Paediatric Sepsis Recognition and Management Acute Care Facilities NT Health Guideline

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The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3):

Sepsis is life-threatening organ dysfunction due to a dysregulated host response to infection.

Septic shock is a subset of sepsis in which underlying circulatory and cellular/metabolic abnormalities are profound enough to substantially increase mortality.

1. Introduction

Sepsis is a time-critical medical emergency that arises when the body has a dysregulated response to an infection. This results in damage to the body's own tissues and organs, which can lead to septic shock and

organ failure. Sepsis can be triggered by infections caused by bacteria, viruses, fungi, and parasites. Bacterial infections are the most common triggers.

Almost half of all global sepsis cases occur in children. The mortality rate for untreated septic shock is more than 80% and with treatment mortality rate is estimated at 15 to 20% in children. In Australia, Aboriginal and Torres Strait Islander children (median age was 1.7 years) are three times more likely to have sepsis that requires intensive care unit (ICU) admission. This reflects the social determinants of health and remoteness of the communities, coupled with transport issues to access medical care, which can result in poor health outcomes.

Early recognition of sepsis is crucial to treating children before their condition worsens and becomes fatal. Literature suggests sepsis improvement tools such as screening and management tools can significantly decrease the time to recognise and manage sepsis, resulting in better survival rates. The common themes of sepsis related deaths in the Northern Territory (NT) includes: patients of a young age, fit build, and delayed or missed sepsis recognition, diagnosis and administration of appropriate antibiotics.

2. Purpose

This guideline is intended to:

- Provide guidance for best practice for sepsis recognition and management.
- Where sepsis is suspected, empower staff to escalate care to clinicians experienced in recognising and managing sepsis.
- Support the provision of education and information to patient and carers.
- Empower staff to engage senior paediatrician in sepsis recognition and management of children.

Recommendations in this guideline are not intended to replace a clinician's good clinical judgement when presented with a patient with unique characteristics, and is not intended to set a standard for clinical care. The guideline should be used in conjunction with the NT Health Observation Chart or age specific observation chart and Paediatric Sepsis Pathway for Acute Care Facilities (Appendix A).

3. Partnering with Consumers

Involve the patient and/or caregiver in all the clinical decision-making and care planning process. This involves discussions during all stages of care from acute management, recovery and on discharge.

When appropriate, discuss goals of care and prognosis and incorporate patient and/or carer wishes into the treatment and end-of-life care planning.

Ensure the patient and/or carer receive information about sepsis and their care in a way they understand. Use Aboriginal Liaison Officers and Interpreters when needed or requested.

Provide consumer resources in written format where available.

4. Sepsis Recognition

Lack of recognition prevents timely therapy. Sepsis screening is associated with earlier treatment.

Early recognition and prompt treatment of sepsis through a formalised screening effort is necessary to reduce mortality risk. Sepsis may not be obvious in every child, it may be non-specific and subtle. Children may exhibit different physiological abnormalities, therefore a diagnosis should be based on clinical judgment and may be supported by relevant investigations. It is important to pay attention to patient risk factors and increase your suspicion of sepsis in these patients.

Parental concern is a demonstrated “RED FLAG”, particularly changes to mental status warrants a prompt clinical assessment.

In the Top End, sepsis can occur due to melioidosis, especially in the wet season. Consider melioidosis in all patients presenting with sepsis or septic shock. Please refer to the TEHS Melioidosis Guideline for diagnosis and management of melioidosis.

4.1 Could it be Sepsis?

Screening for Sepsis should occur in all patients who have signs or symptoms of infection.

Figure 1 outlines the features to assist in recognition of signs and symptoms of infection. If a patient meets these features it does not indicate a definitive sepsis or septic shock diagnosis, but should be considered if a patient has symptoms or signs of an infection, combined with risk factors, abnormal vitals or other signs of compensated shock (new altered mental state, lactate level greater than 2) or markers of a severe infection (petechiae suggestive of meningococcal infections and unexplained severe strong pain to suggest necrotising fasciitis, septic joints, acute abdominal sepsis). The pathway empowers clinicians to escalate to senior medical officer(s) to determine the cause of clinical deterioration on the background of a suspected infection.

Figure 1: Signs and Symptoms of Infection

RECOGNISE

Could it be sepsis?

Consider sepsis in all patients with an acute illness and abnormal vital signs. Presentation can vary between patients and at times may not be obvious.

Are there signs/symptoms that are consistent with an infection?

- ❑ Fever, rigors, tachycardia, reduced alertness
- ❑ Cool peripheries, mottled skin, pallor
- ❑ **Respiratory**: cough, increased respiratory rate or work of breathing, apnoea
- ❑ **Skin**: cellulitis, increased pain and tenderness out of proportion, infected wounds, non-blanching rash
- ❑ **IV/CVC line access**: redness, pain, swelling, discharge
- ❑ **Musculoskeletal**: swollen, painful, tender, warm joints or long bones
- ❑ **Neurological**: neck stiffness, headache, meningism, altered level of cognition or consciousness
- ❑ **Abdomen**: severe pain, tenderness, urinary tract infection, severe vomiting

Younger children may present with the following:

- ❑ Weak cry, grunting, irritable
- ❑ Decreased feeding
- ❑ Acute weight loss (associated with dehydration)

Increase your suspicion of sepsis in these patients:

- ❑ Aboriginal and Torres Strait Islander people
- ❑ High level of parental concern
- ❑ Re-presentation
- ❑ Previous sepsis presentation
- ❑ Worsening of infection despite antibiotics treatment
- ❑ Recent surgery, invasive procedure or burns
- ❑ Immunocompromised or neutropenia
- ❑ Chronic disease or congenital disorder
- ❑ **Risk of bacteraemia**: prosthetic valves, VP shunt, indwelling medical devices
- ❑ Recent trauma including minor trauma

4.2 Signs that may suggest septic shock and rapid deterioration

Warm, flushed skin may be present in the early phases of sepsis. As sepsis progresses to shock, the skin may become cool due to redirection of blood flow to core organs. Additional signs of hypoperfusion include tachycardia, altered consciousness, restlessness, and oliguria or anuria.

Figure 2: Physiological Indicators of Septic Shock and Sepsis

PLUS any of the following criteria:

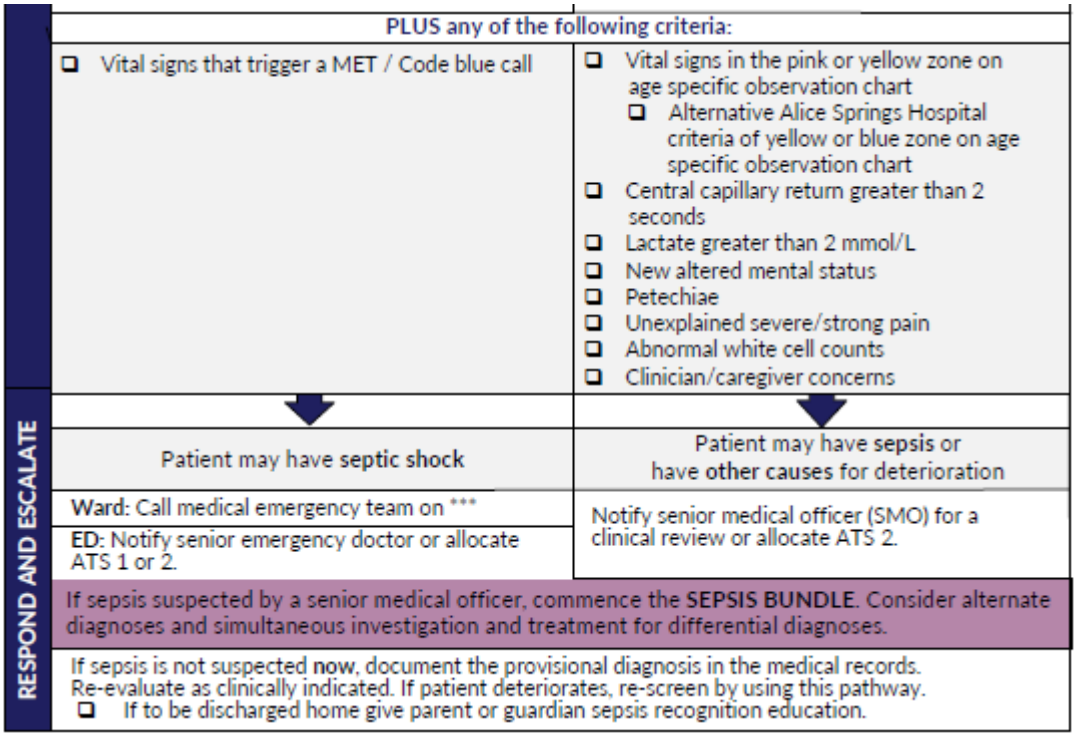
- ❑ Vital signs that trigger a MET / Code blue call

- ❑ Vital signs in the pink or yellow zone on age specific observation chart
  - ❑ Alternative Alice Springs Hospital criteria of yellow or blue zone on age specific observation chart
- ❑ Central capillary return greater than 2 seconds
- ❑ Lactate greater than 2 mmol/L
- ❑ New altered mental status
- ❑ Petechiae
- ❑ Unexplained severe/strong pain
- ❑ Abnormal white cell counts
- ❑ Clinician/caregiver concerns

5. Sepsis Response and Escalation

Early response to suspected sepsis or septic shock through appropriate escalation to a medical emergency team, senior medical officer or paediatrician is crucial to ensure early initiation of appropriate treatment. The following response and escalation process should occur when patients meet the warning signs of deterioration.

Figure 3: Sepsis Response and Escalation



Triage nurses to use clinical judgement to escalate suspected sepsis by assigning appropriate ATS categories. When there are any concerns it is a requirement to call for senior medical advice.

6. Sepsis Management

6.1 Commence Sepsis Resuscitation Bundle

"The culture is one of assuming least injury/illness rather than actively excluding the greatest illness/injury, this is particularly dangerous in a high morbidity cross cultural environment." Dr Didier Palmer, Executive Director RDPH.

Clinical judgement is required to balance the risk of over treatment/investigation. It may be more appropriate to collect targeted cultures and investigations within 2 to 3 hours for those patients with vague presentations and who not meet the screening criteria for septic shock or sepsis.

Initial sepsis management consists of undertaking key actions in the sepsis bundle, including assessment of airway, breathing and circulation as per advanced life support (ALS) principles. This pathway supports the initiation of treatment **as soon as possible** after recognition or strong suspicion and within 60 minutes for both sepsis and septic shock. Evidence suggests that a delay in the first dose of antibiotics beyond 60 minutes of presentation has been associated with increased in-hospital mortality.

6.2 Child below 2 months with Undifferentiated Sepsis

In children below 2 months with sepsis, a lumbar puncture (LP) should be performed to determine whether or not there is meningitis.

If meningitis is suspected based on clinical findings or abnormal CSF, or if an LP cannot be performed, the child should be treated for meningitis. See Figure 4 below.

Figure 4: Empiric Antibiotic Therapy for Child Below 2 Months with Undifferentiated Sepsis

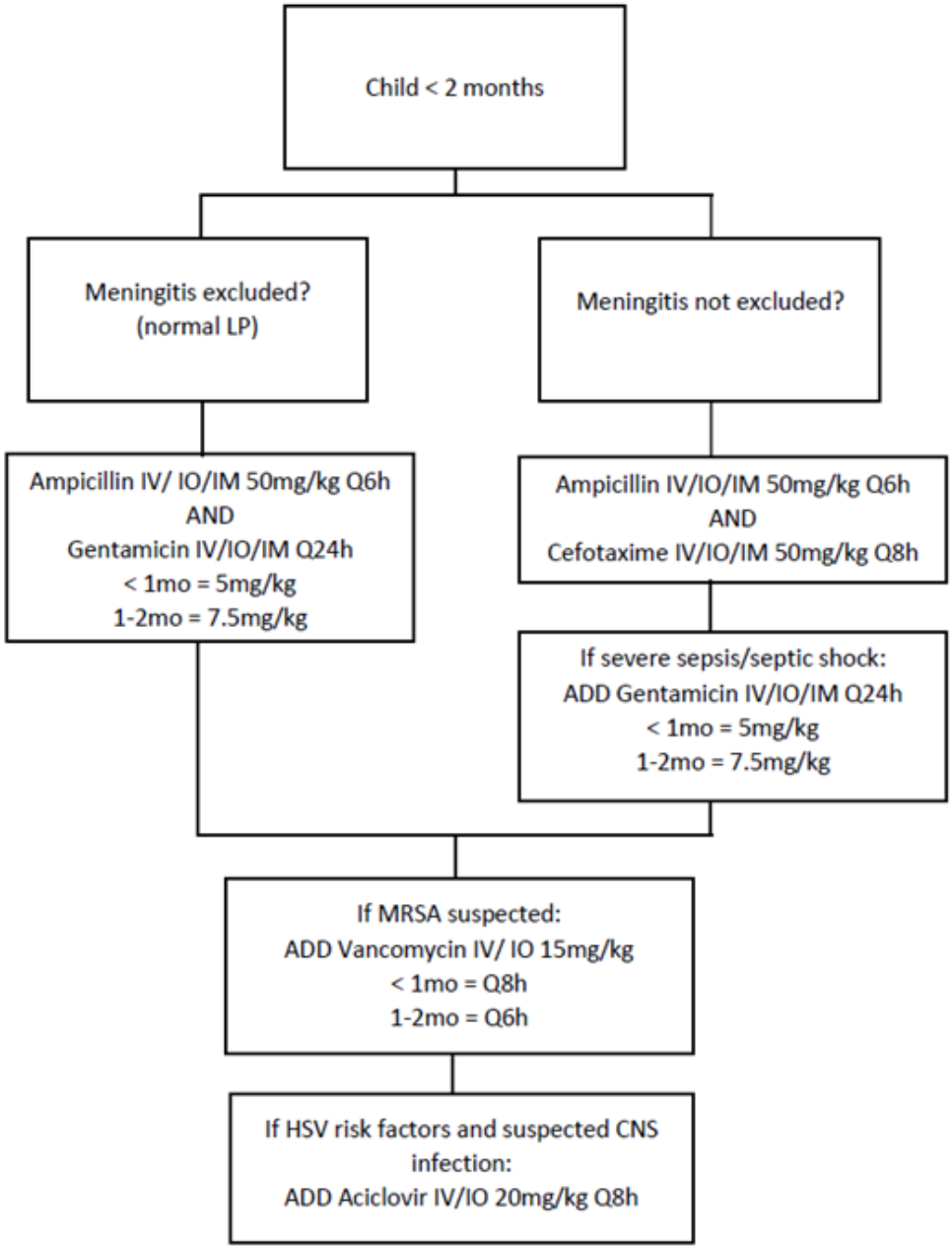


Table 1: Sepsis Resuscitation Bundle

Actions	Details
1. Consider oxygen therapy	• Administer oxygen if appropriate.
2. Establish intravenous (IV) access	• If IV access is unsuccessful after two attempts, consider gaining access via intraosseous (IO). Do not delay antibiotics.

3. Collect blood cultures and lactate.
Other cultures and investigations as clinically indicated.
Aim to collect cultures prior to antibiotics
	• Paediatric and neonate collections to comprise of one paediatric aerobic bottle inoculated with 1–4 mL of blood (4 mL is optimal). If child has a central venous catheter (CVC) collect blood culture from the CVC.
	• Refer to the Blood Culture Collection Procedure for further details.
	• The risk/benefit ratio favours rapid administration of antimicrobials if it is not logistically possible to obtain cultures promptly.
	• Lactate can be obtained from venous blood gas, point of care testing, or in a fluoride EDTA tube. Lactate is a useful marker of the severity of sepsis and sepsis is more likely to be present if lactate is greater than 2 mmol/L.
	• Other investigations can include:
	  ○ Blood tests: blood glucose level, FBC, CRP, LFT, coagulation studies (PT, APTT), UEC.
	  ○ Other cultures as clinically indicated: sputum, urine (and urinalysis) and wound cultures, joint aspirates, melioid rectal and throat swabs.
	  ○ Other cultures/investigations may include lumbar puncture, CXR and other radiology as clinically indicated.

4. Administer intravenous (IV) antibiotics (consider possible source) **(check allergies)**	• Antibiotic regimen is located in appendix A. • If source unknown, use undifferentiated sepsis/septic shock antibiotic regimen. • If source known, use empirical antibiotic regimen. • Nursing staff should be informed of urgent need to administer antibiotics and they should be administered in order of shortest to longest administration time as outlined in the Australian Injectable Drugs Handbook. • If an abscess, septic arthritis or necrotising fasciitis is suspected, consult relevant surgical doctor for advice and/or review. Note necrotising fasciitis is a surgical emergency.
5. Assess fluid status and consider fluid resuscitation	• Consider 10 mL/kg of 0.9% Sodium Chloride or Hartmann's. Reassess and give an additional bolus (10 mL/kg) and repeat as necessary to a maximum total volume of 40 mL/kg. • Refer to Fluid Management (Paediatrics) RDH Guideline and Intravenous (IV) Fluids (Paediatric) CAHS Guideline. • If no response, consider inotropes in consultation with paediatrician +/- intensive care doctor. **If vasopressors required,** consider adrenaline 0.05 microg/kg/min to 0.3 microg/kg/min.
6. Monitor signs of deterioration and urine output	• Patients with sepsis or septic shock should be closely monitored, due to high risk of clinical deterioration. • For the first 2 hours, monitor vital signs every 30 minutes (or more frequently if clinically indicated) and urine output every 60 minutes, until clinically stable from a medical perspective. • If warranted, consider IDC insertion.

7. Re-assess and Monitor

Close monitoring of observations is recommended for patients with suspected or confirmed sepsis due to high risk of clinical deterioration. This is in accordance with the observation chart/MEWS actions in recognising and responding to clinical deterioration.

Medical officers may request targeted vital signs based on the individual context and this should be clearly documented in the medical records in accordance with the observation chart in recognising and responding to clinical deterioration procedure. Figure 5 is a snapshot of the process outlined on the pathway (Appendix A).

Figure 5: Re-assess and Monitor

Re-assess and monitor observations. Aim for the following:

- ❑ Targeted vital signs as per medical consultation
- ❑ Lactate less than 2 mmol/L
- ❑ Blood glucose greater than 3 mmol/L
- ❑ Central capillary return under 2 seconds
- ❑ Urine output greater than 0.5 mL/kg/hour

Escalate for a medical review if patient meets any of the following:

- ❑ Targets are not achieved
- ❑ Vital signs in the coloured zone (follow escalation process)
- ❑ Lactate not trending down
- ❑ Urine output less than 0.5 mL/kg/hour
- ❑ New altered mental state
- ❑ Clinician/patient/caregiver concerns

7.1 Arrange Medical Review of Patients that Deteriorate Despite Initial Treatment to:

- Reassess the source of the infection to determine if surgical input is required (e.g. removal of infected device, drainage of an abscess, washout of an infected joint).
- Reconsider the diagnosis to confirm the cause for deterioration (e.g. Non-septic cause for presentation).Is treatment a cause of deterioration (e.g. Medication reaction, under/over fluid resuscitation)?
- Ensure appropriate antibiotic regimen for the correct source of infection (review if source correct, review cultures and other investigations).
- Discuss with senior medical officer/paediatrician and/or consult with other specialists such asinfectious disease, ICU physicians or surgeons as appropriate.

8. Referral to Higher Level of Care

Patients diagnosed with sepsis or septic shock are at a high risk of deterioriation in the first 24 to 48 hours. Monitor and escalate care early. Appropriate nursing staff ratios and skills to closely monitor an at risk patient is important.

Patients located at a regional hospital: Palmerston Regional Hospital (PRH), Gove District Hospital (GDH), Katherine Hospital (KH) and Tennant Creek Hospital (TCH), should be transferred to the Royal Darwin Hospital (RDH) or Alice Springs Hospital (ASH) after consultation with all relevant stakeholders.

ISOBAR or ISBAR and sepsis pathway should be used to communicate critical information upon handover to ensure the right information is provided to the receiving team to continue to provide care for the patient.

Figure 6: Referral to Higher Level of Care

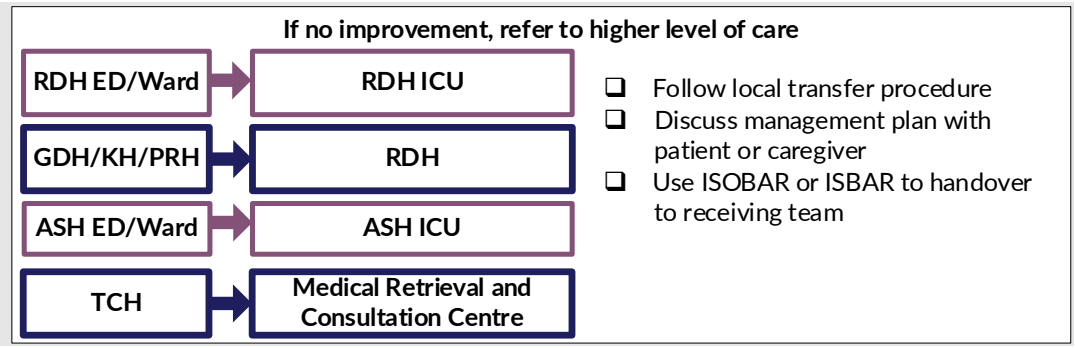
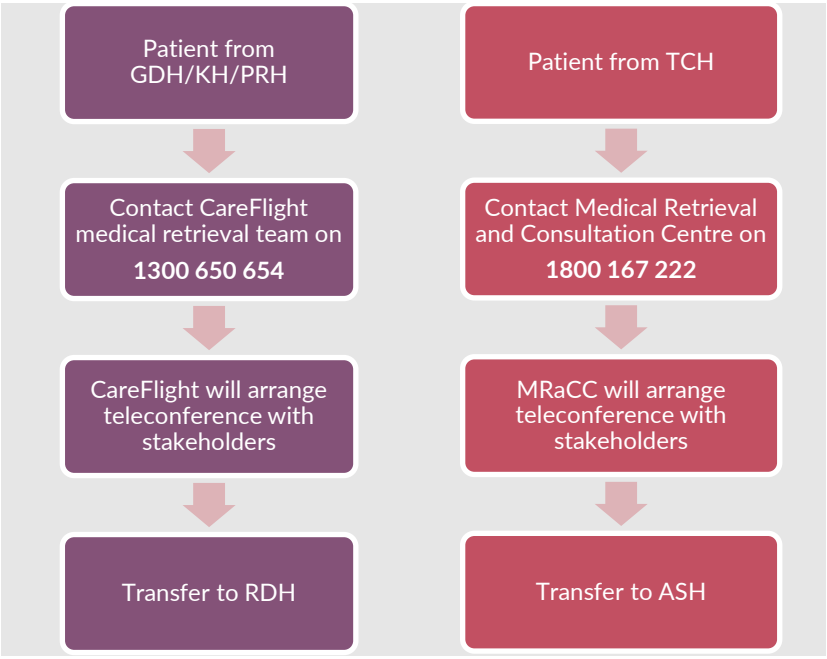


Figure 7: Process of Referral for Regional Hospitals



9. Ongoing Management Plan

The components of ongoing care of patients with sepsis will vary depending on the source of infection as well as the severity of a patient's illness, underlying illnesses and/or immunosuppression.

Document critical information and the sepsis management plan in the patient's medical record to ensure communication of the care plan to clinicians involved in the ongoing care of the patient. Refer to The Clinical Record Documentation NT Hospitals Policy that outlines the requirements for clinical documentation. The management plan should be communicated at handover and to the senior doctor, nurse team leader and the patient and/or caregiver.

In addition to regular documentation, the documented sepsis management plan includes:

- Likely source of infection.
- Any further investigation plans, outstanding results that require review.
- Frequency of observations and monitoring (minimum 4 hourly).
- Fluid balance/weight.
- Medications that are withheld such as anti-hypertensive and/or diuretic medications.

- Antibiotic regimen based on microbiology sensitivities.
- Consultation with relevant specialists e.g. infectious diseases, paediatric or intensive care teams.

10. Care Planning for Discharge from Acute Care

Sepsis can have long-lasting effects including reduced psychological and cognitive functioning. Discuss the cognitive, social and emotional wellbeing effects that may occur after diagnosis and treatment for sepsis, including fatigue and anxiety.

Ensure patients understand the importance of discharge medications, optimisation of chronic disease management, and any need for vaccine scheduling.

Ensure follow-up requirements have been discussed with the patient and carers and this is reflected in the electronic health record/booking system. Discharge documentation provided to patient, carers and usual doctor must include:

- A formal diagnosis of sepsis.
- A referral to the usual primary care provider with a plan for any follow-up requirements.
- Details of the senior clinician or care coordinator where appropriate.
- Contact details for follow up requirements such as Allied Health, Outpatients or Community Clinic etc.

	Method	Responsibility
Implementation	Document will be available for all staff via the PGC. Education supporting this guideline will be available via MyLearning.	PGC Administrators All relevant clinical employees.
Review	Document will be reviewed within a period of 3 months or as changes in practice occur.	Preventing and Controlling Healthcare associated infection Committee, Director Safety and Quality
Evaluation	Compliance with acute paediatric sepsis pathway will be audited as per the required audit scheduled.	Preventing and Controlling Healthcare associated infection Committee, Director Safety and Quality
Compliance	Adverse events will be recorded in the patient's notes and in Riskman	All staff

Key Associated Documents	
Key Legislation, By-Laws, Standards, Delegations, Aligned & Supporting Documents	Australian Commission on Safety and Quality in Health Care (2021). National Safety and Quality Health Service Standards. Retrieved from The NSQHS Standards | Australian Commission on Safety and Quality in Health Care Australian Commission on Safety and Quality in Health Care (2020). Antimicrobial stewardship: Clinical care standard. Retrieved from https://www.safetyandquality.gov.au/sites/default/files/2020-11/saq10001_ccs_antimicrobial_v4_film_web.pdf NSW Government: Clinical Excellence Commission (2019). Northern Territory Sepsis Management Review July 2019.
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Key Associated Documents	
	4. Palasanthiran P, Bowen A. The excess burden of severe sepsis in Indigenous Australian children: can anything be done? The Medical Journal of Australia; 2012 [cited on 2021 February 23] ; 206 (2): 71-72. Available from: https://www.mja.com.au/journal/2017/206/2/excess-burden-severe-sepsis-indigenous-australian-children-can-anything-be-done 5. NSW Clinical Excellence Commission. Northern Territory Sepsis Management Review July 2017. New South Wales. Clinical Excellence Commission; 2019 [cited on 2021 February 21]. 6. Rhodes A et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock. Critical Care Medicine Journal; 2016 [cited 2021 February 1]. Available from: https://journals.lww.com/ccmjournal/Fulltext/2017/03000/Surviving_Sepsis_Campaign___International.15.aspx 7. Singer M, Deutschman C, Seymour C. *The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3).* Journal of American Medical Association. 2016 [cited on 2021 February 18]; 315(8): 801-810. Available from: https://jamanetwork.com/journals/jama/fullarticle/2492881 8. Gatewood M, Wemple M, Greco S, Kritek P, Durvasula R .A quality improvement project to improve early sepsis care in the emergency department. British Medical Journal; Quality & Safety; 2015 [cited on February 1]; 24 (12), 787–795. Available from: https://pubmed.ncbi.nlm.nih.gov/26251506/ 9. Hayden G, Tuuri R, Scott R, Losek J, Blackshaw A, Schoenling A, Nietert P, Hall, G. Triage sepsis alert and sepsis protocol lower times to fluids and antibiotics in the. American Journal of Emergency Medicine; 2016 [cited on 2021 February 1]; 34(1), 1–9. Available from: https://pubmed.ncbi.nlm.nih.gov/26386734/ 10. Burrell A, McLaws ML, Fullick M, Sulivan R, Sindhusake D. Sepsis Kills: Early intervention saves lives. Clinical Excellence Commission NSW. Medical Journal of Australia; 2016 [cited 2021 February 1]. Available from: https://www.mja.com.au/journal/2016/204/2/sepsis-kills-early-intervention-saves-lives 11. Ferrer R, Martin-Loeches I, Phillips G, Osborn T, Townsend S, Dellinger P, Artigas A, Schorr C, Levy M. Empiric Antibiotic Treatment Reduces Mortality in Severe Sepsis and Septic Shock From theFirst Hour: Results From a Guideline-Based Performance Improvement Program. Critical Care Medicine Journal; 2013 [cited on 2021 February 1]. Available from: https://pubmed.ncbi.nlm.nih.gov/24717459/ 12. Australian Commission for National Safety and Quality in Health Service Standards. Antimicrobial Stewardship Clinical Care Standard. Australian Commission; 2020 [cited on 2021 February 1]. 13. Singer M, Deutschman C, Seymour C. *The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3).* Journal of American Medical Association. 2016 [cited on 2021 February 18]; 315(8): 801-810. Available from: https://jamanetwork.com/journals/jama/fullarticle/2492881 14. NSW Clinical Excellence Comssion.Northern Territory Sepsis Management Review July 2019. NSW Clinical Excellence Commission; 2019.

Key Associated Documents	
	15. Australian Sepsis Network. Sepsis Epidemiology. 2020 [cited 2021 February 1]. Available from: https://www.australiansepsisnetwork.net.au/healthcare-providers/sepsis-epidemiology

Definitions, Acronyms and Alternative Search Terms	
Term	**Description**
Search Terms	sepsis, paediatric sepsis, deterioration, septic

National Safety and Quality Health Service Standards							
Clinical Governance	Partnering with Consumers	Preventing and Controlling Healthcare Associated Infection	Medication Safety	Comprehensive Care	Communicating for Safety	Blood Management	Recognising & Responding to Acute Deterioration
☒	☒	☒	☒	☐	☒	☐	☒

Appendix A

To access a print friendly, version follow this link: [Acute Care Paediatric Sepsis Pathway]

NORTHERN TERRITORY GOVERNMENT DEPARTMENT OF HEALTH

ACUTE CARE PAEDIATRIC SEPSIS PATHWAY

Principal name:
Other name(s):
D.O.B.:
HRN:
Sex:

Patient Label

Address must be documented if patient details hand written

Sepsis is a time-critical MEDICAL EMERGENCY.

Clinical pathways never replace clinical judgment. Use this pathway for patients aged 0-17 years with suspected community acquired sepsis. Use in conjunction with NT Paediatric Sepsis Guideline and NT Observation Chart. Refer to local neonatal guidelines for management of early onset neonatal sepsis and hospital acquired neonatal sepsis.

RECOGNISE

Sepsis screening on DD / MM / YY at HH : MM Name: Clinician

Could it be sepsis?

Consider sepsis in all patients with an acute illness and abnormal vital signs. Presentation can vary between patients and at times may not be obvious.

Are there signs/symptoms that are consistent with an infection?

- ❑ Fever, rigors, tachycardia, reduced alertness
- ❑ Cool peripheries, mottled skin, pallor
- ❑ **Respiratory**: cough, increased respiratory rate or work of breathing, apnoea
- ❑ **Skin**: cellulitis, increased pain and tenderness out of proportion, infected wounds, non-blanching rash
- ❑ **IV/CVC line access**: redness, pain, swelling, discharge
- ❑ **Musculoskeletal**: swollen, painful, tender, warm joints or long bones
- ❑ **Neurological**: neck stiffness, headache, meningism, altered level of cognition or consciousness
- ❑ **Abdomen**: severe pain, tenderness, urinary tract infection, severe vomiting

Younger children may present with the following:

- ❑ Weak cry, grunting, irritable
- ❑ Decreased feeding
- ❑ Acute weight loss (associated with dehydration)

Increase your suspicion of sepsis in these patients:

- ❑ Aboriginal and Torres Strait Islander people
- ❑ High level of parental concern
- ❑ Re-presentation
- ❑ Previous sepsis presentation
- ❑ Worsening of infection despite antibiotics treatment
- ❑ Recent surgery, invasive procedure or burns
- ❑ Immunocompromised or neutropenia
- ❑ Chronic disease or congenital disorder
- ❑ **Risk of bacteraemia**: prosthetic valves, VP shunt, indwelling medical devices
- ❑ Recent trauma including minor trauma

PLUS any of the following criteria:

- ❑ Vital signs that trigger a MET / Code blue call
- ❑ Vital signs in the pink or yellow zone on age specific observation chart
  - ❑ Alternative Alice Springs Hospital criteria of yellow or blue zone on age specific observation chart
- ❑ Central capillary return greater than 2 seconds
- ❑ Lactate greater than 2 mmol/L
- ❑ New altered mental status
- ❑ Petechiae
- ❑ Unexplained severe/strong pain
- ❑ Abnormal white cell counts
- ❑ Clinician/caregiver concerns

RESPOND AND ESCALATE

Patient may have **septic shock**	Patient may have **sepsis** or have **other causes** for deterioration
Ward: Call medical emergency team on ***	Notify senior medical officer (SMO) for a clinical review or allocate ATS 2.
ED: Notify senior emergency doctor or allocate ATS 1 or 2.	

If sepsis suspected by a senior medical officer, commence the **SEPSIS BUNDLE**. Consider alternate diagnoses and simultaneous investigation and treatment for differential diagnoses.

If sepsis is not suspected **now**, document the provisional diagnosis in the medical records. Re-evaluate as clinically indicated. If patient deteriorates, re-screen by using this pathway.

- ❑ If to be discharged home give parent or guardian sepsis recognition education.

BINDING MARGIN - NO WRITING

NORTHERN TERRITORY GOVERNMENT DEPARTMENT OF HEALTH

ACUTE CARE PAEDIATRIC SEPSIS PATHWAY

Principal name:
Other name(s):
D.O.B.:
HRN:
Sex:

Patient Label

RESUSCITATE

SEPSIS BUNDLE: 6 KEY ACTIONS IN 60 MINUTES*

*If patient at risk of febrile neutropenia with septic shock, administer antibiotics within 30 minutes.

Ensure management plan aligns with patient's goals of care. If there are any clinically indicated variations in care to the pathway, document this in the patient record.

1. Consider oxygen therapy	❑
2. Establish intravenous (IV) access If unsuccessful, obtain access with intraosseous (IO) or central venous catheter.	❑
3. Collect blood cultures prior to antibiotics (where possible) FBC, UEC, LFTs, CRP, blood glucose, blood gas (with lactate) and coagulation studies. Other investigations as indicated: CXR, urinalysis, urine culture, sputum culture, joint aspirates, wound and melioidosis swabs.	Blood cultures ❑ First Lactate ❑
4. Administer IV antibiotics (check allergies) If source unknown, use undifferentiated sepsis/septic shock antibiotic regimen (page 3). Use correct regimen for age and sepsis severity. If source known, use empirical antibiotic regimen (page 3 to 4). Ensure nursing staff administer antibiotics immediately. If surgical source suspected, consult the relevant surgical team.	❑
5. Assess fluid state and consider fluid resuscitation Consider 10mL/kg of 0.9% sodium chloride or Hartmann's. Reassess and give additional 10mL/kg bolus up to a maximum of 40mL/kg as clinically indicated. Consider inotropes early in consultation with paediatrician +/- intensive care physician.	❑
6. Monitor signs of deterioration and urine output For the first 2 hours, monitor vital signs every 30 minutes and urine output every 60 minutes. If warranted, insert IDC.	❑

REASSESS AND MONITOR

Re-assess and monitor observations. Aim for the following:

- ❑ Targeted vital signs as per medical consultation
- ❑ Lactate less than 2 mmol/L
- ❑ Blood glucose greater than 3 mmol/L
- ❑ Central capillary return under 2 seconds
- ❑ Urine output greater than 0.5 mL/kg/hour

Escalate for a medical review if patient meets any of the following:

- ❑ Targets are not achieved
- ❑ Vital signs in the coloured zone (follow escalation process)
- ❑ Lactate not trending down
- ❑ Urine output less than 0.5 mL/kg/hour
- ❑ New altered mental state
- ❑ Clinician/patient/caregiver concerns

If patient deteriorates or fails to improve, reassess and refer to higher level of care

- ❑ Follow local transfer procedure
- ❑ Discuss management plan with patient and/or caregiver (ensure sepsis is explained)
- ❑ Use ISOBAR/ISBAR to handover to receiving team
- ❑ Reconsider diagnosis
- ❑ Reconsider treatment
- ❑ Consider treatment as a cause of deterioration

REVIEW

The 24 hour management plan to be documented in the patient record and include:

- ❑ Likely source of infection
- ❑ Frequency of observations and monitoring
- ❑ Fluid balance
- ❑ Medication review
  - review of antibiotics against microbiology sensitivities
- ❑ Consultation with relevant specialists e.g. infectious diseases, paediatric or intensive care teams

BINDING MARGIN - NO WRITING

NORTHERN TERRITORY GOVERNMENT DEPARTMENT OF HEALTH

ACUTE CARE PAEDIATRIC SEPSIS PATHWAY

Principal name:
Other name(s):
D.O.B.:
HRN:
Sex:

Patient Label

NT Empirical Antibiotic Guide for Severe Infections

- Review antibiotics daily and de-escalate where appropriate (within 48 to 72 hours).
- Call infectious disease (ID) physician for advice and approval for restricted antibiotics as required.
- Refer to Vancomycin – Children Aged <12 NT Hospitals Guideline OR Vancomycin >12 years NT Hospital Guideline for additional information on vancomycin dosing.
- *Gentamicin maximum dose for children aged less than 10 years is 320mg. Gentamicin maximum dose for children aged 10 years and over is 560mg.
- Administer antibiotics from shortest to longest infusion times (antibiotics are listed in the order of administration).
- When administering Meropenem in patients with immediate severe or delayed penicillin hypersensitivity, administer cautiously in a critical care area and monitor for reaction.
- Consider Vancomycin 25mg/kg IV loading dose if patient requires intensive care unit (ICU) admission.
- Consider urgent surgical consult if condition may require surgical intervention.

	Preferred therapy	Immediate non-severe or delayed non-severe penicillin hypersensitivity	Immediate severe (anaphylaxis) or delayed severe penicillin hypersensitivity (SJS, TEN, DRESS, interstitial nephritis)
UNDIFFERENTIATED SEPSIS			
UNDIFFERENTIATED SEPTIC SHOCK Requiring ICU	**Central Australia (year round) and Top End Dry Season**		
	Piperacillin/tazobactam 100mg/kg IV (maximum 4g) 6 hrly **AND** Vancomycin 25mg/kg IV loading dose **AND THEN CHART REGULAR** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly	Meropenem 25mg/kg IV (maximum 1g) 8 hrly **AND** Vancomycin 25mg/kg IV loading dose **AND THEN CHART REGULAR** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly	
	CONSIDER Clindamycin 15mg/kg IV (maximum 600mg) 8 hrly if toxin mediated streptococcal or staphylococcal infection is suspected.		
	Top End Wet Season		
	Meropenem 25mg/kg IV (maximum 1g) 8 hrly **AND** Vancomycin 25mg/kg IV loading dose **AND THEN CHART REGULAR** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly		
	CONSIDER Clindamycin 15mg/kg IV (maximum 600mg) 8 hrly if toxin mediated streptococcal or staphylococcal infection is suspected.		
UNDIFFERENTIATED SEPTIC SHOCK Not requiring ICU	Ceftriaxone 100mg/kg IV (maximum 4g) 24 hrly **AND** Gentamicin 7.5mg/kg IV (maximum 560mg*) 24 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly		Meropenem 25mg/kg IV (maximum 1g) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly
UNDIFFERENTIATED SEPSIS Not requiring ICU (over 2 months)	Ceftriaxone 100mg/kg IV (maximum 4g) 24 hrly *If S. aureus suspected,* **ADD** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly		Ciprofloxacin 10mg/kg IV (maximum 400mg) 8 hrly *If S. aureus suspected,* **ADD** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly
(under 2 months) Meningitis excluded following LP	Ampicillin 50mg/kg IV 6 hrly **AND** Gentamicin IV 24 hrly (less than 1month=5mg/kg, 1 to 2 months =7.5mg/kg*) *If S. aureus suspected:* **ADD** Vancomycin 15mg/kg IV (less than 1month = 8 hrly, 1 to 2 months = 6 hrly)		Ciprofloxacin 10mg/kg IV (maximum 400mg) 8 hrly *If S. aureus suspected,* **ADD** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly
FEBRILE NEUTROPENIA	Piperacillin/tazobactam 100mg/kg IV (maximum 4g) 6 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly	Meropenem 25mg/kg IV (maximum 1g) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly	
CARDIAC			
ENDOCARDITIS	Ceftriaxone 100mg/kg IV (maximum 4g) 24 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly		Ciprofloxacin 10mg/kg IV (maximum 400mg) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly
CENTRAL NERVOUS SYSTEM			
MENINGITIS (over 2 months)	Ceftriaxone 100mg/kg IV (maximum 4g) 24 hrly		Ciprofloxacin 10mg/kg IV (maximum 400mg) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly
	CONSIDER dexamethasone 0.15mg/kg IV (maximum 10mg). Start before or with first dose of antibiotics, then 6 hrly for 4 days. **CONSIDER** Aciclovir IV 20mg/kg 8 hrly, if Herpes Simplex Virus suspected.		
(under 2 months)	Ampicillin 50mg/kg IV 6 hrly **AND** Cefotaxime 50mg/kg IV 6 hrly (8 hrly in first week of life) **AND** Gentamicin IV 24 hrly (under 1 month = 5mg/kg, 1 to 2months = 7.5mg/kg*) If HSV risk factors: **ADD** Aciclovir IV 20mg/kg 8 hrly		Ciprofloxacin 10mg/kg IV (maximum 400mg) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly
CSF SHUNT INFECTION	Ceftazidime 50mg/kg IV (maximum 2g) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly		Ciprofloxacin 10mg/kg IV (maximum 400mg) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly
URINARY TRACT			
PYELONEPHRITIS/ COMPLICATED UTI	Ampicillin 50mg/kg IV (maximum 2g) 6 hrly **AND** Gentamicin 7.5mg/kg IV (maximum 560mg*) 24 hrly	Gentamicin 7.5mg/kg IV (maximum 560mg*) 24 hrly	

NORTHERN TERRITORY GOVERNMENT DEPARTMENT OF HEALTH

ACUTE CARE PAEDIATRIC SEPSIS PATHWAY

Principal name:
Other name(s):
D.O.B.:
HRN:
Sex:

Patient Label

	Preferred therapy	Immediate non-severe or delayed non-severe penicillin hypersensitivity	Immediate severe (anaphylaxis) or delayed severe penicillin hypersensitivity (SJS, TEN, DRESS, interstitial nephritis)
RESPIRATORY			
SEVERE CAP Requiring ICU	**Central Australia (year round) and Top End Dry Season**		
	Piperacillin + tazobactam 100mg/kg IV (maximum 4g) 6 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly **AND** Azithromycin 10mg/kg IV (maximum 500mg) 24 hrly	Meropenem 25mg/kg IV (maximum 1g) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly **AND** Azithromycin 10mg/kg IV (maximum 500mg) 24 hrly	
	Top End Wet Season		
	Meropenem 25mg/kg IV (maximum 1g) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly **AND** Azithromycin 10mg/kg IV (maximum 500mg) 24 hrly		
SEVERE CAP Not requiring ICU	Ceftriaxone 50mg/kg IV (maximum 4g) 24 hrly *If S. aureus suspected,* **ADD** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly		Ciprofloxacin 10mg/kg IV (maximum 400mg) 12hrly *If S. aureus suspected* **ADD** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly
	CONSIDER Azithromycin 10mg/kg IV (maximum 500mg) 24 hrly		
MODERATE CAP	Benzylpenicillin 50mg/kg IV (maximum 2.4g) 6 hrly	Ceftriaxone 50mg/kg IV (maximum 4g) 24hrly	Azithromycin 10mg/kg IV (maximum 500mg) 24 hrly
EMPYEMA	Ceftriaxone 50mg/kg IV (maximum 4g) 24 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly		Ciprofloxacin 10mg/kg IV (maximum 400mg) 12hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly
HEAD AND NECK			
BACTERIAL TRACHEITIS/ EPIGLOTTITIS	Piperacillin/tazobactam 100mg/kg IV (maximum 4g) 6 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly	Ceftazidime 50mg/kg IV (maximum 2g) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly	Ciprofloxacin 10mg/kg IV (maximum 400mg) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly
MASTOIDITIS			
RETROPHARYNGEAL ABSCESS	Amoxicillin-clavulanate 25mg/kg (maximum 2g) IV 6 hrly	Cefazolin 50mg/kg IV (maximum 2g) 8 hrly **AND** Metronidazole 12.5mg/kg IV (maximum 500mg) 12 hrly	Clindamycin 15mg/kg IV (maximum 600mg) 8 hrly
GASTROINTESTINAL			
COMPLICATED APPENDICITIS OR PERITONITIS	Ampicillin 50mg/kg IV (maximum 2g) 6 hrly **AND** Gentamicin 7.5mg/kg IV (maximum 560mg*) 24 hrly **AND** Metronidazole 12.5mg/kg IV (maximum 500mg) 12 hrly	Ceftriaxone 50mg/kg IV (maximum 4g) 24 hrly **AND** Metronidazole 12.5mg/kg IV (maximum 500mg) 12 hrly	Gentamicin 7.5mg/kg IV (maximum 560mg*) 24 hrly **AND** Clindamycin 15mg/kg IV (maximum 600mg) 8 hrly
CHOLANGITIS			Gentamicin 7.5mg/kg IV (maximum 560mg*) 24 hrly **AND** Metronidazole 12.5mg/kg IV (maximum 500mg) 12 hrly
BONE, JOINT, SOFT TISSUE, SKIN			
SEVERE CELLULITIS	Cefazolin 50mg/kg IV (maximum 2g) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly		Ciprofloxacin 10mg/kg IV (maximum 400mg) 12 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly
SEVERE WATER EXPOSURE CELLULITIS	Ciprofloxacin 10mg/kg IV (maximum 400mg) 12 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly		
	ADD Clindamycin 15mg/kg (maximum 600mg) IV 8 hrly, if crocodile or shark bite.		
ORBITAL CELLULITIS/SEVERE PERIORBITAL CELLULITIS	Ceftriaxone 50mg/kg IV (maximum 4g) 24 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly		Ciprofloxacin 10mg/kg IV (maximum 400mg) 12 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly
OSTEOMYELITIS/ SEPTIC ARTHRITIS	Cefazolin 50mg/kg IV (maximum 2g) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly		Ciprofloxacin 10mg/kg IV (maximum 400mg) 12 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly
SUSPECTED NECROTISING FASCIITIS	Piperacillin/tazobactam 100mg/kg IV (maximum 4g) 6 hrly **AND** Clindamycin 15mg/kg IV (maximum 600mg) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly	Meropenem 25mg/kg IV (maximum 1g) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly	
WOUND/TRAUMA			
SEVERE BITES (HUMAN, CAT, DOG)	Amoxicillin-clavulanate 25mg/kg IV (maximum 2g) 8 hrly **AND** Vancomycin 15mg/kg IV (maximum 750mg) 6 hrly	Clindamycin 15mg/kg IV (maximum 600mg) 8 hrly **AND** Ciprofloxacin 10mg/kg IV (maximum 400mg) 12 hrly	