PAEDIATRIC HOSPITAL LEVEL ESSENTIAL MEDICINES LIST
CHAPTER 1: EMERGENCIES AND TRAUMA
NEMLC 8 DECEMBER 2022 – REPORT

MEDICINE AMENDMENTS

SECTION	MEDICINE	ADDED/DELETED/NOT ADDED
1.1.3 Anaphylaxis/anaphylactic reactions	Oxygen	Use of reservoir bag added
1.1.4 Cardiorespiratory Arrest	Adrenaline	Clarity to directions provided

1.1.2 Resuscitation of a child

Diagrammatic overview updated to correct spelling and add the 'E' to the ABCDE.

1.1.3 Anaphylaxis/anaphylactic reactions

An external comment was received indicating that the use of a face mask with reservoir bag should be specified. The Committee agreed and amended text as follows:

In severe anaphylaxis nasal oxygen is unlikely to be adequate:
- Oxygen, 15 L/minute by face mask with reservoir bag.

1.1.4 Cardiorespiratory arrest

Adrenaline: An external comment was received suggesting that the word diluted be added to emphasize the adrenaline concentration. This was agreed to and updated.

The text was updated as follows:

- Adrenaline (epinephrine) **1:10 000 (diluted),** IV/ intra-osseous, 0.1 mL/kg. (Follow each dose with a small bolus of sodium chloride 0.9%)

1.1.5 Post Resuscitation Care

An external comment was received proposing the addition of a termination of resuscitation section as included in the Adult STGs and EML. The Paediatric Committee agreed and the following section was added:

1.1.5.1 TERMINATION OF RESUSCITATION

» The decision to stop CPR attempts depends on the specifics of the individual patient and should be based on clinical judgement.
» Consider stopping resuscitation attempts and pronouncing death if there is incurable underlying disease, or if asystole > 20 minutes.

Consider carrying on for longer especially with:
» hypothermia and drowning
» poisoning or medicine overdose
» neurotoxic envenomation (e.g. black and green mamba or Cape cobra snakebite) – see Section 21.3.1.4: Snakebites

This decision should take into consideration the potential risk that CPR poses to the rescuer e.g. infectious diseases.

1.1.7 Inhalation, foreign body

Cardiorespiratory resuscitation was updated to provide guidance for both one or two rescuers.

1.1.8 Shock

Prolonged capillary filling time was amended for alignment to ≥ 3 seconds

1.2.1 Burns

Text was clarified as below:

Partial thickness burns (superficial or deep) of > 10% body surface area.

OTHER

An external commenter recommended the inclusion of sections on exposure to poisonous substances, and bites and stings; with referrals to the relevant sections in the poisoning chapter.

The Committee agreed, and the following sections were added:

1.1.11 Exposure to poisonous substances
See Chapter 18 Poisoning, section 18.1 Poisoning.

1.1.12 Bites and Stings
See Chapter 28 Poisoning, section 18.2 Envenomation.

PREVIOUSLY ACCEPTED AMENDMENTS

SECTION	MEDICINE	ADDED/DELETED/NOT ADDED
1.1.3 Anaphylaxis/anaphylactic reactions	Adrenaline	Moved up
	Modified Ringers Lactate	Added
	Hydrocortisone IV	Moved up
1.1.4 Cardiorespiratory Arrest	Modified Ringers Lactate	Added
	Amiodarone	Removed
1.1.8 Shock *Hypovolaemic shock*	Modified Ringers Lactate	Added
Hypovolaemic shock	Packed red cells/whole blood	Dose amended
Cardiogenic shock	Adrenaline	Dose amended
Septic shock	Modified Ringers Lactate	Added
	Cefotaxime	Removed
	Ceftriaxone	Removed
1..1.9 Massive haemorrhage with massive transfusion of blood	Tranexamic acid	Not added
	Lyophilised plasma	Added
	Red Blood Cells (RBC)	Added
	FFP	Added
	Platelets	Added
1.2.1 Burns	Modified Ringers Lactate	Added
	½ Darrows/dextrose	Removed
	Sodium chloride 0.9%/dextrose 5%	Added
	Chlorphenamine	Added
	Aqueous Cream	Added
	Ondansetron	Added
	Gabapentinoids	Referral added
	Pantoprazole IV	Added
	Ceftriaxone	Removed
	Vancomycin	Removed
	Amikacin	Removed

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SECTION	MEDICINE	ADDED/DELETED/NOT ADDED
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1.2.1 Burns	Modified Ringers Lactate	Added
	½ Darrows/dextrose	Removed
	Sodium chloride 0.9%/dextrose 5%	Added
	Chlorphenamine	Added
	Aqueous Cream	Added
	Ondansetron	Added
	Gabapentinoids	Referral added
	Pantoprazole IV	Added
	Ceftriaxone	Removed
	Vancomycin	Removed
	Amikacin	Removed

General

Modified Ringers Lactate: Added

Modified Ringers Lactate was added as an alternative intravenous fluid to 0.9% sodium chloride in a shock, anaphylaxis, cardiac arrest and burns. A randomized trial comparing the effectiveness of ringers lactate and normal saline for correction of paediatric acute severe diarrhoeal dehydration found that 38% of patients on ringers lactate and 23% of patient on normal saline had improvement in clinical status and pH ≥ 7.35 after 6 hours, RR =1.63, 95% CI 0.8 to 3.4). No significant differences were seen secondary outcomes regarding electrolyte, renal

and blood gas parameters, or hospital say duration.[1] The current costs of sodium chloride 0.9% and ringers lactate are equivalent:

Item	Price
Sodium Chloride; 0.9%; Infusion (parenteral); 1 L	R10.61
Ringer Lactate; Infusion (parenteral); 1 L	R10.76

1.1.3 Anaphylaxis/anaphylactic reactions

Modified Ringers lactate: Added
As discussed above in general.

Adrenaline: Moved up
Hydrocortisone IV: Moved up
The order of medicine management we amended to ensure management is outlined in term of priorities.

1.1.4 Cardiorespiratory arrest

Updated advanced Cardiac Arrest algorithm: Added
The Resuscitation Council of South Africa[2], advanced cardiac arrest algorithm was added to this section.

Ratio of compressions to breaths: updated
The resuscitation compressions to breaths ratio was updated with recommendations for one and two rescuers. These recommendations are in line with the Resuscitation Council of South Africa recommendations and algorithm added.

Provide artificial breaths at a ratio of 30 compressions to 2 breaths (30:2) if alone and 15 compressions to 2 breaths (15:2) if two rescuers are present.

Modified Ringers lactate: Added
As discussed above in general.

Amiodarone: Removed
Amiodarone has been reviewed by the Adult ERC and not recommended for inclusion. The Adult Hospital STGs and EML, 2019 edition[3] found that the role of antiarrythmics in adult cardiopulmonary resuscitation was uncertain: *recent meta-analyses suggest that there is uncertainty about the efficacy of antiarrhythmics in cardiac arrest to improve rates of return of spontaneous circulation, survival to hospital discharge or neurological outcomes when compared to placebo. Conflicting outcomes for survival to hospital admission was reported for use of antiarrhythmics in advanced life support: McLeod et al, 2017[4] showed that amiodarone (RR 1.18; 95% CI: 1.08 to 1.30) was associated with a statistically significant increase in survival to hospital admission, whilst Chowdury*

[1] Kartha GB, Rameshkumar R, Mahadevan S. Randomized Double-Blind Trial of Ringers Lactate versus Normal Saline in Pediatric Acute Severe Diarrheal Dehydration. JPGN, 2017, 65 (6):1.
[2] https://resus.co.za/
[3] Adult Hospital STGs and EML, 2019 edition – Emergencies and Injuries NEMLC report – 23 June 2022.
[4] McLeod SL, Brignardello-Petersen R, Worster A, You J, Iansavichene A, Guyatt G, Cheskes S. Comparative effectiveness of antiarrhythmics for out-of-hospital cardiac arrest: A systematic review and network meta-analysis. Resuscitation. 2017 Dec;121:90-97. https://www.ncbi.nlm.nih.gov/pubmed/29037886

et al, 2017[5] showed that amiodarone had no significant effect on survival to admission (OR=1.33; 95% CI 0.91 to 1.97; I_2 = 92%; p=0.14).

1.1.5 Post Resuscitation Care

An algorithm adapted from Resuscitation Council for South Africa for Post Cardiac Arrest Care, 2021 was added to this section added. The adaption was to the Target Temperature monitoring section, where by the text was amended to remove any recommendations on freezing. Permission for adaption gain from Council.

1.1.8 Shock

Modified Ringers lactate: Added
As discussed above in general.

Hypovolaemic shock
Packed red cells/whole blood: dose amended

Cardiogenic shock
Adrenaline: Dose amended

The adrenaline starting dose was amended from 0.01mcg to 0.05 mcg. The British National Formulary for children (BNFc)[6] recommends 0.1mcg/kg/minute and adjusted to response up to 1.5mcg/kg/minutes. The STG dose was increased, however maintained at a more conservative starting dose than BNFc. The lower starting range is in line with Frank Shann.[7]

Text amended as follows:

Chronotropic/inotropic plus vascular tone support: If tissue perfusion and blood pressure do not improve satisfactorily on adequate fluid volume replacement and inotropic support, consider: • Adrenaline (epinephrine), IV infusion, 0.~~01~~05–1 mcg/kg/minute.

Septic Shock
Cefotaxime: Removed
Ceftriaxone: Removed
The antibiotic recommendations were removed, and replaced with information to consider whether community or hospital acquired and treat based on susceptibility when available.

This section was updated as follows:

Antibiotic therapy » Start empiric antibiotics early.

[5] Chowdhury A, Fernandes B, Melhuish TM, White LD. Antiarrhythmics in Cardiac Arrest: A Systematic Review and Meta-Analysis. Heart Lung Circ. 2018 Mar;27(3):280-290. https://www.ncbi.nlm.nih.gov/pubmed/28988724
[6] British National Formulary for Children 2020-2021. BMJ Group and Pharmaceutical Press.
[7] Frank Shann, Drug Doses, RCH, 15th ed. 2010.

» Aim to get source control: all pus should be drained; all necrotic tissue should be removed/debrided.

Before initiating antibiotic therapy, take blood and urine specimens, if appropriate, for culture and sensitivity testing.

Consider whether community or hospital acquired, and treat based on anticipated susceptibility. Ensure immediate administration.

Reconsider antibiotic and/or antifungal therapy when culture and sensitivity results become available.

~~• 3rd generation cephalosporins, e.g.:~~
~~• Cefotaxime, IV, 75 mg/kg/dose, 8 hourly (neonates).~~
~~**OR**~~
~~Children > 1 month:~~
~~• Ceftriaxone, IV, 50 mg/kg/dose, 12 hourly.~~

1.1.9 Massive Haemorrhage with massive transfusion of blood.

This section is a new addition to the chapter. The medicine management was largely aligned with recommendations from the Adult Hospital Level STGs and EML.[8]

Lyphilised plasma: Added
RBC: Added
FFP: Added
Platelets: Added
Tranexamic acid: Not added

Tranexamic acid however was not added: A systematic review and meta-analysis evaluating the effectiveness and safety of tranexamic acid in paediatric trauma found that the benefits are unclear.[9] Tranexamic acid use was note associated with increased survival in paediatric trauma (adjusted odds ratio 0.61, 95% CI 0.3 to 1.22) after adjustment for patient-level variables such as injury severity. Increased survival was only found in a subset of patients experiencing trauma in a combat setting.

1.2.1 Burns

Terminology of depth of burns amended
Percentage burn table amended with addition of 8 to < 9 years, and then 9 years and older.

[8] National Department of Health, Adult Hospital Level STGs and EML, 2019.
[9] Kornelsen E, Kuppermann N, Nishijima DK, Ren LY, Rumantir M, Gill PJ, Finkelstein Y. Effectiveness and safety of tranexamic acid in pediatric trauma: A systematic review and meta-analysis. American Journal of Emergency Medicine. 2022, 55: 103-110.

Updated as follows:

Age Years	Head + neck Front + back	Torso Front	Torso Back	Lower limb Front + back	Upper Limb Front + back
< 1 year	18%	18%	18%	14%	9%
1 to < 2 years	17%	18%	18%	14.5%	9%
2 to < 3 years	16%	18%	18%	15%	9%
3 to < 4 years	15%	18%	18%	15.5%	9%
4 to < 5 years	14%	18%	18%	16%	9%
5 to < 6 years	13%	18%	18%	16.5%	9%
6 to < 7 years	12%	18%	18%	17%	9%
7 to < 8 years	11%	18%	18%	17.5%	9%
8 to < 9 years	10%	18%	18%	18%	9%
9 years and older *(plus 1% perineum)*	9%	18%	18%	18%	9%

Distraction therapy added under general and supportive measures
The following text was added:

» Distraction therapy: music, video games, etc. for dressing changes.

Modified Ringers lactate: Added
As discussed above in general.

Warning on urine output: added

If Urine output > 1-2 ml/kg/hour or venous blood gas (VBG) better than minus 4, stop resuscitation fluids. Too much fluid is almost as harmful as too little fluid.

½ Darrows/dextrose: Removed
Sodium chloride 0.9%/dextrose 5%: added
In line with the Alimentary Chapter, ½ Darrows/dextrose has been removed and replaced with sodium chloride 0.9%/dextrose 5%.

Pruritus in burns
Management for pruritus in burns was added. [10]
Chlorphenamine: Added
Cetirizine: Added
Aqueous Cream: Added
Ondansetron: Added
Referral for gabapentinoids: Added
Antihistamines are the mainstay of post-burn pruritus therapy. First-generation antihistamines seem to have better efficacy than second generation antihistamine, thus chlorphenamine was added as first line management. Topical emollients are the most widely used topical treatments. These assist with softening the stratum corneym and restoring the barrier function, thereby relieving the itching. Aqueous cream was added as a topical option for management. Ondansetron is often used as a second or third line option, and in one study found to have better effects than antihistamines. The gabapentoids are often used in pruritus, however not included in the hospital level STGs and EML, only available at a Tertiary level for refractory neuropathy. It was proposed that gabapentinoids be added for consideration for refractory pruritus as initiated by a specialist.

[10] Chung BY, Kim HB, Jung MJ, Kang SY, Kwak IS, Park CW, Kim HO. Post-Burn Pruritus. International Journal of Molecular Sciences. 2020, 21, 3180.

The section was added as follows:

For pruritus
Antihistamines:

- Chlorphenamine, oral, 0.1mg/kg/dose as a single dose at night. (Maximum 4mg)

Topical

- Aqueous cream

If not controlled:

- Ondansetron, oral, 0.1-0.2 mg/kg 12 hourly.

If oral route cannot be used:

- Ondansetron, IV, 0.1 mg/kg immediately.
  - Maximum dose: 4 mg/day.

Refractory pruritus: refer for consideration of gabapentinoids

Pantoprazole IV: Added
Previously only ranitidine IV was included as an IV option where oral cannot be taken. Ranitidine has had historic supply constraints and it was recommended that an intravenous proton pump inhibitor (PPI) be added, this recommendation would be in line with the Tertiary inclusion of intravenous PPIs in cases where oral cannot be taken.

Antibiotics
Ceftriaxone: Removed
Vancomycin: Removed
Amikacin: Removed

As for previous sections, antibiotic recommendations removed and text to consider whether community or hospital acquired and treat based on susceptibility when available, was added.

The text was amended as follows:

The choice of antibiotics is based on the culture and sensitivity results of wound, urine and blood cultures once available.
Positive wound cultures alone do not indicate systemic infections requiring antibiotic treatment.

» Start antibiotics early.
» Aim to get source control: all pus should be drained; all necrotic tissue should be removed/debrided.

Before initiating antibiotic therapy, take blood and urine specimens, if appropriate, for culture and sensitivity testing.

Consider whether community or hospital acquired, and treat based on anticipated susceptibility. Ensure immediate administration.

Reconsider antibiotic and/or antifungal therapy when culture and sensitivity results become available.

- ~~Ceftriaxone, IV, 50 mg/kg/dose 24 hourly for 5 days.~~

~~If MRSA is suspected or confirmed, replace with:~~

- ~~Vancomycin, IV, 15 mg/kg/dose 6 hourly for 5–14 days.~~

~~**AND**~~

- ~~Amikacin, IV, for 5–14 days if renal function is satisfactory.~~
  - ~~1 week to < 10 years: 25 mg stat then 18 mg/kg once daily.~~
  - ~~10 years and older: 20 mg stat then 15 mg/kg.~~

1.2.2 Traumatic Brain Injury

A brief section on Traumatic Brain Injury (TBI) was added to outlined screening and referral; with a link to the TBI section in the Intensive Care Chapter added.