Management Sepsis in DCCM

1. Purpose of the Document

DCCM acknowledges the work of groups such as the Surviving Sepsis Campaign – http://www.survivingsepsis.org – and its recommended bundles of care. Many of our principles are aligned with those of the Surviving Sepsis Campaign. However, we do not embrace their suite of recommendations in their entirety and this document describes the DCCM approach to sepsis and a guide to escalation in therapies.

2. Responsibility

All medical and nursing staff providing care and treatment for patients admitted to the DCCM with sepsis.

3. Document Principles and Goals

To aid in the early recognition and management of sepsis and septic shock. To optimize the key principles of appropriate cultures, early antibiotics and source control. To guide the user through step-wise supportive treatments for those with septic shock based on the best available evidence as applied to the practice of DCCM diagnostic criteria

Defining Sepsis

Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection.

Organ dysfunction is assessed as an increase in the Sequential Organ Failure Assessment (SOFA) score of 2 points or more, which is associated with in-hospital mortality greater than 10%.

Septic shock is a group with more profound illness, defined as a vasopressor requirement to maintain a mean arterial pressure of 65 mm Hg or greater and serum lactate level greater than 2 mmol/L in the absence of hypovolemia. This combination is associated with hospital mortality rates greater than 40%.

In DCCM we see patients who are admitted with septic shock as the primary cause of their admission as well as patients who develop sepsis or septic shock alongside another primary problem (e.g. a post-operative complication, pneumonia etc)
The goals of this document are to provide the DCCM team members with information to manage patients admitted with sepsis and septic shock.

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4. Inclusion Criteria

All patients admitted to the DCCM with septic shock.

5. Exclusion Criteria

Patients may not receive this treatment if:

- The duty intensivist sets ceilings of treatment or determines a clinical or other indication for deviation from this document.

6.Process of treatment

Initial Management

Initial Steps may happen outside of the DCCM and many of these steps may happen together.

As with all critically unwell patients attention must be paid to the airway and breathing. Supplemental oxygen should be applied only if required to maintain saturations >92%. The patient should be intubated and ventilated if required, the settings for the ventilator in patients with sepsis-induced ARDS
should have a target tidal volume of 6 mL/kg predicted body weight and should be managed in keeping with the DCCM ARDS Standard Operating Procedure.

Important in the early management of this group of patients is to find and treat the source of infection.

All patients should have appropriate cultures sent to microbiology. This includes at least 2 sets of blood cultures (both aerobic and anaerobic bottles) are obtained before starting antimicrobial therapy. Blood should be drawn percutaneously rather than via existing lines unless drawn at the time of line placement while observing CLABSI precautions. Blood drawn in this manner should be labelled as peripheral blood on the laboratory form. Other samples should be sent as appropriate including urine, sputum/tracheal aspirate, and CSF.

Source Control should be considered for all patients.

In general devitalised infected tissue is best debrided, pus collections are best drained, and infected devices such as central venous lines are best removed, rather than relying on antimicrobial therapy. This

may require imaging or surgical exploration to delineate the anatomical site of infection.

Monitoring for all patients

Monitoring includes heart rate/ECG, blood pressure, arterial oxygen saturation, and respiratory rate. Signs of end organ dysfunction such as reduced urine output, CNS depression and elevated lactate are associated with severe illness.

The circulation in sepsis: Target a MAP 70-90mmHg (80-100mgHg in patients with longstanding hypertension and acute kidney injury).This target is achieved through the judicious use of fluids and vasoactive agents.

The circulatory state in sepsis typically includes relative hypovolaemia due to capillary leak, and peripheral vasodilation with compensatory tachycardia. This may be associated with hypotension. With progression myocardial depression may occur secondary to circulating inflammatory mediators or due to the unmasking of underlying cardiac disorders such as ischaemic heart disease.

Fluid Therapy

The resuscitation fluid of choice is Plasmalyte. This is given as challenges of 500-1000mL and titrated to clinical response. Patients are likely to require 2-3 litres in the first 3-4 hours.

There is published data suggesting a trend towards better outcome using albumin containing fluids in septic shock. These may be considered as a second line therapy after initial crystalloid infusions.

There is a sound theoretical basis for avoiding excess volume loading in the setting of sepsis induced capillary leak, which promotes end-organ oedema causing organ dysfunction. There is limited evidence suggesting that early initiation of noradrenaline is better than prolonged efforts with fluid resuscitation.

Red blood cells are infused when the haemoglobin is less than 70g/L.

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Vasopressors and inotropes for septic shock

Vasopressors should be begun initially to target a mean arterial pressure of 70-90mmHg (or 80-100 if longstanding hypertension and AKI). They are infused by central venous lines. Occasionally peripheral metaraminol is used to temporise prior to line insertion.

Noradrenaline is the first-line vasopressor and is charted as "Noradrenaline for MAP IV".

Vasopressin at a fixed dose may be used in addition to noradrenaline when the noradrenaline dose is greater than 4mg/h. It is charted as "Vasopressin 2units/h IV". It recommended that the vasopressin dose is not increased outside of dire circumstances of refractory shock.

Adrenaline may also be considered as a second line agent. It should be charted as a fixed dose, with noradrenaline infusion titrated against the mean arterial pressure. The typical starting dose is in the range of 0.5 to 1.5mg/h.

The addition of dopamine may be considered for patients with absolute or relative bradycardia. It should be charted as a fixed dose, with noradrenaline infusion titrated against the mean arterial pressure. The typical starting dose is in the range of 10 to 20mg/h.

When patients with permanent pacemakers have relative bradycardia and septic shock, a pacemaker technician will be called and the pacemaker rate increased to 90/minute.

Dobutamine should be considered for patients with septic shock and evidence of low cardiac output with high filling pressures. It should be charted as a fixed dose, with noradrenaline infusion titrated against the mean arterial pressure. The typical starting dose is in the range of 10 to 20mg/h.

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Corticosteroids

Among the patients with septic shock undergoing mechanical ventilation intravenous hydrocortisone has not clearly been shown to reduce mortality. But it has been associated with a more rapid resolution of shock.

Ventilated patients with refractory septic shock, who are receiving high dose pressor infusion (eg>3mg/h noradrenaline) after adequate resuscitation, will be charted hydrocortisone 50mg Q6H.

VTE Prophylaxis

In the absence of contraindication pharmacologic prophylaxis with enoxaparin (or heparin) should occur. Otherwise mechanical prophylaxis (calf compression device) should be used.

Prescribing antimicrobials

IV antimicrobials should be initiated as soon as possible after recognition of sepsis and within the first hour Antimicrobial prescribing adheres to the principals of good antibiotic stewardship and deviation from the ADHB guidelines should only occur in consultation with the infectious diseases service. Empiric antimicrobial therapy is narrowed as soon as culture and sensitivity information is available.

DCCM medical staff will chart the antimicrobial generic name, dose and frequency and duration/review date. The indication will be documented in the clinical notes.

Inflammatory states and fever can occur in the absence of infection – e.g. pancreatitis, trauma – and antimicrobial therapy should be avoided or curtailed as soon as clinical information such as negative cultures allows.

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When prescribing antibiotics for sepsis we should also remember to prescribe any other important drugs of benefit in key groups of patients: e.g. dexamethasone in meningitis that is possibly pneumococcal in origin.

MAP (mmHg)	[1]70-90 or 80-100 if longstanding hypertension And AKI
Oxygen	Saturations 92-96%
CO2 KPa)	[2]4.6-6.0
Temp (degrees Celcius)	36-39
Patient position	4 flat, 4 head up, 2 left, 2 right
Enteral Nutrition	As per DCCM protocol, jejunal tube if fails gastric feeding
DVT Prophylaxis	Enoxaparin (or heparin) unless contraindicated then mechanical
[1] "*Noradrenaline for MAP*" is charted on treatment sheet.	
[2] See ARDS SOP if patient has ARDS and permissive hypercarbia may be appropriate	

Non-neutropenic community acquired sepsis	Cefuroxime 750mg IV q6h +*gentamicin 5 mg/kg IVq24h	Review at 48 hours, then 5 days for culture negative sepsis
Neutropenic Sepsis Haematology Neutropenic Sepsis Oncology	Piperacillin-tazobactam 4.5 g IV q6h ± *gentamicin 5 mg/kg IV q24 hr Cefuroxime 1.5g IV q8h ± * gentamicin 5 mg/kg IV q24h	72 h to max 14 days 72 h to max 14 days
Community Acquired Pneumonia	Amoxicillin +clavulanic acid 1.2 g IV q8h +clarithromycin 500 mg IV q12h M. pneumonia or Chlamydophila spp. Clarithromycin alone. Legionella spp. Ciprofloxacin 400 mg. IV q8h	5 days
Aspiration pneumonitis	Antibiotics not indicated	

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Hospital Acquired Pneumonia	Low risk amoxicillin + clavulanic acid 1.2 g IV q8h. High risk piperacillin-tazobactam 4.5 g. IV q8h	7 days 7 days
Influenza pneumonitis	Oseltamivir ID 75 mg po/NGT 12 hourly	5 days
Epiglottitis	Amoxicillin-clavulanate 1.2g IV q8h	5 days
Meningitis	Dexamethasone* 10 mg IV q6h for 4 days +ceftriaxone 2 g IV a 12 hr +vancomycin as per Vanculator ± benzylpenicillin 1.2 g IV q4h (if>50y o or pregnant or immunosuppressed) N.meningitidis benpencillin 2.4g IV q4h for 3 days. H.influenzae amoxicillin 2 g. IV q4h for 7 days S.pneumoniae benzylpenicillin 2.4g IVq4h for 10 days Listeria benpen/amox/cotrim for 14 days	
Encephalitis	Dexamethasone* 10mg IV q6h for 4 days +ceftriaxone 2g. IVq12h +vancomycin as per Vanculator +benzylpenicillin 1.2g IV q4h +acyclovir 10mg/kg IV q8h	14 – 21 days
Brain Abscess	Unknown source/mastoiditis: Amoxicillin 2gIV q4h +metronidazole 500 mg IV q12h Secondary to trauma/neurosurg: Amoxicillin 2g IV q4h +metronidazole 500mg IVq12h +flucloxacillin 2g IVq4h P.acnes benzylpenicillin S.aureus flucloxacillin S.milleri group benzylpenicillin Anaerobes metronidazole	28 days
Endocarditis	Benzylpenicillin 1.2g IV q4h +*gentamicin 3 mg/kg IV q24h Flucloxacillin 2g IV q4h instead of penicillin if staphylococcal Sepsis is suspected e.g. IV drug user S.aureus (MSSA) flucloxacillin 2 g IV q4h 4 weeks S.aureus (MRSA) vancomycin IV as per Vanculator 4 weeks Viridans strep. Benzylpenicillin 1.2g. IV q4h 4 weeks or with *gentamicin 3 mg/kg IV q24h for 2 weeks Enterococi benzylpenicillin 2.4 g IV q4-6h +*gentamicin 3mg/kg IV q24h for 4 weeks	

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Cellulitis	Flucloxacillin 1 g IV q6h Or cefazolin 1g IV q8h if intolerant	5 days
Osteomyelitis	Flucloxacillin 2g IV q6h MRSA vancomycin IV as per Vanculator	6weeks
Septic Arthritis	Flucloxacillin 2 g IV q6h MRSA vancomycin IV as per Vanculator Group A Strep benzypenicillin	3 – 4 weeks
Intra-abdominal Sepsis	Amoxicillin 1g IV q6h +*gentamicin 5 mg/kg IV q24h +metronidazole 500 mg IV q12h	5 days unless drained
Biliary Sepsis	Amoxicillin 1g IV q6h +*gentamicin 5mg/kg IV q24h	5 days
Urosepsis	*gentamicin 5mg/kg IV q24h +amoxicillin 1g IV q6h	10 days

*Substitute aztreonam 1 g. IV 8 hourly for gentamicin if renal dysfunction is present

References :

Singer M, Deutschman CS, Seymour CW, et al. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA. 2016;315(8):801-810. doi:10.1001/jama.2016.0287

Disclaimer:

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