Pause for Ventilation | Yes | No (6-8 ventilations per min) |
| Compression Rate | 100-120 | 100-120 |

- CPR begins when the patient is pulseless
- Two handed technique is used for adult

Safety using ZOLL monitor

Defibrillation and resuscitation requisite knowledge

| Element | | Requisite Knowledge | Performance Criteria |
|--|---------|--|----------------------|
| Paediatric defibrillation pad application technique | | <ul style="list-style-type: none"> As close as possible to adult placement (same as adult placement) The 'anterior' pad is placed on the left side, mid-axillary line The 'posterior' pad is placed on the right upper chest/clavicle (same as adult placement) Wrapping over the shoulder is permissible to ensure sufficient gap between the pads. Avoid the neck. | • 2.1.2 |
| Considerations for the application of defibrillation pads | | <ul style="list-style-type: none"> Do not place defibrillation pads over GTN patches, GTN paste, implanted pacemakers or ECG electrodes and/or cables Avoid skin pigmentation and nipples to prevent burns, Avoid skin folds to prevent electrical arcing Do not allow contact between the defibrillation pads and/or ECG electrodes or cables Do not perform chest compressions over the defibrillation pads or wires (note: this does not include the CPR feedback device) Do not defibrillate if the defibrillation pads are not properly adhering to the patient | • 1.1.1 |
| Operator Safety with Defibrillation and Disarm Processes | | <ul style="list-style-type: none"> Prior to charging the defibrillator, the operator calls "Continue compressions - everyone else CLEAR" and performs a visual inspection to confirm there is no contact with the patient, except the compressor's hands When ready to perform rhythm analysis and defibrillation or disarm, operator taps assistant's hands, calls "STOP COMPRESSIONS" and ensures assistant replies with "CLEAR". Operator does not make contact with shock button until compressor is clear of the patient Operator states rhythm followed by "shocking" or "disarming" prior to pressing appropriate button | • 1.2.1 |
| Safety Requirements using the Defibrillator | | | |
| Environment Safety | Element | <ul style="list-style-type: none"> Do not use the defibrillator around flammable agents, oxygen rich atmospheres or anaesthetics Do not use the defibrillator on or near water or on metal surfaces | • 1.1.1 |
| Equipment related issues | Element | <ul style="list-style-type: none"> Damaged therapy cables must be replaced Do not use dry, damaged, faulty or expired defibrillation pads If the monitor 'Ready for Use' (RFU) indicator is flashing or displaying a circle with a diagonal line through it, install a fully charged battery and recharge. If it continues flashing or showing the circle symbol, the defibrillator is unserviceable and should be replaced | • 1.1.1 |
| Patient / Chest preparation | Element | <ul style="list-style-type: none"> Wipe moist or sweaty skin with a dry towel only. Do not use Bedaine or alcohol wipes as they can cause burns and interfere with pad adhesion Clip chest hair only when coarse, dense and wavy. Refrain from shaving as this can cause electrical arcing | • 1.1.1 |
| Weight / Age Limit of Defibrillation Pads | Element | <ul style="list-style-type: none"> Paediatric defibrillation pads should be used in patients ≤15kgs Standard adult defibrillation pads should be used in patients >15kgs and <12 years old CPR feedback pads should be used in patients ≥12 years old | • 2.1.1 |
| Adult Defibrillation pad application technique | Element | <ul style="list-style-type: none"> The 'Apex' pad is placed on the left, at the mid-axillary line, 6th intercostal space The 'Sternal' pad is rolled on laterally from right sternal margin on the patient's right chest, under the right clavicle and above the right nipple If using feedback pads the feedback device is first positioned on the anterior median (mid-sternal) line. The remaining pad is then rolled laterally ensuring final placement is under the right clavicle and above the right nipple. If not able to achieve this position, the feedback device can be separated from the sternal pad to facilitate accurate placement Apply the pads in a rolling motion to avoid air pockets. Smooth the pads into the intercostal spaces of thinly built people Apply gentle pressure over the entire surface of the gel and adhesive ring to ensure adhesion | • 2.1.2 |

| Element | Requisite Knowledge | Performance Criteria |
|--|--|----------------------|
| Paediatric defibrillation pad application technique | <ul style="list-style-type: none"> As close as possible to adult placement (same as adult placement) The 'anterior' pad is placed on the left side, mid-axillary line The 'posterior' pad is placed on the right upper chest/clavicle (same as adult placement) Wrapping over the shoulder is permissible to ensure sufficient gap between the pads. Avoid the neck. | • 2.1.2 |

Specific safety requirements using the Defibrillator on Paediatric Patients

| Element | Requisite Knowledge | Performance Criteria |
|--|---|----------------------|
| Paediatric defibrillation energy selection | <ul style="list-style-type: none"> Weight (in kg) of paediatric patient aged between 1 – 9 years old is calculated using the following formula: <ul style="list-style-type: none"> Weight = $(Age \times 2) + 8$ Weight (in kg) of paediatric patient aged 10 or 11 years old is calculated using the following formula: <ul style="list-style-type: none"> Weight = Age x 3.3 <p>The results of the above calculations can be rounded according to normal mathematical rules, e.g. 36.3 rounded down to 36 kg. Once the weight has been calculated then the amount of energy in Joules can be calculated. This is based on the following formula for patients aged between 0-11 years: Weight x 4 = Joules</p> <p>Examples:</p> <p>Paediatric patient – Aged 4 years</p> <p>Calculated weight = $(4 \times 2) + 8 = 8 + 8 = 16\text{kg}$</p> <p>Calculated Joules = 4 Joules per kg = $16\text{kg} \times 4\text{ Joules} = 64\text{ Joules}$</p> <p>Paediatric patient – Aged 11 years</p> <p>Calculated weight = $11\text{kg} \times 3.3 = 36.3\text{kg} \times 4\text{ Joules} = 144\text{ Joules}$</p> <p>Calculated Joules = 4 Joules per kg = $36.3\text{kg} \times 4\text{ Joules} = 144\text{ Joules}$</p> <p>Once the correct joules are calculated using the above method, the participant must ROUND UP to the nearest joule interval on the monitor to deliver the correct DCGs.</p> | |

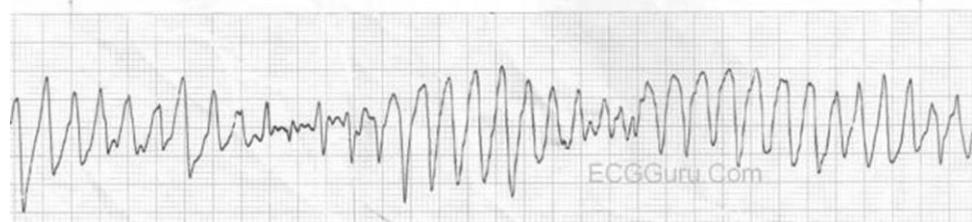
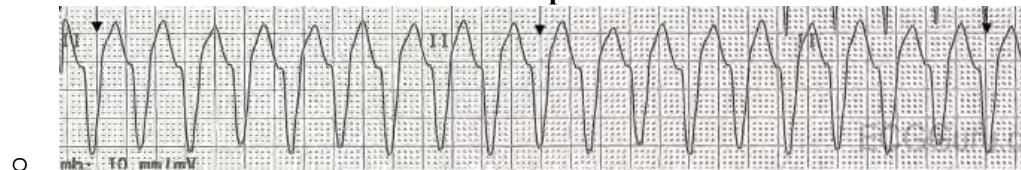
Paediatric Chart

| Age (Years) | <24 hrs | 3mth | 6mth | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|-----------------------|---------|------|------|----|----|----|----|----|-----|-----|-----|-----|-----|-----|
| Weight (kg) | 3.5 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 |
| DCGS (4J/kg) | 14 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 | 104 | 112 | 144 |
| Zoll X Series setting | 15 | 30 | 50 | 50 | 70 | 70 | 85 | 85 | 100 | 120 | 150 | 150 | 150 | 150 |

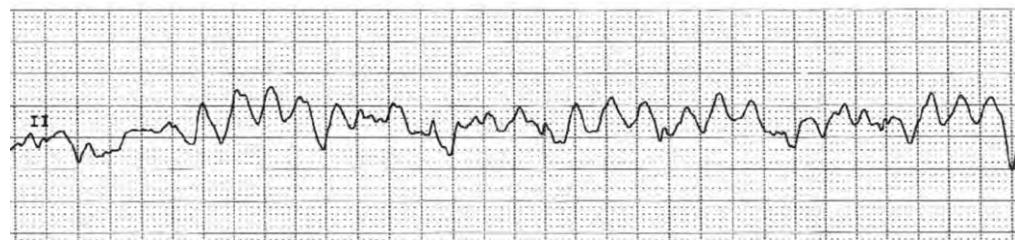
| Element | Requisite Knowledge | Performance Criteria |
|---------------------------------------|---|---|
| General defibrillation considerations | <ul style="list-style-type: none"> Do not defibrillate when there is any patient movement, stretcher movement or the ambulance is not stationary, except when: <ul style="list-style-type: none"> Patient suffers cardiac arrest during transport, where the process of safely parking the ambulance may cause a delay to defibrillation Patients are being transported with mechanical CPR in progress and require regular defibrillation, where frequently stopping the ambulance will delay definitive care Performing synchronised cardioversion (MCA only) All rhythm checks and defibrillation should be done in manual mode All rhythm checks are to be done on screen (printing not required). Patients with known or suspected pacemakers should have ECG electrodes applied when time permits and without interruptions to CPR if the Paramedic suspects the pacemaker is affecting the underlying rhythm on initial analysis. This will enable a view of the presence or absence of pacing spikes to confirm if the pacemaker is affecting the underlying rhythm i.e. Capturing or not capturing If using CPR feedback pads, "See-through CPR" can be utilised to perform a preliminary rhythm check prior to charging Compressions should continue during charging of the defibrillator A final rhythm check must take place once compressions have stopped Where there is uncertainty determining if a rhythm needs to be defibrillated then the preference is to defibrillate | <ul style="list-style-type: none"> 1.3.1 1.3.2 1.3.3 |

ECG Rhythm Analysis

- Can be analysed in great depth, shock or not shock there are 5-points
 1. Rate: number of beats per minute
 2. Rhythm: regular or irregular
 3. P-waves: present or not
 4. QRS: present or not, and it's width in seconds
 5. T-wave: present or not
- Ventricular Tachycardia
 - Rate: >100bpm
 - Rhythm: regular
 - P-waves: not discernible (when present and associated with QRS)
 - QRS: present >0.12sec
 - T-waves: may or may not be present (opposite polarity to QRS)
 - **SHOCK – CPR PATIENT MUST BE: pulseless and unconscious**



- Ventricular Fibrillation
 - Rate >100bpm or not discernible
 - Rhythm: chaotic
 - P-waves: not discernible
 - QRS: not discernible
 - T-waves: not discernible
 - **SHOCK – CPR**



- Asystole
 - Rate: 0
 - Rhythm: nil
 - P-waves: not present
 - QRS: not present
 - T-waves: not present
 - **No shock – CPR**

| Applying ECG Recognition Criteria | | Requisite Knowledge | Performance Criteria |
|--|---|---------------------|---|
| Element | | | |
| A/V basic ECG recognition criteria | <ul style="list-style-type: none"> • Ventricular rate • Ventricular rhythm • P waves • PR interval • QRS duration | | <ul style="list-style-type: none"> • 3.1.1 |
| Normal sinus rhythm criteria | <ul style="list-style-type: none"> • Ventricular rate: 60 – 100 • Ventricular rhythm: Regular • P waves: Present and associated with each QRS • PR interval: 0.12 - 0.2 seconds • QRS duration: < 0.12 seconds | | <ul style="list-style-type: none"> • 3.1.2 |
| Ventricular fibrillation (VF) criteria | <ul style="list-style-type: none"> • Ventricular rate: Nil discernible • QRS duration: Nil discernible • Ventricular rhythm: Bizarre, chaotic, amplitude > 0.1mV • P waves: Nil discernible • PR interval: Nil discernible | | <ul style="list-style-type: none"> • 3.1.2 |
| Ventricular tachycardia (VT) criteria | <ul style="list-style-type: none"> • Ventricular rate: Greater than 100 • Ventricular rhythm: Regular • P waves: Not associated or nil discernible • PR interval: Nil discernible • QRS duration: > 0.12 seconds | | <ul style="list-style-type: none"> • 3.1.2 |
| Asystole criteria | <ul style="list-style-type: none"> • Ventricular rate: Nil discernible • Ventricular rhythm: No electrical activity, flat isoelectric line. • Amplitude ≤ 0.1mV • P waves: Nil discernible • PR interval: Nil discernible • QRS duration: Nil discernible | | <ul style="list-style-type: none"> • 3.1.2 |
| ECG paper small square value | <ul style="list-style-type: none"> • 1 small square = 0.04 seconds • 2 small squares = 0.08 seconds • 3 small squares = 0.12 seconds • 4 small squares = 0.16 seconds • 5 small squares = 0.2 seconds (= 1 large square) | | <ul style="list-style-type: none"> • 3.2.1 |
| ECG paper large square value | <ul style="list-style-type: none"> • 1 large square = 0.2 seconds • 2 large squares = 0.4 seconds • 3 large squares = 0.6 seconds • 4 large squares = 0.8 seconds • 5 large squares = 1 second | | <ul style="list-style-type: none"> • 3.2.1 |

- Pulseless Electrical Activity (PEA)
 - AKA Electromechanical Dissociation (EMD)
 - If the patient does not present as one of the above three rhythms and has no pulse, then it is considered PEA
 - **No shock – CPR**



- Causes (HEAT AA)
 - Hypoxia
 - Exsanguination (hypovolaemia)
 - Asthma
 - Tension Pneumothorax
 - Anaphylaxis
 - Airway obstruction

Treating Cardiac Arrest

- What is the most important piece of equipment used in treating cardiac arrest?
 - EARLY CPR and EARLY DEFIBRILLATION
- What is the role of adrenaline in cardiac arrest?
 - Vasoconstriction of the peripheral blood vessels (movement of blood back towards the heart and vital organs)

Defibrillation Pads

Paediatric pads – <15kg <4years, adult otherwise



Adult pads – >15kgs >4years



Adult High-Performance pads –



Paediatric Cardiac Arrest

Compression : Ventilation

- CPR begins when HR <40 for children
- CPR begins when HR <60 for infants
- Two finger/two thumb technique used for infants
- Single handed for small child
- 2 hands for large child

- For patients who are <12 years
 - CPR begins when HR <40 for children
 - Single handed for small child
 - 2 hands for large child
 - Compression depth should be 1/3 of the chest, allowing for full recoil
 - Change operator every 2-minutes

| | Basic Airway | Advanced Airway MICA |
|------------------------------------|--------------------------------------|-------------------------------------|
| Single Operator | 30:2 | - |
| Dual Operator | 15:2 | 15:2 |
| Pause for Ventilation | Yes (1 second pause per ventilation) | No (1 second pause per ventilation) |
| Compression Rate per minute | 100-120 | 100-120 |

- Newborns
 - CPR begins when HR <60 for infants
 - Two finger/two thumb technique used for infants
 - Compression depth should be 1/3 of the chest, allowing for full recoil
 - Change operator every 2-minutes

| | Basic Airway | Advanced Airway MICA |
|-------------------------------------|--|---|
| Single Operator | 3:1 | 3:1 |
| Dual Operator | 3:1 | 3:1 |
| Pause for Ventilation | Yes (approx. 10 ventilations per minute / 0.5 sec pause per ventilation) | No (approx. 10 ventilations per minute / 0.5 sec pause per ventilation) |
| Compression/Ventilation Rate | 90:30 (120 events per minute) | 90:30 (120 events per minute) |

Treatment of Cardiac Arrest

- Prioritise airway and breathing
- Consider different position required to maintain an adequate airway depending on size of child and relative size of occiput
- Consider common causes of cardiac arrest
- Consider alternative CPR techniques depending on patient size
- Consider the limitations of ALS paramedics in treating paediatric patients – what does MICA's extended scope of practice include?
- Consider parents/bystanders – can be patients too in this instance

Focus

- Prioritise airway and breathing
- Early access to the patient
- Early CPR
- Early defibrillation where appropriate
- Minimise interruptions to chest compressions
- Perform high quality CPR
- Call for back-up/MICA/air support early
- Apply a systematic approach to cardiac arrest management (team leader and checklist)

Children different to adults.

CPGs – Adult

Clinical Approach

| CPG A0101 | Clinical Approach | CPG A0101 |
|---|--|---|
| Care Objective <ul style="list-style-type: none">To ensure all patients receive a structured and comprehensive assessment of their health status that leads to their healthcare needs being addressed. | Intended patient group <ul style="list-style-type: none">All patients | Primary survey <ul style="list-style-type: none">If a patient deteriorates the default position should be to return to the primary survey for reassessment.Exposure: Refers to both exposing the patient for assessment (e.g. to locate possible major haemorrhage) and exposure to environmental conditions. Patient dignity should be maintained as much as possible while managing the risks of potential life-threatening conditions. Prevent hypothermia following exposure. |
| This CPG represents a minimum standard of assessment. If a full assessment is not completed or is deemed unnecessary, the rationale MUST be documented. | Pre-arrival | History of the presenting illness <ul style="list-style-type: none">Avoid interrupting or redirecting the patient where possible during initial history taking.Appears well / non-serious complaint: Avoid concurrent vital signs and other assessment elements where possible to allow for uninterrupted, thorough history taking.Appears unwell / serious complaint: Concurrent assessment as required (e.g. 12 lead ECG in chest pain, SpO₂ in acute SOB). |
| | Biases & human factors | Accountability and responsibilities <ul style="list-style-type: none">All paramedics at scene are accountable for ensuring the patient receives appropriate and safe care.Where two paramedics attend a case, both should be present for assessment if possible to allow for shared decision making. |
| | Rapid assessment | <ul style="list-style-type: none">Attendant 1: Assess the patient directly, taking the lead in history taking and physical examination.Attendant 2: Observes assessment and scene with minimal cognitive load, collects information and identifies missed information, errors or opportunities. |
| | Assessment | Vital signs & adjuncts <ul style="list-style-type: none">BSL must be measured in patients with:<ul style="list-style-type: none">Altered conscious stateHistory of diabetesMedical patients with undifferentiated acute illness |
| | | Physical examination <ul style="list-style-type: none">Focused examination found in specific CPGs indicated for particular complaints (e.g. ACT[®] FASTIMASS, AEIOUTIPS, Spinal neurological examination, etc.)General physical examination: Any other physical assessment informed by the paramedic's evolving understanding of the patient's presenting illness |
| | | Social / Environmental factors <ul style="list-style-type: none">May present a range of hazards and health risks which influence their care plan as much as the diagnosis or clinical problems. |
| | Rapid assessment | <ul style="list-style-type: none">Immediate impression based on the presence of altered conscious state, increased work of breathing and obvious skin signs (e.g. diaphoresis, cyanosis) that informs:<ul style="list-style-type: none">The need for a formal primary surveyThe urgency with which the patient should be assessed and the need for simultaneous collection of information |
| | | <p style="text-align: right;">This is an uncontrolled document. It is the reader's responsibility to ensure currency.</p> |