Waterford: Antimicrobial Guidelines - Antimicrobial Guideline: Positive Blood Cultures - Tips on Clinical Assessment of Patients Following Notification of Positive Blood Culture and Gram Stain

Please note that this guide is not comprehensive of all potential pathogens and scenarios for positive blood cultures. It is a simply a guide to aid the attending doctor when assessing the clinical significance and need for urgent action on receipt of a new blood culture gram stain result (verbal / electronic). All empiric therapy should be modified according to definitive identification and sensitivity testing, clinical response and senior consultation.

Each individual case should be taken on its own merits and the clinical assessment of the patient and actions, including prescribing of empiric antimicrobial therapy for newly positive blood cultures remains the responsibility of the attending clinician.

Gram Positive Cocci (GPC)

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Gram Positive Cocci (GPC) - Perhaps the most common gram stain result phoned during the working day or after hours.

Potential GPC organisms (most common):

Staphylococci: (*Staphylococcus aureus* (MSSA or MRSA) or Coagulase Negative Staphylococci) Staphylococci often have an appearance of cells in groups or clusters on gram.

Streptococci: (including Group A streptococci or other haemolytic streptococci e.g. Group B/C/G, *Streptococcus pneumoniae* (pneumococcus), *Streptococcus viridans*). Streptococci often have an appearance of cells in pairs or chains on gram stain.

Enterococci: (including *Enterococcus faecalis* / *Enterococcus faecium* / VRE if either resistant to vancomycin). Enterococci often have an appearance of cells in chains on gram stain.

Risk assessment

The key is to review the patient carefully for signs and symptoms of sepsis / bacteraemia. Carry out a NEWS score and follow the Sepsis Six protocol if clinically indicated. Bear in mind that the gram stain result may reflect a causative organism of life threatening sepsis (e.g. MSSA, MRSA, Group A Strep, *Streptococcus pneumoniae* , Enterococcus spp) or a skin contaminant (e.g. Coag Neg Staph / *Strep viridans*), therefore careful clinical risk assessment is paramount. Note it is important not to dismiss potential skin contaminants such as Coagulase Neg Staph / *Strep viridans* if endocarditis / intravascular catheter or prosthetic device infection suspected.

Empiric Antibiotic Cover

This should be guided by the Gram stain appearance and likely significance / pathogen based on the clinical risk assessment. Consult the current empiric antimicrobial guideline document for advice on empiric cover in the relevant section.

Check previous microbiology results and for a history of MRSA colonisation / infection. If the potential pathogen appears likely from the likely source of sepsis, ensure patient is on appropriate antimicrobial therapy for that source and pathogen (e.g. Group A Strep in severe soft tissue infection / *Strep pneumoniae* in CAP).

If systemic sepsis suspected, and source and potential pathogen unclear - glycopeptides cover most Gram positive organisms and a loading dose of vancomycin is a reasonable option to cover the patient pending the culture result of ID and sensitivity. It is critically important however that this step is taken only if clinical indication of sepsis or significant infection and that the antimicrobial treatment is later reviewed with the culture identification and sensitivity and assessed regarding the need to continue / stop / change therapy. If the patient is clinically well following a thorough clinical review and contamination is suspected – a watch-and-observe approach is reasonable pending identification and sensitivity on culture. Ensure there is a trigger for a repeat review and initiation of empiric antimicrobial therapy if the patient develops new signs/symptoms.

Gram Negative Bacilli (GNB)

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Gram Negative Bacilli (GNB) GNB on Gram of blood culture represents presumptive Gram negative septicaemia and the need for urgent review and prompt antibiotic treatment pending confirmation of identification.

Potential GNB organisms (most common):

Enterobacterales including *E coli* , *Klebsiella* spp, *Enterobacter* spp, *Pseudomonas* spp, *Acinetobacter* spp, Gram negative anaerobes including *Bacteroides* (less common) Note that MDRO (Multi-Drug Resistant Organism) including ESBL *E coli* / *Klebsiella* , CPE *E coli* / *Klebsiella* , MDR

Pseudomonas / *Acinetobacter* are included in this category.

Risk assessment

The key is to review the patient carefully for signs and symptoms of sepsis / bacteraemia. Carry out a NEWS score and follow the Sepsis Six protocol if clinically indicated.

Bear in mind that the Gram stain result of GNB may reflect a causative organism of life threatening sepsis and may harbour antibiotic resistance mechanisms.

Ensure Sepsis Protocols are followed as clinically appropriate. In a very small number of cases GNB on blood culture may turn out to be contaminants (e.g some *Acinetobacter* / environmental GNBs) but the vast majority are clinically significant and often pathogens of life-threatening sepsis, warranting immediate appropriate antibiotic therapy and source control.

Empiric Antibiotic Cover

Gram negative sepsis requires urgent review and appropriate empiric antibiotic therapy. Consult this document for advice on empiric cover in the relevant section. If the potential pathogen appears likely from the likely source of sepsis ensure patient is on appropriate antimicrobial therapy for that source and pathogen. If source unclear – see **Sepsis - Undetermined Origin** Section.

Gram Negative Cocci (GNC)

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Gram negative cocci on gram of blood culture represents presumptive Meningococcal Septicaemia and is a medical emergency warranting urgent senior clinical review, supportive therapy and rapid administration of appropriate empiric antimicrobials pending confirmation of identification. Notify Public Health.

The key is to review the patient urgently for signs and symptoms of meningococcal sepsis. The patient may already be on appropriate empiric therapy following the initial clinical assessment if meningococcal sepsis was suspected. Carry out a NEWS score and follow the Sepsis Six protocol if clinically indicated. Ensure Meningococcal Sepsis Protocols are followed and that the patient is on the appropriate antimicrobials and doses. See relevant section in this guideline.

Gram Positive Bacilli (GPB)

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Potential GPB organisms later confirmed by culture:

“Diphtheroid” bacilli or Coryneforms, Proprionibacteria, *Bacillus* species, *Listeria monocytogenes* /spp Anaerobic GPB including *Clostridium perfringens* , and other Clostridia species

Risk assessment

The key is to review the patient carefully for signs and symptoms of sepsis / bacteraemia.

Carry out a NEWS score and follow the Sepsis Six protocol if clinically indicated. Bear in mind that the gram stain result may reflect a causative organism of life threatening sepsis (e,g Listeria / Clostridia species) or more frequently, a skin contaminant (e.g. Diphtheroid bacilli or Bacillus species), therefore careful clinical risk assessment is paramount.

It is important not to dismiss potential skin contaminants such as Diphtheroid bacilli / Bacillus species if endocarditis / intravascular catheter or prosthetic device infection suspected, or if the more uncommon conditions such as Diphtheria / Bacillus anthracis / Bacillus cereus infection suspected on clinical grounds.

Empiric Antibiotic Cover

This should be guided by the gram stain appearance and likely significance / pathogen based on the clinical risk assessment. If Listeria bacteraemia / sepsis suspected – Amoxicillin +/- Gentamicin (in penicillin allergy discuss with microbiology team). If Clostridial bacteraemia / sepsis suspected (e.g in setting of faecal peritonitis / severe wound infection etc) – a broad – spectrum penicillin such as co-amoxiclav / piperacillin – tazobactam (in penicillin allergy discuss with microbiology team). If systemic sepsis is suspected, and source unclear - glycopeptides cover most gram positive organisms and a reasonable option to cover the patient pending identification and sensitivity and follow up with culture and review of antimicrobial therapy.

However if the patient is clinically well following a thorough clinical review and contamination is suspected, – a watch-and-observe approach is reasonable pending ID and sensitivity on culture. Bear in mind that the patient may already be on appropriate antibiotic regimen for their condition. Ensure there is a trigger for a repeat review and initiation of empiric antimicrobial therapy if the patient develops new signs/symptoms.

Yeasts on Gram Stain

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Yeasts on blood culture Gram stain should be always be considered as **significant and suggestive of candidaemia** (Candida blood stream infection) pending full clinical review and subsequent species identification. Assess the patient for signs and symptoms of candidaemia, carry out a NEWS score and review previous microbiology results for history of candida colonisation.

Review with regards to potential source(s) including intravenous catheters and intra-abdominal infections.

Repeat blood cultures, consider removal of central lines if implicated and organise echocardiogram.

Other life threatening fungaemia such as cryptococcaemia in immunocompromised hosts e.g. HIV should be considered, It is important to note that *Cryptococcus* appears as a yeast on Gram stain also and clinical correlation is paramount in these settings.

Empiric antifungal cover

Start an echinocandin such as **Anidulafungin 200mg stat IV** on Day 1 followed by 100mg OD IV on Day 2 and thereafter pending subsequent identification of the presumed *Candida* species and antifungal sensitivity testing. Where there is suspicion of cryptococcaemia or other fungaemia, please discuss with clinical microbiology for alternative empiric antifungal therapy.

Liaise with clinical microbiology team regarding follow up and assessment for potential de-escalation as part of the clinical review the following day, and for advice on ongoing management such as source control and optimisation of antifungal therapy based on antifungal sensitivity testing and clinical response.