Appendix 2:

Positive BC Cheat Sheet (Adults): Gram positive cocci ?Staphylococci

Also called: "Gram positive cocci ?Staph" *or* "Gram positive cocci in clusters"

Likely organisms

- **Staphylococcus aureus** – *significant mortality associated: 20-30%*
- **Coagulase-negative staphylococci** – e.g. S. epidermidis, hominis, caprae, lugdenensis, saprophyticus
- **Others (rare): e.g.** Aerococcus, Micrococcus, Rothia, Kocuria

Commonest sources of infection

- Refer to **Empirical Antibiotic Guidelines for Secondary Care (Adults)** for condition-specific antibiotic recommendations. *If S. aureus is a potential pathogen the empiric regimens often provide sufficient cover:*
  - https://tinyurl.com/NHSDG-EmpiricalAbxGuidance
- Urinary, respiratory, biliary tract and other intra-abdominal infections are relatively unlikely sources

Staphylococcus aureus

- Skin and soft tissue infections e.g. cellulitis, infected ulcers, diabetic foot infection
- Post-operative infections
- Cannulas, intravascular lines (e.g. PICC, Hickmann)
- Bone and joint infections e.g. septic arthritis, osteomyelitis, spine infections
- Infected prosthetic material
- Catheter-associated UTIs
- Infective endocarditis – native and prosthetic
- Other deep-seated abscesses/collections

Coagulase negative staphylococci (CoNS)

- Most common contaminant of blood cultures, usually the result of poor technique and/or patient's own skin.
- May cause infection, usually with indolent presentation, and often associated with prosthetic material: e.g. prosthetic heart valves, pacemaker leads, orthopaedic implants, intravascular lines (e.g. PICC, Hickman)

Important exceptions:

- **S. lugdunensis**: similar to S. aureus
- **S. saprophyticus**: assoc. with UTI/urosepsis, but may also be a contaminant.
  - Rare – approx 1 per year

Others (rare)

- **Aerococcus sp:** can be associated with urinary tract infections, endocarditis and/or discitis
- **Micrococcus, Rothia, Kocuria:** similar to CoNS

Predicted susceptibilities

Staphylococcus aureus

Methicillin-sensitive S. aureus (MSSA)

- **IV flucloxacillin 2g QDS**, with normal renal function (always susceptible)
- Other active agents: cefazolin, high dose ceftriaxone, co-amoxiclav, piperacillin-tazobactam, gentamicin (98%), co-trimoxazole (96%), clindamycin (80%), and all those listed as active against MRSA.

Methicillin-resistant S. aureus (MRSA)

- **IV vancomycin**
- Other active agents: daptomycin, linezolid, gentamicin (66%). **Do not use beta-lactams.**
- *Uncommon: Between 2021-2025 NHS D&G the observed bacteraemia ratio was 38 MSSA cases for 1 MRSA case.*

Coagulase negative Staphylococci (CoNS)

Usually susceptible to:

- **Vancomycin, Daptomycin, Linezolid**
- Susceptibilities are otherwise variable and unpredictable

Exceptions:

- **S. lugdunensis**: similar to MSSA
- **S. saprophyticus**: similar to MSSA

Others (rare)

- **Aerococcus sp:** Amoxicillin, ceftriaxone, vancomycin (all provide >90% cover)
- **Micrococcus, Rothia, Kocuria:** similar to CoNS

*Examples of commonly used antibiotics with **NO (OR UNRELIABLE) ACTIVITY** against GPC ?Staphylococcus:*
• Benzylpenicillin, Amoxicillin, Temocillin • Ciprofloxacin • Aztreonam • Ceftazidime

*If **Staphylococcus aureus bacteraemia (SAB) is strongly suspected clinically** (or confirmed on culture identification):*
• **Avoid oral antibiotics** • Refer to SAPG SAB guidance: ○ https://tinyurl.com/NHSDG-SAPGGuidance

- **Always review previous microbiology results** to look for previous resistant organisms (e.g. known MRSA colonisation) and/or susceptibilities to help guide antimicrobial choices

Suggested initial actions when BC with GPC ?Staphylococcus phoned through

CoNS are frequent blood culture contaminants.
Antibiotic therapy should NOT be targeted towards them until their significance has been clarified.
DO NOT de-escalate a patient's antibiotic treatment based on the initial Gram stain result

- **Review patient**. Determine clinical status, likely focus of infection, current antibiotics
- **If NEWS score ≥7, request senior review**
- **Review past microbiology results.** Look for previously isolated resistant organisms, including MRSA.
- **Risk assessment:** is this likely to be a Staphylococcus aurues bacteraemia, a contaminant, or something else?
- **Consider whether further non-antibiotic actions are indicated:**
  - If intravascular line (e.g. PICC, Hickman) is present, **consider line infection:**
    - Do vascular access sites look infected? Are episodes of fever/rigors associated with line use?
    - Take repeat paired peripheral and line cultures – even if stable
    - *Consider if line removal is indicated*
  - If cardiac, orthopaedic or vascular implants/devices present, **consider device infection/endocarditis:**
    - Are there any clinical signs on examination that suggest device/implant infection?
    - Take 2 further sets of blood cultures 20 minutes apart, from different sites – even if stable
    - *Seek advice from specialist teams if implant/device infection suspected*

- **Consider whether antibiotic adjustment is required.** Suggested actions to consider are listed below:

If… your patient is on an antibiotic regimen likely to provide sufficient empirical cover for MSSA AND clinically stable
➔ Change in treatment is unlikely to be required at this stage. ➔ If *Staphylococcus aureus* infection is clinically suspected AND previously MRSA colonised: ➔ add MRSA cover with IV vancomycin

If… your patient is on an antibiotic regimen likely to provide sufficient empirical cover for MSSA BUT clinically deteriorating / acutely unwell
▪ **Seek urgent senior clinical review** ▪ **Undertake antimicrobial review,** including: ▪ *Current therapy*: route, dosing, administration ▪ *Source control:* is there a deep-seated infection that needs draining? Is there an infected device / line that needs removal? Consider imaging/surgical input ▪ **If Staphylococcus aureus infection is clinically suspected:** ▪ Most empiric antibiotic choices will cover MSSA – see predicted susceptibilities ▪ **Could this be an MRSA?** Review previous microbiology results. • If previously colonised with MRSA ➔ **add IV vancomycin** • If no previous MRSA ➔ **consider IV vancomycin** [<2.5% of S. aureus bacteraemias are MRSA]

- **If CoNS infection is clinically suspected (e.g. intravascular line or cardiac/orthopaedic/vascular device infection. cardiac, orthopaedic, vascular):**
  - Take further blood cultures
    - Line infection: repeat paired peripheral and line cultures
    - Device infection: 2 further sets, 20 minutes apart, from different sites
  - **Add IV vancomycin**
  - Strongly consider line / device removal – seek senior /specialist team advice

- **If CoNS/S. aureus infection is NOT suspected clinically (e.g. urosepsis, biliary sepsis)**
  - Ensure current therapy provides sufficient cover for BOTH:
    A. The suspected infection (refer to guidance: https://tinyurl.com/NHSDG-EmpiricalAbxGuidance)
    AND
    B. Staphylococcus aureus (MSSA; and MRSA if previously colonised)

- Further escalation options and management advice is available within:
  
  "The "Life Jacket": Urgent Antimicrobial Management for Acutely Deteriorating Adult Patients ≥16 years old when Immediate Microbiology Consultant Advice Is Unavailable"

If… your patient is NOT ON ANTIBIOTICSs OR on an antibiotic regimen with NO or UNRELIABLE activity against Staphylococcus aureus

No clinical evidence of infection

- **Repeat blood cultures** when the following risks are present:
  - Intravascular lines: repeat paired peripheral and line cultures
  - Cardiac, orthopaedic or vascular implants: 2 further sets, 20 min apart, different sites
- **Hold off any changes in current treatment**
- **If patient develops sepsis** before further information is available:
  - Re-assess for source of infection AND re-culture
  - Treat the most likely clinical source. Refer to Empirical Antibiotic Guidelines for Secondary Care (Adults) for condition-specific antibiotic recommendations. *If S. aureus is a potential pathogen the empiric regimens often provide sufficient cover.*

Clinical evidence of infection, AND clinically stable

- As per "No clinical evidence of infection"

Clinical evidence of infection, AND clinically deteriorating

- **Seek urgent senior clinical review**
- Adjust antibiotic therapy to ensure current therapy provides sufficient cover for BOTH:
  A. The suspected infection (refer to guidance: https://tinyurl.com/NHSDG-EmpiricalAbxGuidance)
  AND
  B. Staphylococcus aureus (MSSA; and MRSA if previously colonised)
- Consider additional actions as per earlier red-coloured "clinically deteriorating" box.

Staphylococcus aureus bacteraemia (SAB): Actions when confirmed

- Staphylococcus aureus ID is confirmed using either MALDI or PCR.
  - MALDI cannot distinguish between MSSA/MRSA: antibiotic susceptibilities will usually follow ~24 hours.
  - PCR can distinguish between MSSA/MRSA: result is available on the interim electronic report.
- SAB have a 20-30% mortality rate. **They should always be considered significant.**
- All SAB require a full clinical workup as per the SAPG Guidance on the management of SAB in adults:
  - https://tinyurl.com/NHSDG-SAPGGuidance
- All SAB should be discussed with a microbiology / infectious diseases consultant the next working day / Monday morning.