AHL CH 23: Adult Critical Care

National Department of Health

Affordable Medicines Directorate
Essential Drugs Program

Adult Hospital Level Standard Treatment Guidelines – 2020-4 Review cycle

Evidence

Please access National Essential Medicines List Committee (NEMLC) report for detailed evidence (including rationale, references and costings) informing decision-making on medicine addition, amendments and deletions:

NHI Website: https://www.health.gov.za/nhi-edp-stgs-eml
Knowledge Hub: www.knowledgehub.health.gov.za/e-library

Disclaimer

This presentation is an implementation tool and should be used alongside the most recently published STGs available on the Knowledge Hub.

This information does not supersede or replace the STGs.

New Chapter development → Topics included in this chapter

Principles of Critical Care

Respiratory Support: Ventilation Management

Septic Shock: → Adrenaline → Balanced Salt Solution

Haem Support: T/prophylaxis PBM MBT

1 2 3 4 5

Neuro-Psych Support Analgo-Sedation IV Paracetamol

6

Metabolic and Endocrine: Thyroid Crisis

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Sepsis & Critical Care: Ceftazidime-Avibactam

Patient Safety and Transfer

End of Life Care

Case Study

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New Chapter Development

HOT OFF the PRESS

How was the Adult Critical care chapter developed?

This is a new chapter developed in the 2020-4 review cycle

It replaces the previous Adult Hospital level Chapter 23: Sedation

Critical care is a series of organ support offered to patients

Medicines have been proposed for the newly-developed Adult Critical Care Chapter and Essential Medicines List (EML)

The chapter is a work in progress as medicine reviews for non-EML items continue to be recommended for prioritization for future review cycles.

New Chapter Development

NEW CHAPTER

How were medicines selected for this chapter?

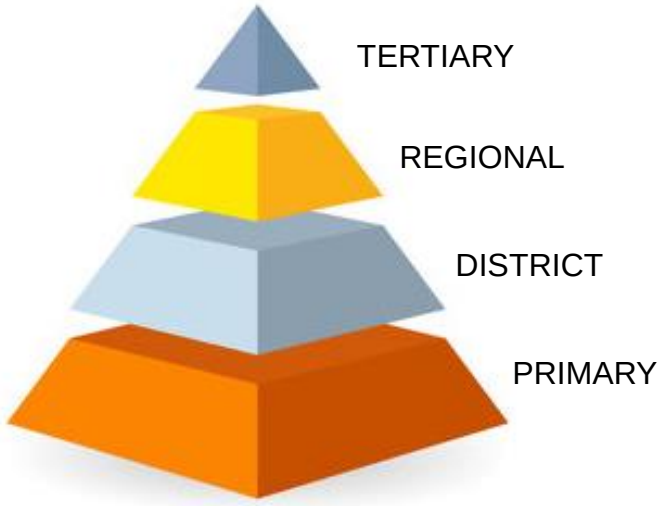
New medicines were added to the chapter following a medicine review

Medicines already on the EML used for similar or a different indication were added to critical care with justification either through a medicine review or evidence-base substantiation

Medicines on the EML, being used for the same indication ('aligned' and cross referenced to other chapters)

At whom is this chapter aimed?

- South African Critical Care Landscape
- Varying functional units at same level
- The Medical Officer
- The General Specialist
- [The Critical Care Specialist “Intensivist”]



Topics Included in the Chapter

23.1 Introduction and Principles of Critical Care	23.8 Metabolic and endocrine support
23.2 Respiratory support	23.9 Toxicology in ICU
23.3 Cardiovascular support	23.10 Sepsis in ICU
23.4 Renal support	23.11 Safety in ICU
23.5 Haematological support	23.12 End of life care
23.6 Neuro-psychological support	Appendices
23.7 Gastro-intestinal support	

Topics Included in the Chapter

***Selected aspects of topics highlighted in red will be discussed in this presentation

23.1 Introduction and Principles of Critical Care	**23.8 Metabolic and endocrine support**
23.2 Respiratory support	23.9 Toxicology in ICU
23.3 Cardiovascular support	**23.10 Sepsis in ICU**
23.4 Renal support	**23.11 Safety in ICU**
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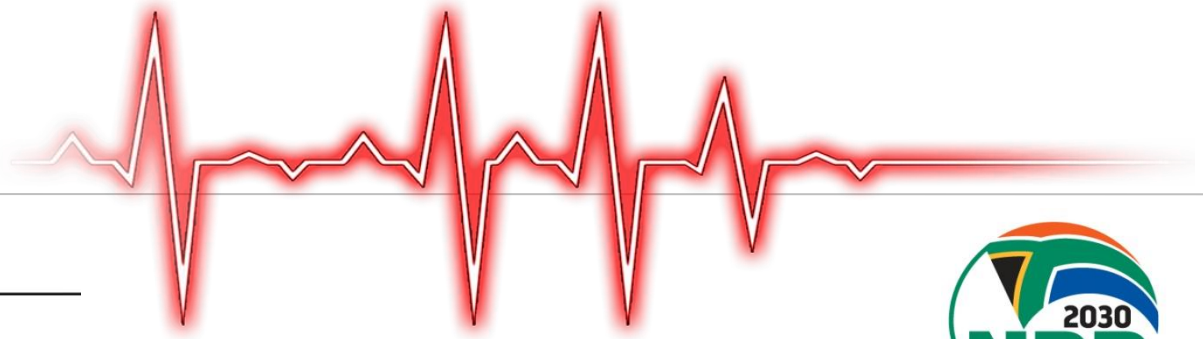
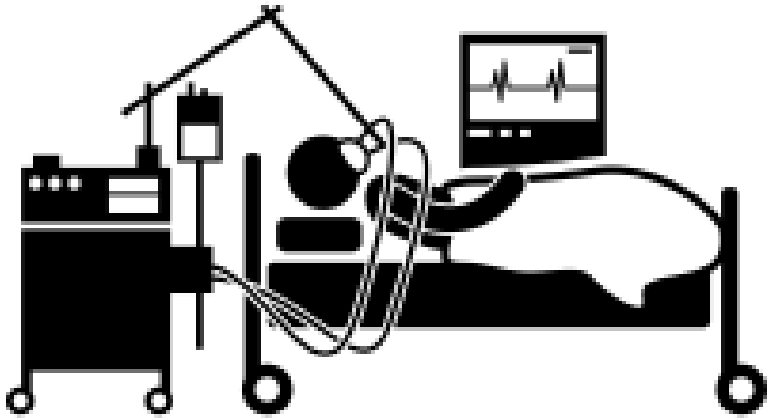
23.7 Gastro-intestinal support	



Principles of Critical Care

What is critical care?

Specialised medical and nursing care for patients who have, are at risk of, or are recovering from serious, life threatening injuries and illnesses



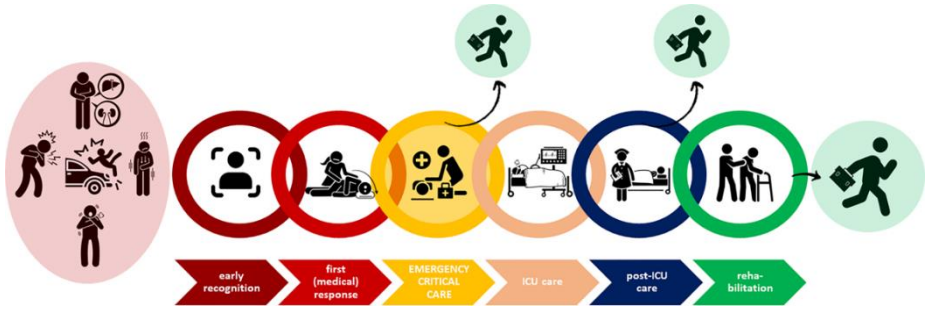
What does it entail?

- Constant, intensive monitoring and comprehensive care including multiple modalities of vital physiologic organ support to sustain life during a period of life-threatening organ system insufficiency.
- Also involves intensive resuscitation and appropriate end-of-life care.

Principles of Critical Care

Which disciplines are involved

- Usually delivered in intensive care unit
- Continuum of care throughout health care chain including pre-hospital environment, emergency department, hospital ward, high-care wards, & follow-up clinic.



Which healthcare professionals are involved?

- Multi-disciplinary team
- Medical and nursing personnel, plus *inter alia* physiotherapists, occupational therapists, dieticians, critical care technologists and social workers.

Principles of Critical Care

Pharmacology in critical care?

- P/K & P/D variations with underlying illness, multiorgan dysfunction & use of multiple supportive modalities.
- Altered absorption, protein binding, volume of distribution, clearance, & affinity of molecules to target receptors.
- Loading doses may be required.
- Maintenance may need to be adjusted.
- Careful dose titration with
- Therapeutic drug monitoring where possible.
- Tailor dosing with kidney replacement therapy.
- Polypharmacy → watch for drug interactions or toxicity.

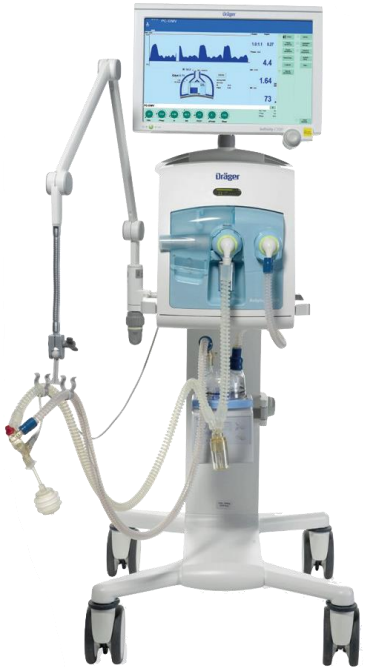
Respiratory Support

Ventilation Management Strategy

Generic step by step guide:

- ✓ Ventilation
- ✓ Level of support
- ✓ Oxygen concentrations

Available as an appendix



Ventilators will differ between different settings.

General guidance is provided for:

- ✓ Setting the machine
- ✓ Monitoring the patient
- ✓ Titration of the ventilator
- ✓ Liberation of patient

Septic Shock: Adrenaline

What is shock?

State where perfusion is inadequate to meet the metabolic needs at a cellular level. There are various forms of shock each requiring specific treatment.

Vasocative medicines for shock

2019 edition of STGs recommended adrenaline for the treatment of septic shock that is unresponsive to a fluid challenge.

Other indications

Adrenaline historically included in AHL STGs for other indications

e.g. Chapter 20: Emergencies and injuries as an immediate emergency medicine treatment for cardiac arrest in adults e.g. Chapter 3: Cardiovascular System for persistent hypotension.

National Department of Health: National Department of Health: Essential Drugs Programme. Adult Hospital level STGs and EML. NEMLC Report - Chapter 23: Adult Critical Care. https://www.health.gov.za/wp-content/uploads/2024/04/Adult-Hospital-Chapter-23-Critical-Care_2020-3-with-supporting-NEMLC-report-1.pdf

Septic Shock: Adrenaline

Medicine Review: Vasopressors, inotropes as monotherapy or in combination

International standard

Internationally, noradrenaline recommended as first-line vasopressor for management of septic shock in adults.

Methodology

- Systematic reviews sourced & appraised using the AMSTAR 2 tool.
- Historical Surviving Sepsis Guidelines reviewed to identify additional studies of relevance.
- Five relevant primary RCTs extracted from the systematic review and risk-of-bias appraised and synthesised with meta-analysis of homogenous data as appropriate.

Adrenaline vs Noradrenaline

Noradrenaline can safely be used as an alternative to adrenaline (epinephrine) but may not be affordable. . A direct comparison of per-milligram drug prices suggest a 7-20 fold increase in treatment costs with noradrenaline.

Conclusion

The review found that adrenaline monotherapy is associated with similar clinical outcomes as noradrenaline when used as monotherapy or in combination with other vasopressors.

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For the full medicine review:
National Department of Health: Affordable Medicines, EDP-Adult Hospital level. Medicine Review: Vasopressors, inotropes as monotherapy or in combination, April 2023. http://www.health.gov.za/. https://accessmedicine.mhmedical.com/content.aspx?bookid=1944&sectionid=143516493

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Septic Shock: Adrenaline

ADRENALINE **VS** **NORADRENALINE**

Noradrenaline with/without other catecholamines, probably does not reduce mortality compared to **adrenaline** in the management of septic shock:
131/289 (45.3%) vs 124/271 (45.8%), with a relative risk (RR) of 0.99 (95% CI 0.83 to 1.18; I2 = 0%),

LOW CERTAINTY EVIDENCE

It is uncertain whether **noradrenaline**, with/without other catecholamines, may have an effect on time to mean arterial pressure goal (24 hours without vasopressor use), time to Mean Arterial Pressure (MAP) stabilisation (MAP 70 to 80 mmHg) or effect on vasopressor free days (28 days), **compared to adrenaline.**

VERY LOW CERTAINTY EVIDENCE

Noradrenaline, with/without other catecholamines, may not reduce mean change in lactate concentration from baseline, at 24 hours, **compared to adrenaline.** The mean difference was - 0.16 mmol/l (95% CI -1.14 fewer to 0.82 more). This change is not considered clinically significant.

VERY LOW CERTAINTY EVIDENCE

There was **no difference** in supra- or ventricular-tachyarrhythmias between the adrenaline [31/176 (17.6%)] vs noradrenaline + dobutamine combination treatment group [30/184(16.3%)], RR 0.92 (95% CI 0.59 to 1.45)

VERY LOW CERTAINTY EVIDENCE

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https://accessmedicine.mhmedical.com/content.aspx?bookid=1944&sectionid=143516493

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Septic Shock: Adrenaline

NEMLC Recommendation

With the evidence being of low-very low certainty, **NEMLC did not recommend** noradrenaline over adrenaline for the initial management of septic shock that is unresponsive to a fluid challenge, due to the absence of clinically significant advantages in mortality or safety.

Septic Shock: Adrenaline

Post-review considerations *(Call for comment process)*

Dosing

- The upper range on the adrenaline dosing was revised to 1.0mcg/kg/min
- A higher dosage of adrenaline is provided for the emergency setting in Chapter 20: Emergencies and injuries vs a wider range which falls within the emergency dosing range for adrenaline in the adult critical care chapter. The context for adrenaline IV use in the critical care and the emergency setting may be different.

Non-inclusion of Noradrenaline

- International Surviving Sepsis Campaign Guidelines 2021 edition issued a strong recommendation for noradrenaline as a first line vasopressor in septic shock
- Concerns about adrenaline safety were also raised and mentioned as follows: serious cardiac arrhythmias, myocardial ischemia exacerbation, splanchnic hypoperfusion and hyperlactatemia
- Reports of cardiac events in patients with ischemic heart disease, as well as bowel ischemia in patients presenting for emergency gastrointestinal surgery, with the use of adrenaline to treat shock.
- Noradrenaline as second line treatment for various types of shock will be reviewed for prioritisation in the next review cycle as per the NEMLC recommendation.

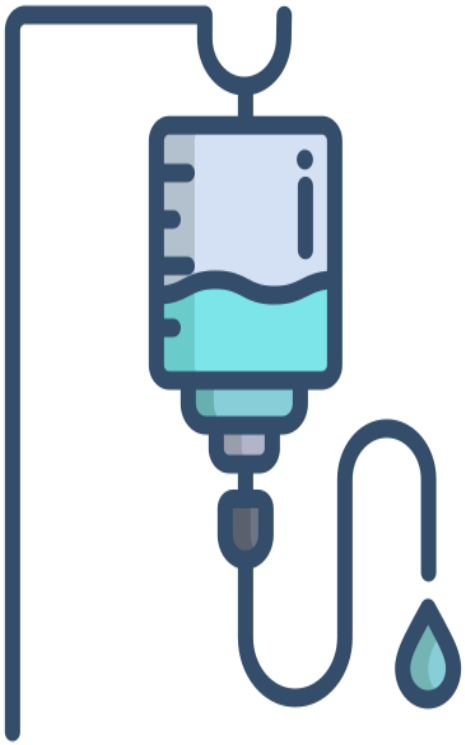
Evans et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021. Crit Care Med. 2021 Nov 1;49(11):e1063-e1143. doi: 10.1097/CCM.0000000000005337. PMID: 34605781.

Septic Shock: Adrenaline

NEMLC Recommendation

The committee has recommended a **medicine review of noradrenaline and/or other vasopressors as a second line alternative treatment** for various types of shock in consideration of historical use in the EML in the case of adrenaline contra-indication, unavailability or ineffectiveness. Noradrenaline is now SAHPRA registered. The section on vasoactive medicines for shock in the chapter which refers to additional treatment if target with adrenaline is not achieved will remain unfinalized until the recommended review is concluded in **the next review cycle**.

Fluid Therapy for Shock
Balanced Salt Solution



Based on an evidence review updated in 2019 , NEMLC recommends that sodium chloride 0.9% be the primary **resuscitation** fluid (including for septic shock).

Ringer's lactate is included on the therapeutic interchange database for patients in whom balanced solutions **may** be more appropriate e.g., critically ill patients presenting with hyperchloremia, patients previously receiving renal replacement therapy.

It is acknowledged that maintenance fluid support for patients not in shock is not addressed in the chapter and that a section on general/maintenance fluid support would be helpful in future iterations of the chapter. For example:

- calculation of daily fluid requirements
- recommended types of fluid to use
- monitoring.

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NDoH Medicine Review. Ringer lactate for resuscitation in patients with hypovolaemia. Aug 2019. Microsoft Word - Ringer Lactate for resuscitation in Adults Medicine review update_August2019 (health.gov.za)

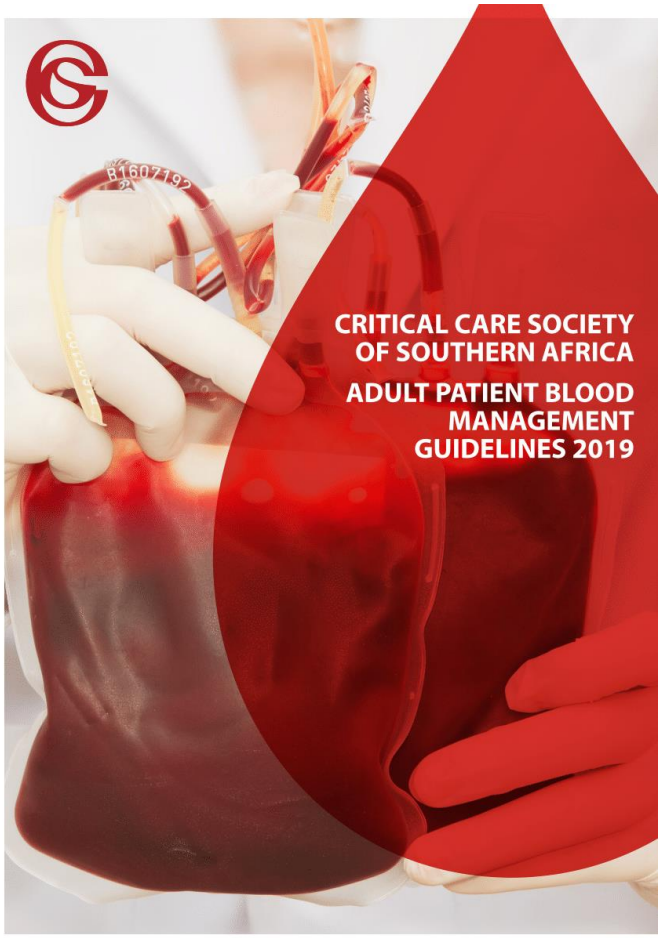
Haematological Support

Thromboprophylaxis

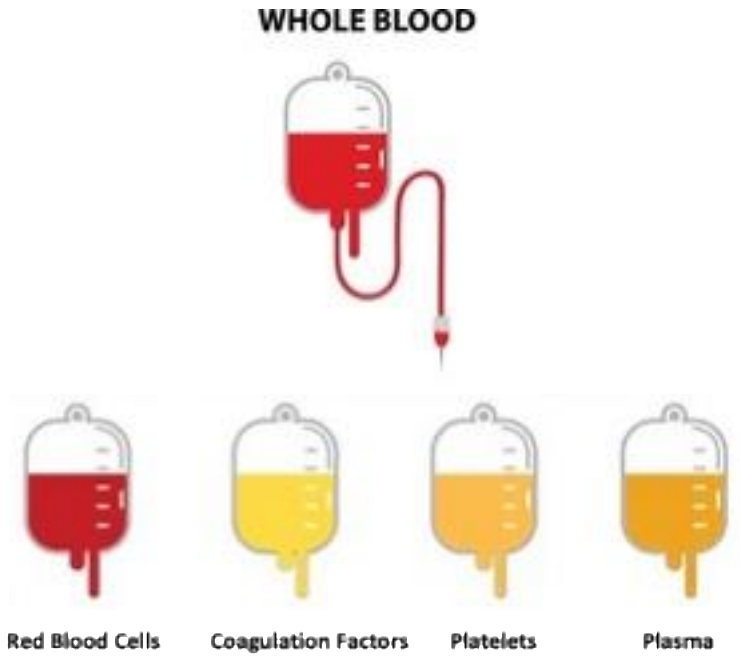
All critically ill patients should receive pharmacological (superior) OR mechanical thromboprophylaxis.

Low-molecular weight heparin (LMWH) e.g.Enoxaparin, SC, 40mg daily recommended
Reduce dose to 20 mg daily if eGFR <30 ml/min..

Haematological Support



Patient Blood Management



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https://criticalcare.org.za/wp-content/uploads/2019/10/CCSSA-Patient-Blood-Management-Guidelines-for-Comment-2.pdf

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Massive Transfusion Protocol

A **massive transfusion protocol** is outlined in the STG.

A definition, aspects of a protocol and an example of a protocol approach are provided.

Treating doctor initiates MTP if:

- Major haemorrhage with non-response/transient response resuscitation
- Uncontrolled major haemorrhage requiring immediate surgery
- Massive transfusion anticipated for other reason

Initial Action

- Phone blood bank and initiate MTP (blook bank prepares 6 units of red blood cells [on returnable basis if available] and 1 pool of platelets and ensure cryoprecipitate available)
- Send cross match
- Send blood to laboratory for clotting profile and/or perform point of care coagulation testing
- Insert high-capacity IV line
- Prepare fluid-warmer

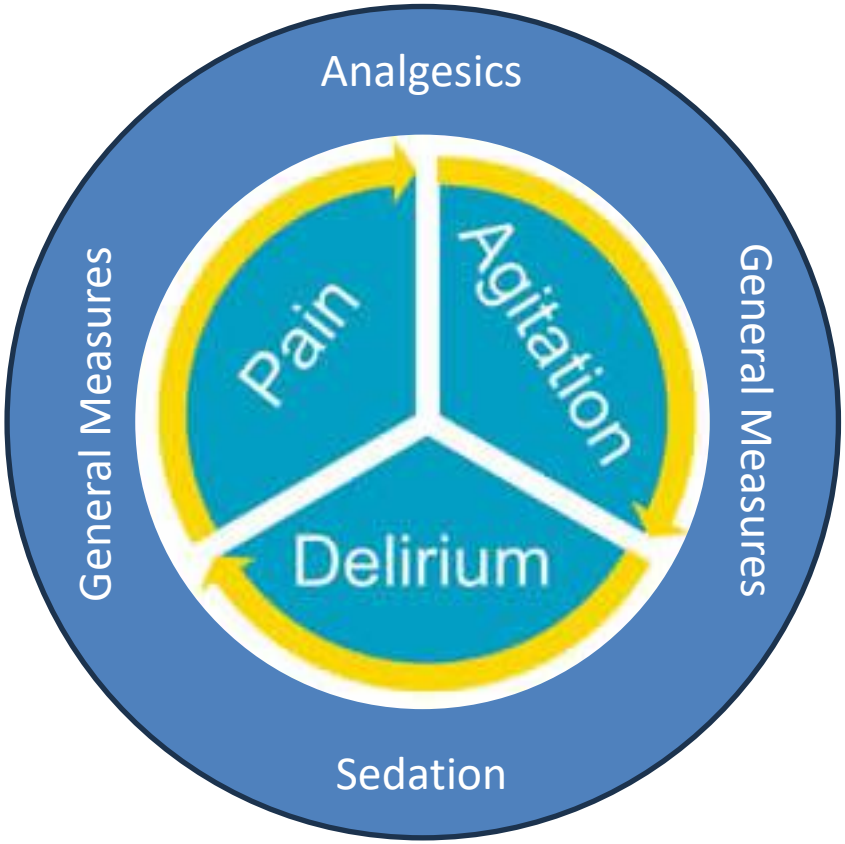
Initial Action

- Transfuse Red blood cells: platelets FDP/FFP in ratio of 1:1:1
- Give 10 units of cryoprecipitate once 8 units of packed cells required
- Administer tranexamic acid if indicated
- Monitor and replace calcium as required
- Treatment to be directed by coagulation testing when required

Figure 23.1 Massive Transfusion Protocol Approach

Neuropsychological Support

- Importance of neuropsychological support
- General measures !!!
- Avoid routine sedation
- Analgesia first
- Individualize therapy
- Watch for depression



Paracetamol IV for Pain Management

In July 2015, IV paracetamol reviewed by Adult Hospital Level (AHL) Expert Review Committee (ERC) for "Analgesia during the perioperative period"

Aimed to **update previous reviews on IV paracetamol** to provide additional evidence to confirm efficacy & safety of IV paracetamol in selected indications and in comparison, to NSAIDs & opioids

Concluded **that IV paracetamol can provide safe & efficacious analgesia** in trauma patients, the perioperative period and for patients with renal colic, with a safety profile superior to NSAIDs and opioids

The review was presented to NEMLC in October 2015. **NEMLC did not recommend** paracetamol IV for this indication due to affordability of paracetamol

In June 2022, the Paediatric Hospital Level ERC also concluded a medicine review for Intravenous Paracetamol for the treatment of peri-operative pain in children where oral route cannot be used.

NEMLC recommended that paracetamol IV be included at paediatric hospital level for management of pain reserved for paediatric patients who cannot receive oral paracetamol, i.e. those with gastrointestinal pathology causing poor absorption or not allowing for feeding

IV paracetamol was found to be **less costly** than listed alternative (rectal paracetamol). Paracetamol IV was also approved for the Paediatric Hospital Level Pain Chapter in situations where oral cannot be used.

In July 2023, NEMLC aligned to the paediatric hospital standard treatment guidelines approving paracetamol IV for adult hospital level critical care use in special circumstances.

Paracetamol IV for Pain Management

NEMLC Recommendation

NEMLC recommends IV paracetamol for an initial treatment period of 24 hours only in adult intensive care unit (ICU)/ high care ward (HCW) patients, or those who are candidates for, or awaiting admission to ICU/HCW, who are nil per mouth. The prescription is to be initiated by a specialist, and any extension of IV paracetamol treatment beyond 24 hours is to be authorised by a specialist. The approved indication is specifically for adults who cannot take oral medicines or safely receive perioperative parenteral opioids and/or NSAIDS

Metabolic & Endocrine Support

Thyroid Crisis

Historically, Atenolol, oral retained as example of beta-blocker group aligned with section 8.18.1: Graves' hyperthyroidism.

Oral atenolol not a suitable option in emergency situation for treatment of thyroid crisis in patient who cannot swallow.

Labetalol IV commercially available in SA, however due to alpha1-receptor antagonistic activity, considered unsuitable for critical care environment.

IV esmolol (SAHPRA registered), which is a short acting titratable, is a viable option to stabilize patients until oral atenolol but is non EML.

In the absence of an IV formulation of atenolol, the Committee recommended Atenolol, oral (administered via nasogastric tube).

The Committee recommended a medicine review regarding use of a pure IV beta blocker (not an alpha and beta agent) in thyroid crisis, as the chapter remains a work in progress and is developed further.

Sepsis and Critical Care

SEPSIS Facts

stop sepsis save lives

47 - 50 million cases per year[1]

At least **11 million** deaths per year[2]

1 in 5 deaths worldwide is associated with **sepsis**[3]

Sepsis is the number 1
- Cause of death in hospitals[4]
- Cause for hospital readmissions[5]
- Healthcare cost[6]

(e.g. $62 billion is spent on sepsis healthcare costs in the US alone)

Up to **50%** of sepsis survivors suffer from long-term physical and/or psychological effects[7]

40% of cases are children **under 5**[8]

80% of sepsis cases occur **outside** of a hospital[9]

SEPSIS is always caused by an **infection** like pneumonia or diarrheal illness[10]

SEPSIS is a medical **emergency** - if you or someone you know shows signs of sepsis, seek medical care immediately. Every hour counts.[11]

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Adapted from:https://www.worldsepsisday.org/sepsisfacts

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Sepsis and Critical Care - Antimicrobials

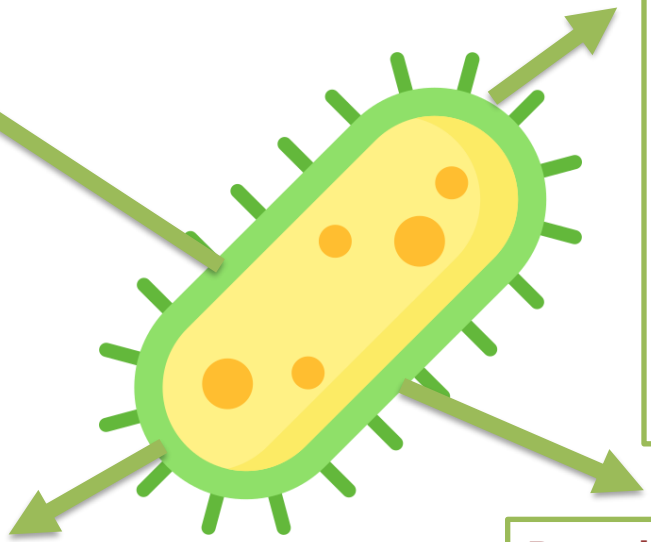
Table 23.8: Example of an ICU Empiric Antimicrobial Guideline

Infection	Community Acquired Infection	Healthcare Associated Infection	Suspected Multidrug-resistance
Upper Gastro-intestinal tract (GIT)	Amoxicillin/clavulanic acid ± Gentamycin# + Fluconazole	Piperacillin-tazobactam ± Amikacin# + Fluconazole	Meropenem* + Fluconazole
Lower GIT Urological Gynaecological	Amoxicillin/clavulanic acid ± Gentamycin#	Piperacillin-tazobactam ± Amikacin#	Meropenem*
	For pelvic inflammatory disease, add: Metronidazole		
Infected pancreatic necrosis (suspected)		Piperacillin-tazobactam ± amikacin	Meropenem
Pneumonia in HIV negative patient	Amoxicillin/clavulanic acid + Azithromycin	Piperacillin-tazobactam ± Amikacin# ± Vancomycin^	Meropenem* ± Vancomycin^
Pneumonia in HIV positive patient (with bilateral infiltrates)	+Cotrimoxazole + Anti-TB Rx*		
Meningitis	Ceftriaxone	Meropenem	
Skin and soft tissue	Amoxicillin/clavulanic acid	Piperacillin-tazobactam ± Vancomycin^	Meropenem* ± Vancomycin^
	For necrotizing fasciitis, add: Clindamycin ± Gentamycin#	+ Clindamycin + Amikacin#	+ Clindamycin
Catheter-related bloodstream infection		Piperacillin-tazobactam ± Amikacin# ± Vancomycin^	Meropenem ± Vancomycin^
Infective endocarditis	Ampicillin + Cloxacillin + Gentamicin	Meropenem ± Vancomycin^	
Tetanus	Metronidazole		
Suspected Clostridium Difficile Enterocolitis	Enteral Vancomycin (IV prep via NGT)		

- Variations!
- Consider sites of infection
- Consider local antibiograms
- Consider patient factors
- Involve microbiologists
- Develop unit guidelines

Ceftazidime-Avibactam for Sepsis in ICU

Carbapenem-resistant Enterobacterales (CRE) are Gram-negative bacteria with reduced susceptibility to at least one carbapenem antimicrobials.



Ceftazidime-avibactam can be considered for CRE bacteraemia, in consultation with a specialist and antimicrobial stewardship team, where the infecting organism is proven to be sensitive to ceftazidime-avibactam on bacterial culture.

Clinical outcomes with CRE infections are worse than for other infections and it is imperative that **these organisms do not spread to other patients** in the unit.

Duration of treatment is dependent on indication and clinical response. Duration of treatment should not exceed 14 days.

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For the full medicine review:
National Department of Health: Affordable Medicines, EDP-Adult Hospital level. Medicine Review: Ceftazidime-avibactam for the treatment of carbapenem-resistant Enterobacterales (CRE) bacteraemia, July2023 (Updated September 2023). http://www.health.gov.za/.
https://accessmedicine.mhmedical.com/content.aspx?bookid=1944&sectionid=143516493

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Ceftazidime-Avibactam for Sepsis in ICU

Medicine Review: Ceftazidime-Avibactam for the treatment of carbapenem-resistant Enterobacterales (CRE) bacteraemia

Surveillance

NICD surveillance suggests comparable CRE epidemiology in South Africa, with the largest proportion of CRE bacteraemia being caused by Klebsiella pneumonia producing OXA-48.

Sensitivity

A significant proportion of CRE isolates (almost 25%) are still unlikely to be susceptible to ceftazidime-avibactam therapy (metallo-beta-lactamases) and thus culture and sensitivity must be used to guide its usage.

Results

Ceftazidime-avibactam-containing therapy is associated with a reduction in mortality (NNT 5–7) and nephrotoxicity (NNT 12)), and improved clinical cure when compared to other appropriate antibiotic regimens in populations with high proportions of Klebsiella pneumoniae CRE infections that produce KPC and OXA-48 carbapenemases.

Cost-effectiveness

At the current price, the incremental cost-effectiveness ratio suggests an additional cost of ZAR 109 786.21 to prevent one death (when compared to a regimen of tigecycline with amikacin), and an additional cost of ZAR 84 613.32 to prevent one death (when compared to a regimen of tigecycline and colistin).

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National Department of Health: Affordable Medicines, EDP-Adult Hospital level. Medicine Review: Ceftazidime-avibactam for the treatment of carbapenem-resistant Enterobacterales (CRE) bacteraemia, July2023 (Updated September 2023). http://www.health.gov.za/. https://accessmedicine.mhmedical.com/content.aspx?bookid=1944&sectionid=143516493

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Ceftazidime-Avibactam for Sepsis in ICU

NEMLC Recommendation

NEMLC recommends the use of ceftazidime-avibactam in selected patients with bacteraemia due to carbapenem resistant organisms. Use must be based on sensitivity of the cultured organism to ceftazidime-avibactam in consultation with a multidisciplinary antibiotic stewardship team (for example microbiologists or infectious disease specialists). Use of ceftazidime-avibactam should be avoided in patients with a very poor prognosis.

Patient Safety and Transfer

Patient Safety

Patient safety issues in critical care include:

- ❖ proper patient identification
- ❖ timely response to critical tests
- ❖ appropriate & safe use of clinical alarms
- ❖ improvement of staff communication
- ❖ appropriate and safe use of medicines
- ❖ infection prevention and control

Patient safety incidents (PSI) to be reported on the South African National Patient Safety Incident Reporting and Learning (NPSIRL) System & acted upon appropriately as per processes of system. (https://www.knowledgehub.org.za/elibrary/national-guideline-patient-safety-incident-reporting-andlearning-health-sector-south)

Patient Safety

Patient Transfer

Considerations for the transfer of critically ill patients include:

- Decision to transfer is made by responsible senior
- Appropriate communication between referring & receiving teams
- Experienced, well-trained transfer teams
- Patient to be stabilized as far as possible with on-going organ support
- Appropriately secured airway for transfer
- Appropriate monitoring with sufficient battery back-up
- Appropriate level of sedation and pain control
- Adequate oxygen for transfer duration
- Adequate volumes of medications & fluids for duration of transfer
- Prevention of pressure damage & wounds & fractures management
- Emergency medications & equipment
- Appropriate & detailed documentation with patient.

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End of Life Care

The **STG advises** palliative and end-of-life care processes when therapy is considered non-beneficial.

A component of a **"Living Will"** as per the HPCSA Ethics booklet (Updated 20 October 2023), was added as this is an ethical requirement that must now be adhered to as part of end-of-life care

END-OF-LIFE CARE

A **Family Meeting Form** is provided as an **appendix** to ensure appropriate documentation of the discussion with patient and family, including signatures for the treating doctor, patient/family member and witness

A section on the **determination of death** has been added to the end-of-life care STG including a table which presents a summary of the clinical assessment process.

Case Study

Considerations for managing a critically ill patient with Sepsis

Case Study

- A 25-year-old female discharged 5 days ago from a district hospital following a caesarean delivery which was performed for a prolonged second stage of labour.
- She now presents back complaining of feeling unwell with abdominal pain for the preceding two days.
- Pulse:120 beats/min (weak & thready), BP:92/55 mmHg, RR:25 breaths/min, SpO_2:92% on room air, GCS:14/15, T^0:38.5^{0}C.
- Abdomen tender over lower aspect with abdominal guarding noted. Operative scar is red & indurated with no obvious areas of fluctuance. No wound or vaginal discharge noted.

Case Study

- Immediately recognized as being critically ill secondary to possible sepsis & resuscitative measures initiated

- Able to maintain & protect own airway on 40% O_2 via a facemask. 2X large bore IV lines sited + 2 litres of a balanced crystalloid solutions over 30mins. ECG, non-invasive BP monitor and pulsoximetry applied.

- The sepsis care bundle was initiated within the first hour.
  - Blood samples taken including blood cultures & ABG
  - Sputum + urine sample sent and CXR ordered.
  - Co-amoxicillin-clavulanate 1.2g IVI
  - ABG: pH 7.20, PCO_2 3.0kPa, PO_2 18.0 kPa, HCO_3- 15mmol/L, BE -8, Lactate 4.0mmol/L, SpO_2 97%.

- Referral set in motion to regional hospital

Case Study

- Patient stabilized for transfer.
- Arrives at regional hospital BP 90/52, HR 122, GCS 13/15, laboured breathing.
- Immediate aggressive resuscitation
  - IV balanced salt solution bolus administered
  - Endotracheal intubation inserted and ventilation assisted
  - Adrenalin infusion commenced at 0.1ug/kg/min
  - Gynaecologist assessment – uterine sepsis
- Patient prepared for theatre & a pre-operative assessment by anaesthetist & ICU bed booked.

Case Study

- General anaesthetic performed. Findings were pus in abdomen and a necrotic uterus Microbial samples taken & abdomen washed out. A hysterectomy was then performed.

- At end of operation, patient remained on adrenalin & was acidaemic needing ongoing resuscitation and monitoring.

- Post-operatively, patient admitted to ICU. Overnight she showed signs of responding to the resuscitation. Acidaemia cleared & shock reversal achieved in 16 hours. Patient liberated from mechanical ventilation.

- Microbiology reported a polymicrobial sample of pus with gram-positive and gram-negative organisms. The co-amoxicillin-clavulanate was continued for 5-days.

- The patient was discharged to the general ward on the 3rd post-operative day.

Key points

- Sepsis is a complex syndrome that may be masked in pregnancy or the post-natal period, therefore early recognition of sepsis is key to improving morbidity and mortality.
- Prompt, initial resuscitation is guided by the 1-hour sepsis care bundle.
- Early empiric broad-spectrum antimicrobials based on suspected pathogens are important.
- A thorough search for the source of sepsis is paramount.
- Close monitoring of the patient with maternal sepsis is vital.
- Timely surgical intervention may be necessary to remove the source of infection.
- Appropriate, safe onward referral is important.
- Microbiological results are key to targeting the causative organism with the appropriate antimicrobial medication.
- A continuum of care is essential to ensure good outcomes.

Sepsis and Critical Care

- Definition and Diagnosis
- Initial Resuscitation
- Source Control
- Haemodynamic Support
- Antimicrobial Therapy
- Adjunctive Therapy
- Infection Prevention & Control

Thank you