

**PAEDIATRIC HOSPITAL LEVEL ESSENTIAL MEDICINES LIST**  
**CHAPTER 4: CARDIOVASCULAR SYSTEM**  
**NEMLC 8 DECEMBER 2022**

**MEDICINE AMENDMENTS**

SECTION	MEDICINE	ADDED/DELETED/NOT ADDED
<b>4.1 Cardiac Arrhythmias</b> <i>Sedation for cardioversion in unstable patients</i>	Ketamine	Added
	Midazolam	Removed

**4.1 Cardiac arrhythmias**

Ketamine: Added

Midazolam: Removed

Following clinical editing, it was proposed that some guidance be given for the use of the recommended sedation for cardioversion in unstable patient. The recommendation for sedation was midazolam, however on review by the Paediatric Expert Review Committee, it was outlined that ketamine would be a more appropriate recommendation in terms of safety and due to this agent having a better cardiovascular stability. Midazolam has negative haemodynamic effects with quick IV administration, and thus ketamine is a better option. This decision was based on these pharmacological properties. Ketamine has been included in the Paediatric Pain Chapter for procedural sedation for with various options for routes of administration (oral, intranasal, IV, IM).

In the paediatric setting there is a paucity of evidence on sedation of unstable patients with tachycardia for cardioversion. Guidelines such as the UK Resuscitation Council, Paediatric Cardiac Arrhythmias Guideline recommend use of ketamine for sedation for cardioversion in both broad and narrow complex tachycardia.<sup>1</sup>

A Cochrane review on anaesthesia and sedative agents for electrical cardioversion evaluated agents used in patients undergoing both elective and emergency cardioversion.<sup>2</sup> The review included randomised controlled trials comparing the following anaesthetic/sedative agents: propofol, etomidate, midazolam/diazepam, thiopentone, sevoflurane, fentanyl/remifentanyl. Data could not be pooled, and the conclusion of the review was that since not many studies included statistically significant results, all agents could currently be considered appropriate. This review was not considered applicable to this decision as it was limited to adults, was not specific to the emergency setting, and ketamine was not specifically included, only included in one study in combination with propofol.

<sup>1</sup> <https://www.resus.org.uk/sites/default/files/202104/Paediatric%20Cardiac%20Arrhythmias%20Algorithm%202021.pdf>

<sup>2</sup> Lewis SR, Nicholson A, Reed SS, Kenth JJ, Alderson P, Smith AF. Anaesthetic and sedative agents used for electrical cardioversion. The Cochrane Library. 2015, issue 3. CD010824.

The text was updated in the two areas as follows:

**Narrow complex tachycardia**

Unstable patient – heart failure/shocked:

- » DC synchronised cardioversion at 1 J/kg, and then 2 J/kg.
- » If possible, empty the stomach before cardioversion is attempted. Resuscitation facilities must be available.
- ~~Midazolam for sedation, if necessary~~ Ketamine for sedation, if necessary. Refer to Chapter 20 Pain: Section 20.1.2 Procedure Sedation and Analgesia, for ketamine dosing.

**Broad complex tachycardia**

Unstable patient – heart failure/shock:

- » Pulseless – treat as ventricular fibrillation. See Chapter 1: Emergencies and Trauma, section 1.1.4: Cardiorespiratory arrest.
- » DC synchronised cardioversion at 1 J/kg, and then 2 J/kg.
- » If synchronised cardioversion fails, use asynchronised shocks.
- » Resuscitation facilities must be available.
- » ~~Midazolam for sedation, if level of awareness indicates~~ Ketamine for sedation, if necessary. Refer to Chapter 20 Pain: Section 20.1.2 Procedure Sedation and Analgesia, for ketamine dosing.

**PAEDIATRIC HOSPITAL LEVEL ESSENTIAL MEDICINES LIST**  
**CHAPTER 4: CARDIOVASCULAR SYSTEM**  
**NEMLC 31 MARCH 2022**

**MEDICINE AMENDMENTS**

SECTION	MEDICINE	ADDED/DELETED/NOT ADDED
<b>4.3 Endocarditis, infective</b>	Azithromycin	Added (for penicillin allergy)
<b>4.4 Rheumatic Fever, Acute</b> Antibiotic therapy	Phenoxymethylpenicillin	Dose amended
	Azithromycin	Added (for penicillin allergy)
<b>4.4 Rheumatic Fever, Acute</b> Prevention of repeated attacks	Consult with specialist	Added for patients with penicillin allergy
<b>4.11.1 Hypertension, acute severe</b>	Prazosin	Deleted
	Doxazosin	Not added

**4.3 Endocarditis, infective**

**PROPHYLAXIS**

Azithromycin: Added (for penicillin allergy)

An external comment was received recommending the addition of an alternative agent in cases of penicillin allergy. Azithromycin was proposed as the oral alternative. The Committee agreed with this recommendation as it is in line with current recommendations.<sup>3</sup>

**4.4 Rheumatic fever, acute**

**ANTIBIOTIC THERAPY**

Phenoxymethylpenicillin: dose amended

- Phenoxymethylpenicillin, oral, 250 (~~<30kg~~) ~~500 mg~~ 15 mg/kg (to a maximum of 500 mg) 12 hourly for 10 days.

An external comment was received outlining that the described dosing was confusing. The dosing of phenoxymethylpenicillin was simplified. This was dosing in line with the Australian acute rheumatic fever guidelines.<sup>4</sup>

Azithromycin: added (for penicillin allergy)

<sup>3</sup> Wilson W, et al. Prevention of Viridans Group Streptococcal Infective Endocarditis: A Scientific Statement from the American Heart Association. Circulation. 2021;143(20):e963. Epub 2021 Apr 15

<sup>4</sup> Currie B, Ralph A, et. al. The 2020 Australian guideline for prevention, diagnosis and management of acute rheumatic fever and rheumatic heart disease, 3<sup>rd</sup> edition. 2020. Menzies School of Health Research.

An external comment was received recommending the addition of an alternative agent in the case of penicillin allergy. Azithromycin as above was proposed for addition.

#### **PREVENTION OF REPEATED ATTACKS**

##### Consult with specialist for penicillin allergy

An external comment was received proposing an alternative for penicillin allergy in this setting. There is little evidence of appropriate alternatives in this area, and thus it was proposed that for these patients, a specialist should be consulted.

#### **4.11 Hypertension in children**

An external comment was received noting that blood pressure levels are by age/height percentiles rather than Z-scores. It was noted that z-scores are used in the road to health book, and there may be a need to standardize.

The Committee recommended that the blood pressure tables by age/height percentiles be retained, but a link to the various growth charts be added for reference.

The following text was added:

**NOTE: Blood pressure levels by age and height percentiles. Various growth charts can be obtained from:**

[https://www.cdc.gov/growthcharts/clinical\\_charts.htm#Set1](https://www.cdc.gov/growthcharts/clinical_charts.htm#Set1)

#### **4.11.1 Hypertension, acute severe AND 4.11.2 Hypertension chronic**

##### **Phaeochromocytoma**

Prazosin: Deleted

Prazosin 1 mg tablets have been discontinued. An alternative alpha blocker was thus investigated for use. However through specialist consultation, it was outlined that hypertension associated with phaeochromocytoma can be complex and should rather be managed at a tertiary level by the relevant specialists. A note to consult a specialist if phaeochromocytoma is suspected, and refer; was added.

**PAEDIATRIC HOSPITAL LEVEL ESSENTIAL MEDICINES LIST**  
**CHAPTER 4: CARDIOVASCULAR SYSTEM**  
**NEMLC 9 DECEMBER 2021**

**MEDICINE AMENDMENTS**

SECTION	MEDICINE	ADDED/DELETED/NOT ADDED
<b>4.1 Cardiac Arrhythmias</b>	Adenosine	Dose added for infants
<b>4.2.1 Cyanotic Congenital Heart Disease With Hypoxaemia Attacks/Spells (Hypercyanotic Spells)</b>	Phenylephrine	Added (in consultation with a specialist)
<b>4.4 Rheumatic Fever, Acute</b>	Aspirin	Amended, ibuprofen recommended before aspirin for severe arthritis
	Ibuprofen	
<b>4.5 Myocarditis</b>	Hydrochlorothiazide	Deleted
	Spironolactone	Added (in consultation with a specialist)
<b>4.9.1 Heart Failure, Acute With Pulmonary Oedema</b>	Captopril	Amended – removed from ACE Inhibitor class

**4.1 CARDIAC DYSARRHYTHMIAS**

The Paediatric Hospital Level Expert Review Committee (ERC) agreed upon changing terminology back from Cardiac Dysrhythmias to Cardiac Arrhythmias.

Bradydysrhythmia

An external comment was received proposing additions to important causes of bradycardia and was accepted by the Committee.

The text was amended as follows:

Important causes of bradycardia:	
Hypoxia	Drug ingestion
Congenital heart block	Excessive vagal stimulation
<u>Hypothyroidism</u>	<u>Head injury</u>

Medicine Treatment

Stable patient

It was proposed and supported by the Committee that a starting dose of adenosine for infants be added which is aligned with the South African Medicines Formulary<sup>5</sup>. The need for higher doses in infants is also

<sup>5</sup> Adenosine Dose: South African Medicines Formulary (SAMF), 13th Edition. Division of Pharmacology, Faculty of Health Sciences, University of Cape Town. 2020.

described by Diaz Parra et.al in a retrospective study<sup>6</sup>. In addition, an external comment was received proposing additions to the text with which the Committee agreed.

The text was amended as follows:

- In consultation with a paediatric specialist: Adenosine, IV, 0.1 mg/kg rapid IV push via large bore cannula (within seconds). For infants start with 0.2mg/kg.

## 4.2 CONGENITAL HEART DISEASE (CHD)

### Description

It was recommended and supported by the Paediatric Hospital Level ERC that the text under the four pathophysiological groups be amended as follows:

Structural abnormalities of the heart or great vessels present at birth. They fall into 4 pathophysiological groups:

1. Acyanotic Left to right shunts - ventricular septal defect (VSD), patent duct arteriosus (PDA), atrial septal defect (ASD), atrioventricular septal defect (AVSD), ~~Truncus arteriosus~~.
2. Acyanotic Obstructive lesions - pulmonary stenosis, aortic stenosis, coarctation of the aorta.
3. Cyanotic CHD - mostly right to left shunts tetralogy of Fallot (TOF), pulmonary atresia (PA), truncus arteriosus, total anomalous pulmonary venous drainage (TAPVD), tricuspid atresia (TA), but including parallel circulation - transposition of great arteries (TGA) (see Chapter 19: Prematurity and Neonatal Conditions, section 19.2 Cyanotic Heart Disease in the Newborn) and Eisenmenger syndrome.
4. Regurgitant lesions - aortic incompetence (AI), mitral incompetence (MI) are not common in CHD.

### 4.2.1 CYANOTIC CONGENITAL HEART DISEASE WITH HYPOXAEMIA ATTACKS/SPELLS (HYPERCYANOTIC SPELLS)

#### Medicine Treatment

- It was proposed that ketamine be administered without consultation with a specialist and that phenylephrine be added as another option if patient remains cyanosed and to be administered in consultation with a specialist. The use of Phenylephrine is well described, with evidence going back to the 1980s.<sup>7, 8, 9</sup> It was agreed by the Paediatric Hospital Level Committee that due to the specialist nature of the medicine and the setting in which it should be used (ICU), a specific dose should not be stated.

<sup>6</sup> Diaz Parra S, Sanchez Yanez P, Zabala-Arguelles I, et.al. Use of adenosine in the treatment of supraventricular tachycardia in pediatric emergency department. *Pediatric Emer Care*. 2014; 30: 388-393.

<sup>7</sup> Tanaka K, Kitshata H, Kawahito S, Nozaki J, Tomiyama Y, Oshita S. Phenylephrine increases pulmonary blood flow in children with tetralogy of Fallot. *Can J Anesth*. 2003, 50 (9): 926-929.

<sup>8</sup> Magder S. Phenylephrine and Tangible Bias. *Anesthesia & Analgesia*. 2011, 113(2): 211-213.

<sup>9</sup> Thiele RH, Nemergut EC, Lynch C. The Clinical Implications of Isolated Alpha<sub>1</sub> Adrenergic Stimulation. *Anesth Analg*. 2011, 113: 297-304.

The text was amended as follows:

If failure to improve the cyanotic spell, consider ~~in consultation with specialist~~:

- Ketamine, IV, 0.5–1 mg/kg.

**Note:** IV ketamine is a general anaesthetic.  
Take standard precautions for respiratory arrest.

OR

- Phenylephrine (in consultation with a specialist)

#### 4.2.3 CONGENITAL HEART DISEASE WITH LEFT TO RIGHT SHUNT

##### Diagnostic Criteria

The Paediatric Hospital Level ERC agreed upon adding an additional criterion for large left to right shunt.

The text was amended as follows:

Each condition has specific clinical, radiological and ECG findings.

Large left to right shunts present clinically with:

- » Tachypnoea and indrawing.
- » Sweating during feeds.
- » Failure to thrive.
- » Chest deformity: respiratory sulcus, praecordial bulge.
- » Chest X-ray: usually cardiomegaly with plethoric lung fields.
- » Cardiac impulse felt below the xiphisternum.

#### 4.4 RHEUMATIC FEVER, ACUTE

##### Diagnostic Criteria

It was agreed by the Paediatric Hospital Level ERC that the Revised Jones Criteria be aligned with the 2015 version<sup>10</sup> and that South Africa be defined as a high-risk setting.

The text was amended as follows:

##### **Revised Jones criteria:**

- » Evidence of recent streptococcal infection:
  - > Elevated ASO-titre or other streptococcal antibody titres.
  - > Positive throat culture for group A beta haemolytic streptococcus.

##### **PLUS**

- » Two major manifestations, **or** one major and two minor manifestations, justifies the presumptive diagnosis of acute rheumatic fever (Jones' Criteria 2015 – South African children are defined as members of a high risk population).

**Major manifestations**

**Minor manifestations**

<sup>10</sup> Beaton A, Carapetis J. The 2015 revision of the Jones criteria for the diagnosis of acute rheumatic fever: implications for practice in low-income and middle-income countries. Heart Asia. 2015;7(2):7-11. Published 2015 Aug 19. doi:10.1136/heartasia-2015-010648

<ul style="list-style-type: none"> <li>▪ <u>Mono or polyarthritis/polyarthralgia</u></li> <li>▪ carditis</li> <li>▪ erythema marginatum</li> <li>▪ subcutaneous nodules</li> <li>▪ Sydenham's chorea</li> </ul>	<ul style="list-style-type: none"> <li>▪ <u>Polyarthralgia monoarthralgia</u></li> <li>▪ fever <math>\geq 38^{\circ}\text{C}</math></li> <li>▪ acute phase reactants: increased erythrocyte sedimentation rate (ESR) <math>\geq 30\text{mm/hr}</math> or C-reactive protein (CRP) <math>\geq 30\text{mg/l}</math></li> <li>▪ ECG: prolonged PR-interval, <math>\geq 0.168</math>-seconds in the absence of carditis</li> </ul>
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> Carditis is either defined clinically or after an echocardiographic study

### Medicine Treatment

It was agreed by the Paediatric Hospital Level ERC that the order of ibuprofen and aspirin should be switched. Furthermore, that aspirin should only be administered in consultation with a specialist due to potential adverse effects.

The text was amended as follows:

<p><b>Anti-inflammatory therapy</b></p> <p>Do not start until a definite diagnosis is made. Paracetamol can be administered for joint pain. <u>Anti-inflammatory therapy is no longer recommended for carditis alone.</u></p> <p>Severe arthritis:</p> <p><u>Ibuprofen, oral, 10 mg/kg/dose, 8 hourly, oral, (non-steroidal anti-inflammatory agents are preferred to aspirin as a result of the side effect profile) until the arthritis resolves.</u></p> <p><b>OR</b></p> <p><u>If necessary, with specialist consultation, aspirin soluble, oral, 20 mg/kg/dose 6 hourly can be considered until the arthritis resolves.</u></p> <p><b>OR</b></p> <ul style="list-style-type: none"> <li>• <u>If aspirin cannot be tolerated:</u></li> <li>• <u>Ibuprofen, oral, 5mg/kg/dose, 6 hourly</u></li> </ul>
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### Referral

It was highlighted that rheumatic fever is becoming a rarer disease and that all cases warrant referral. This was supported by the Paediatric Hospital Level ERC.

The text was amended as follows:

<p>Rheumatic fever: all patients need to be referred for echocardiography and further evaluation</p> <ul style="list-style-type: none"> <li>» <u>With residual valvular damage electively for planning of care,</u></li> <li>» <u>With symptomatic valvular damage,</u></li> <li>» <u>Unresponsive to treatment</u></li> </ul>
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## 4.5 MYOCARDITIS

### Medicine Treatment of Viral Myocarditis

An external comment was received for hypoxia proposing inclusion of Continuous Positive Airway Pressure (CPAP) or high nasal cannula. It was agreed by the Paediatric Hospital Level ERC that this should be added.



The text was amended as follows:

To prevent hypoxia:  
Oxygen via face mask, nasal cannula, CPAP or high flow ~~headbox~~

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It was suggested that spironolactone be included in treatment earlier on instead of treating with hydrochlorothiazide if response is inadequate. Hydrochlorothiazide is used in the acute situation as a synergistic diuretic with a loop diuretic to encourage diuresis; however where there is a protracted course, spironolactone is added due to effect on the tissue. This is based on Adult data<sup>11</sup> where blockage of aldosterone receptors by spironolactone in addition to standard therapy reduces the risk of both morbidity and mortality in patients with severe heart failure. The Committee was in agreement and retained that the agent be administered in consultation with a paediatric cardiologist.

The lack of evidence to support use of immunoglobulins (Cochrane review<sup>12</sup>) was discussed by the Paediatric Hospital Level ERC and it was agreed that a statement regarding its use be included in the text.

The text was amended as follows:

- ~~Hydrochlorothiazide, oral, 1mg/kg/dose, 12 hourly~~ Spironolactone, oral, 1–3 mg/kg/dose once daily-in consultation with a paediatric cardiologist. May be divided 12 hourly.
- Inotropic support may be needed see section 4.9.1: Heart Failure, acute with pulmonary oedema
- IV immunoglobulins are not recommended.

## 4.6 Dilated Cardiomyopathy

### Medicine Treatment

An external comment was received for hypoxia proposing inclusion of Continuous Positive Airway Pressure (CPAP) or high nasal cannula. It was agreed by the Paediatric Hospital Level ERC that this should be added.

The text was amended as follows:

To prevent hypoxia:  
Oxygen via face mask, nasal cannula, CPAP or high flow ~~headbox~~

## 4.8 Pericarditis

### Referral

<sup>11</sup> Pitt B, Zannad F, Remme WJ, Cody R, Castaigne A, Perez A, et. al. The Effect of Spironolactone on Morbidity and Mortality in Patients with Severe Heart Failure. NEJM. 1999, 341 (10): 709-717.

<sup>12</sup> Robinson J, Hartling L, Vandermeer B, Sebastiani M, Klassen TP. Intravenous immunoglobulin for presumed viral myocarditis in children and adults. Cochrane Database of Systematic Reviews 2020, Issue 8. Art. No.: CD004370. DOI: 10.1002/14651858.CD004370.pub4.

A grammatical change was made to the text under Referral.

The text was amended as follows:

All patients in whom the cause is ~~unidentified~~ unidentifiable ~~or merits further referral.~~

#### 4.9.1 Heart Failure, Acute With Pulmonary Oedema

##### Medicine Treatment

An external comment was received proposing inclusion of Continuous Positive Airway Pressure (CPAP) or high nasal cannula. It was agreed by the Paediatric Hospital Level ERC that this should be added.

The text was amended as follows:

- Oxygen 100%, administered via face mask, ~~or~~ nasal cannula, CPAP or high flow

It was agreed by the Paediatric Hospital Level ERC that the treatment for stabilised patients (captopril, oral) should not be in a class (ACE inhibitors) but as a molecule due to the specific dosing requirements.

The text was amended as follows:

- ACE inhibitor, Note: ACEI should be avoided in patients with obstructive heart lesions.  
~~E.g.~~
- Captopril, oral.
  - Initial dose: 0.5 – 1 mg/kg/24 hours in 3 divided doses (8 hourly) for 24–48 hours.

#### 4.10 Dyslipidaemia

It was agreed by the Paediatric Hospital Level ERC that the section on Dyslipidaemia should primarily be included in the Endocrine chapter with a cross-reference included in the Cardiovascular chapter (4.10 page 121) to the section in the Endocrine Chapter rather than the section falling primarily under the Cardiovascular Chapter. The section was included in the Endocrine chapter tabled at the National Essential Medicines List Committee meeting in July 2021. It was asserted that the condition is most often attended to by endocrinologists rather than cardiologists.

The text was amended as follows:

##### **Refer to Chapter 7: Endocrine system - section 7.5.2.5 Dyslipidaemia**

##### **DESCRIPTION**

Dyslipidaemia is a broad term used to describe disorders of lipid metabolism that may be classified according to the Frederickson classification.

Phenotype	Elevated particles	Lipid increased	Frequency
I	Chylomicron	TG	Rare
IIA	LDL	LDL-C	Common
IIB	LDL and VLDL	LDL-C, TG	Common
III	IDL	TC, TG	Rare
IV	VLDL	TG	Common
V	Chylomicron and VLDL	TG	Uncommon

The three common types of dyslipidaemia are important because they are associated with an increased risk of cardiovascular disease due to atherosclerosis

#### **DIAGNOSTIC CRITERIA:**

Children with severe hypercholesterolaemia may present with xanthomas or myocardial infarction but most children with hypercholesterolaemia will be asymptomatic in childhood.

Children should be screened for dyslipidaemia if any of the following are present:

- Family history of premature cardiac disease or dyslipidaemia
- A medical condition associated with dyslipidaemia: diabetes mellitus, nephrotic syndrome, liver disease, obesity.

#### **INVESTIGATIONS**

- » Exclude causes of secondary hyperlipidaemia
- » In most cases non fasting total cholesterol is determined in children at risk.  
If level is higher than upper limit, lipid profile is done after 12 hours of fasting.
  - Upper limit of S-cholesterol and triglycerides: Total cholesterol 5.2 mmol/L.
  - Triglycerides (after 12 hours of fasting):
    - influenced by lifestyle — needs attention if > 1.68 mmol/L,
    - pancreatitis risk if > 10 mmol/L.

#### **GENERAL AND SUPPORTIVE MEASURES**

Manage secondary causes of hyperlipidaemia according to guidelines.  
Schedule for integrated cardiovascular health promotion in children.

- » **Obesity**
  - See Chapter 7: Endocrine System, section 7.15: Obesity.
- » **Blood pressure**
  - With family history of hypertension < 55 years of age: routine BP measurement from 3 years of age once a year.
  - If BP ≥ 95th percentile for sex, age, and height percentile, follow up and investigate if persistently elevated.
- » **Diet**
  - Refer to a dietician.
  - Learning healthy eating habits is an important preventative measure.
  - Moderate salt intake.
- » **Physical activity**
  - Encourage active child-parent play.
  - Limit child's sedentary behaviour such as time watching television and playing video computer games to a maximum of 2 hours per day or 14 hours per week.
  - Children should not be allowed to eat while watching television, i.e. "no grazing".
  - Organised sport 5 times per week for at least 20–30 minute periods.
- » **Smoking**
  - Encourage members of the household who smoke to stop.

#### **MEDICINE TREATMENT**

Consider medicine treatment only after failure of general and supportive measures to lower the cholesterol over 6–12 months. Children should be at least 8 years of age for consideration of pharmacological intervention.

If LDL-C remains above 4.1 mmol/L in children with 2 or more risk factors, or above 4.9 mmol/L regardless of the presence of risk factors, refer to a paediatric specialist for consideration of statins:

Risk factors: smoking, hypertension, BMI ≥ 95<sup>th</sup> centile (z-score +1.96), HDL-C < 35 mg/dL, diabetes mellitus, renal disease, male sex.

- Statins, e.g.:
- Simvastatin, oral, 10 mg at night.

### **Secondary hypercholesterolaemia due to nephrotic syndrome**

See Chapter 6 Nephrological/Urological Disorders, section 6.3 Nephrotic Syndrome.

#### **REFERRAL**

- » ~~Children with homozygous familial hypercholesterolaemia.~~
- » ~~Children with or inadequate response to statins.~~

## **4.11 Hypertension in Children**

### Description

Changes to the text were proposed and accepted by the Committee.

The text was amended as follows:

A sustained blood pressure of ~~>115/80~~130/80 mmHg in a child older than 13 years is defined as hypertension is abnormal in a child between 6 weeks and 6 years of age.

Measure blood pressure with the child in a sitting or supine position with the entire arm in line with the level of the heart.

~~In children, it is easier to monitor the systolic blood pressure because of better correlation and less technical pitfalls than diastolic blood pressure.~~

The importance of ensuring that equipment is validated and calibrated correctly as well as the preference for auscultation technique was asserted and agreed upon by the Paediatric Hospital Level ERC.

The text was amended as follows:

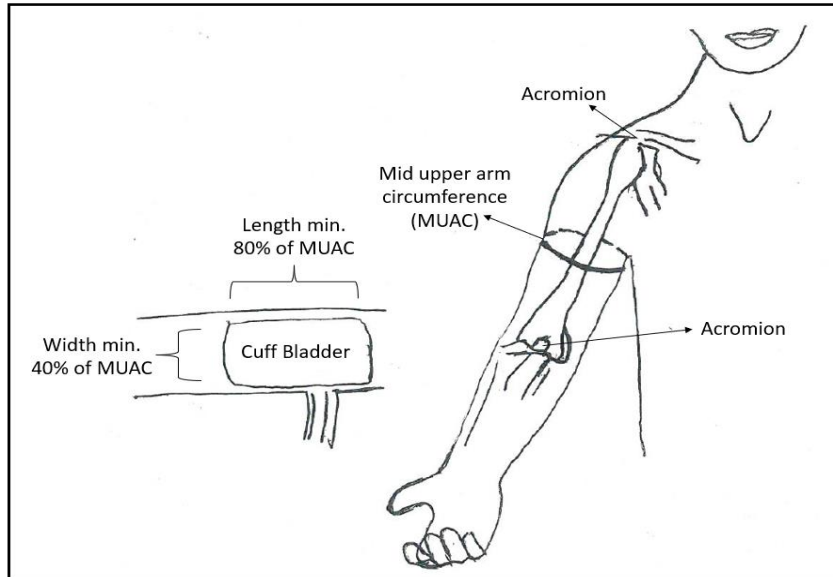
The blood pressure is measured by standard auscultation technique in children > 1 year of age.

~~In children < 1 year of age, a flush technique is usually used, although Doppler measurement would be preferable.~~

The description on measuring BP was highlighted as confusing and it was recommended that an illustration would be more useful. The diagram illustrating the standard auscultation technique for measure blood pressure was proposed for insertion with accompanying notes. The Paediatric Hospital Level ERC was in agreement with the changes.

The text was amended as follows:

One should use the widest cuff that can be applied to the upper arm. The cuff bladder must encircle at least 80% of the upper arm and should cover at least ~~75~~<sup>40</sup>% of the distance between the acromion and the olecranon.



1. Palpate bony prominence of Acromion and Olecranon posteriorly to determine the mid upper arm point, where the mid upper arm circumference (MUAC) is measured.
2. MUAC for BP measurement is done on the right arm whereas for malnutrition we use the non-dominant arm.

## Diagnostic Criteria

### **Clinical**

The term prehypertension has been changed to elevated blood pressure. In addition, the definition for stage 1 has been modified<sup>13</sup>. The Paediatric Hospital Level ERC agreed that these should be amended accordingly.

The text was amended as follows:

#### Categories of hypertension

- » Normal: below 90<sup>th</sup> percentile.
- » ~~Prehypertension~~ Elevated blood pressure 90<sup>th</sup>–95<sup>th</sup> percentile or BP > 120/80 mmHg.
- » Stage 1 hypertension: > 95<sup>th</sup>–99<sup>th</sup> percentile plus ~~5~~<sup>12</sup> mmHg.
- » Stage 2 hypertension: > 99<sup>th</sup> percentile plus 5 mmHg.

The tables on blood pressure levels for girls and boys by age and height percentile have been updated and were amended accordingly. It was also proposed and accepted by the Paediatric Hospital Level ERC that another summary table from the American Academy of Pediatrics' guidelines be added above the other tables (Table 6 in the guidelines)<sup>13</sup>. See pages 123 – 131 in the Cardiovascular System Chapter.

<sup>13</sup> Joseph T. Flynn, David C. Kaelber, Carissa M. Baker-Smith, Douglas Blowey, Aaron E. Carroll, et al. Urbina and SUBCOMMITTEE ON SCREENING AND MANAGEMENT OF HIGH BLOOD PRESSURE IN CHILDREN. Pediatrics September 2017, 140 (3) e20171904; DOI: <https://doi.org/10.1542/peds.2017-1904>

#### 4.11.1 Hypertension, Chronic

##### Medicine Treatment

It was discussed that there is a lack of evidence showing superiority of different classes of antihypertensives for children. Thus, it was recommended that the diagram illustrating a stepwise approach be removed and all options remain available as potential 1<sup>st</sup> line treatment. The Paediatric Hospital Level ERC agreed with the proposal.

The text was amended as follows:

~~Use specific classes of antihypertensive medicine according to the underlying pathogenesis or illness. There is no evidence of superiority of specific classes of drugs however daily dose improves compliance.~~

The following diagram was removed:

