UKMi North West

NICE Bites

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A summary of prescribing recommendations from NICE guidance

Sepsis

NICE NG51; 2016

This guideline covers recognition, diagnosis and early management of sepsis for all populations. It should be used together with: algorithms organised by age group and treatment location and risk stratification tools.

There is significant overlap between this guideline and other NICE guidance: acutely ill patients in hospital, fever in under 5s, meningitis (bacterial) and meningococcal septicaemia in under 16s, neutropenic sepsis, neonatal infection, and pneumonia in adults.

Definition of terms

AKI	acute kidney injury
BP	blood pressure
CRP	C-reactive protein
FBC	full blood count
IV	intravenous
RR	respiratory rate
SpO2	oxygen saturation
U+E	urea and electrolytes

Assessment and referral – see NICE pathway

- **Do** think '**could this be sepsis?**' if a person presents with signs or symptoms that indicate possible infection.
- Take into account that people with sepsis may have non-specific, non-localised presentations e.g. feeling very unwell, and may not have a high temperature.
- Pay particular attention to concerns expressed by the person and their family/carers e.g. changes from usual behaviour.
- Assess people with extra care if they cannot give a good history e.g. people with English as a second language or people with communication problems.
- Assess people with any suspected infection to identify:
  - possible source of infection,
  - factors that increase risk of sepsis,
  - any indications of clinical concern, such as new onset abnormalities of behaviour, circulation or respiration.
- During a remote assessment identify factors that increase risk of sepsis or indications of clinical concern when deciding whether to offer, and the urgency of offering, face-to-face-assessment.
- In a face-to-face setting use a structured set of observations to assess people to stratify risk if sepsis is suspected.
- For assessment outside of hospital - see NICE algorithms for managing suspected sepsis in: children <5 years, children aged 5 to 11 years, children and young people aged 12 to 17 years and adults aged ≥18 years.
- For assessment in a hospital setting - see NICE algorithms for managing suspected sepsis in: children <5 years, children aged 5 to 11 years, children and young people aged 12 to 17 years and adults aged ≥18 years.
- Consider using an early warning score to assess people in acute hospital settings.
- **Do** suspect neutropenic sepsis in patients having anticancer treatment who become unwell - see NICE pathway: Neutropenic sepsis.

People most vulnerable to sepsis – see NICE pathway

Face to face assessment

- In patients with suspected sepsis:
  - in **young people and adults** assess temperature, heart rate, RR, BP, level of consciousness and SpO2,
  - in **children <12 years** assess temperature, heart rate, RR, level of consciousness, SpO2 and capillary refill time,
  - in **children aged 5 to 11 years** measure BP if facilities (including a correctly sized BP cuff) are available,
  - in **children <5 years** measure BP if heart rate or capillary refill time is abnormal and facilities (including a correctly sized BP cuff) are available.
- **Do NOT** measure BP in **children <12 years** in community settings if it will cause a delay in assessment or treatment.
- Measure SpO2 in community settings if equipment is available and taking a measurement does not cause a delay in assessment or treatment.
- Examine people for mottled or ashen appearance, cyanosis of the skin, lips or tongue, non-blanching rash of the skin, any breach of skin integrity (e.g. cuts, burns or skin infections) or other rash indicating potential infection.
- Ask the person, parent or carer about frequency of urination in the past 18 hours.
- Use the person's history and physical examination results to grade risk of severe illness or death from sepsis using criteria based on age. See NICE risk stratification tools:
  Table 1: Adults, children and young people aged ≥12 years
  Table 2: Children aged 5 to 11 years
  Table 3: Children aged <5 years
- **Do NOT** use temperature as the sole predictor of sepsis.
- **Do NOT** rely on fever or hypothermia to rule sepsis in or out.
- Ask the person and their family/carers about any recent fever or rigors.
- Take into account that:
  - some groups of people may not develop a raised temperature – see NICE pathway,
  - a rise in temperature can be a physiological response e.g. after surgery or trauma.
- Interpret BP in the context of a person's previous BP, if known. Be aware that the presence of normal BP does not exclude sepsis in children and young people.
- Interpret the heart rate of a person with suspected sepsis in context – see NICE pathway,
- Interpret a person's mental state in the context of their normal function and treat changes as being significant.
- Be aware that changes in cognitive function may be subtle and assessment should include history from patient and family or carers.
- Changes in cognitive function may present as:
  - changes in behaviour or irritability in both **children** and in **adults with dementia**,
  - acute changes in functional abilities in **older people**.
- If SpO2 is difficult to measure, this may indicate poor peripheral circulation because of shock.

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Immediate transfer to hospital

- Immediately refer patients with suspected neutropenic sepsis for assessment and treatment in secondary or tertiary care – see NICE guideline.
- Immediately refer people for emergency medical care by the most appropriate means of transport (usually 999 ambulance) if:
  - they meet any high risk criteria – see NICE risk stratification tools, **OR**
  - they are aged <17 years and their immunity is impaired by drugs or illness and they have any moderate to high risk criteria.
- Pre-alert secondary care (through GP or ambulance service) when high risk criteria are met in a person outside an acute hospital, and transfer them immediately.
- Assess all people with any moderate to high risk criteria to:
  - make a definitive diagnosis of their condition,
  - decide if they can be treated safely outside hospital.
- If a definitive diagnosis is not reached or the person cannot be treated safely outside hospital, refer them urgently for emergency care.
- Provide people who do not have any high or moderate to high risk criteria information about symptoms to monitor and how to access medical care if they are concerned.

Treatment and management

See NICE risk stratification tools

Patients with ≥1 high risk criteria

- For all patients with ≥1 high risk criteria:
  - arrange for immediate review by the senior clinical decision maker to assess the person and think about alternate diagnoses,
  - carry out a venous blood test for blood gas including glucose and lactate measurement, blood culture, FBC, CRP, U+Es, creatinine, and a clotting screen,
  - give a broad-spectrum antimicrobial at the maximum recommended dose without delay*,
  - discuss with a consultant.
- Monitor people continuously, or a minimum of once every 30 minutes depending on setting.
- Physiological track and trigger systems should be used to monitor all patients in acute hospital settings.
- Monitor the mental state of all patients. Consider using a scale such as Glasgow Coma Scale or 'alert, voice, pain, unresponsive' (AVPU) scale.
- Alert a consultant to attend in person if the patient fails to respond within 1 hour of initial antibiotic and/or IV fluid resuscitation.
- In **adults, children and young people ≥12 years**, failure to respond is indicated by any of:
  - systolic BP persistently <90 mmHg,
  - reduced level of consciousness despite resuscitation,
  - RR >25 breaths per minute or a new need for mechanical ventilation,
  - lactate not reduced by more than 20% of initial value within 1 hour.
- In **children aged 5 to 11 years, children aged 3 months to 5 years and children aged <3 months**, failure to respond is indicated by any of:
  - reduced level of consciousness despite resuscitation,
  - heart rate or RR fulfil high risk criteria,
  - lactate remains >2mmol/L after 1 hour.

Adults, children and young people ≥12 years

- If lactate >4mmol/L **OR** if systolic BP <90mmHg:
  - give IV fluid bolus without delay*, **AND**
  - refer to critical care for review of management including need for central venous access and initiation of inotropes or vasopressors.
- If lactate 2 to 4mmol/L give IV fluid bolus without delay*
- If lactate <2mmol/L consider giving IV fluid bolus.

Children aged 5 to 11 years

- If lactate >4mmol/L:
  - give IV fluid bolus without delay*, **AND**
  - refer to critical care for review of central access and initiation of inotropes or vasopressors.
- If lactate 2 to 4mmol/L give IV fluid bolus as soon as possible*,
- If lactate <2mmol/L consider giving IV fluid bolus.

Children aged 3 months to 5 years

- If lactate >4mmol/L:
  - give IV fluid bolus without delay, **AND**
  - refer to critical care for review of central access and initiation of inotropes or vasopressors.
- If lactate 2 to 4mmol/L give IV fluid bolus without delay*.
- If lactate <2mmol/L consider giving IV fluid bolus.

Children aged <3 months

- If lactate >4mmol/L:
  - give IV fluid bolus without delay, **AND**
  - refer to critical care for review of central access and initiation of inotropes or vasopressors.
- If lactate 2 to 4mmol/L give IV fluid bolus without delay*.
- If lactate <2mmol/L consider giving IV fluid bolus.
- Give parenteral antibiotics to:
  - infants aged <1 month with fever,
  - all infants aged 1 to 3 months with fever who appear unwell,
  - infants aged 1 to 3 months with white blood cell count $<5\times10^9$/L or $>15\times10^9$/L.

Patients with ≥2 moderate to high risk criteria

See NICE risk stratification tools

Adults, children and young people ≥12 years

- If ≥2 moderate to high risk criteria **OR** systolic BP 91 to100mmHg:
  - carry out a venous blood test for blood gas including glucose and lactate measurement, blood culture, FBC, CRP, U+Es, and creatinine, **AND**
  - arrange for a clinician to review their condition and venous lactate results within 1 hour of meeting criteria.
- If lactate >2 mmol/L **OR** evidence of AKI, treat as high risk and follow recommendations for ≥1 high risk criteria.
- If lactate <2 mmol/L, no evidence of AKI and a definitive condition cannot be identified:
  - repeat structured assessment at least hourly,
  - ensure review by a senior clinical decision maker within 3 hours of meeting ≥2 moderate to high risk criteria for consideration of antibiotics.
- If lactate <2 mmol/L, no evidence of AKI and a definitive condition or infection can be identified and treated:
  - manage the definitive condition,
  - if appropriate, discharge with information.

* within 1 hour of identifying they meet any high risk criteria

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Children aged 5 to 11 years

- Carry out a venous blood test for blood gas including glucose and lactate measurement, blood culture, FBC, CRP, U+Es, and creatinine, **AND**
  - arrange for a clinician to review their condition and venous lactate results within 1 hour of meeting criteria.
- If lactate >2 mmol/L, treat as high risk and follow recommendations for ≥1 high risk criteria.
- If lactate <2 mmol/L, and a definitive condition cannot be identified:
  - repeat structured assessment at least hourly,
  - ensure review by a senior clinical decision maker within 3 hours of meeting ≥2 moderate to high risk criteria for consideration of antibiotics.
- If lactate <2 mmol/L, and a definitive condition or infection can be identified and treated:
  - manage the definitive condition,
  - if appropriate, discharge with information.

Children aged <5 years

- Carry out a venous blood test for blood gas including glucose and lactate measurement, blood culture, FBC, CRP, U+Es, and creatinine, **AND**
  - arrange for a clinician to review their condition and venous lactate results within 1 hour of meeting criteria.
- If lactate >2 mmol/L, treat as high risk and follow recommendations for ≥1 high risk criteria.
- If lactate <2 mmol/L, and a definitive condition cannot be identified:
  - repeat structured assessment at least hourly,
  - ensure review by a senior clinical decision maker within 3 hours of meeting ≥2 moderate to high risk criteria for consideration of antibiotics.
- If lactate <2 mmol/L, and a definitive condition can be identified and treated:
  - manage the definitive condition, **AND**
  - if appropriate, discharge with information.

Patients with only 1 moderate to high risk criteria

See NICE risk stratification tools

Adults, children and young people ≥12 years

- Arrange clinician review within 1 hour of meeting criterion for clinical assessment, **AND**
  - perform blood tests if indicated.
- If a definitive condition can be identified and treated:
  - manage the definitive condition,
  - if appropriate, discharge with information.
- If a definitive condition cannot be identified, there is no evidence of AKI, and lactate <2mmol/L:
  - repeat structured assessment at least hourly,
  - ensure review by a senior clinical decision maker within 3 hours of meeting criterion for consideration of antibiotics.

Children aged 5 to 11 years

- Arrange clinician review within 1 hour of meeting criterion for clinical assessment , **AND**
  - perform blood tests if indicated.
- If a definitive condition can be identified and treated:
  - manage the definitive condition,
  - if appropriate, discharge with information.
- If a definitive condition cannot be identified:
  - repeat structured assessment at least hourly,
  - ensure review by a senior clinical decision maker within 3 hours of meeting criterion for consideration of antibiotics.

Children aged <5 years

- Arrange clinician review within 1 hour of meeting criterion for clinical assessment, **AND**
  - perform blood tests if indicated.
- If a definitive condition can be identified and treated:
  - manage the definitive condition,
  - if appropriate, discharge with information.
- If a definitive condition cannot be identified:
  - repeat structured assessment at least hourly,
  - ensure review by a senior clinical decision maker within 3 hours of meeting criterion for consideration of antibiotics.

No moderate to high risk criterion

- Arrange clinical assessment of all adults, children and young people and manage according to clinical judgement.

Antibiotic treatment

See NICE NG15: antimicrobial stewardship

- Ensure urgent assessment mechanisms are in place to deliver antibiotics within 1 hour when any high risk criteria are met in secondary care.
- Ensure GPs and ambulance services have mechanisms in place to give antibiotics to patients with high risk criteria in pre-hospital settings if transfer time is >1 hour.
- For patients in hospital who have suspected infections take microbiological samples before prescribing an antimicrobial and review the prescription when results are available.
- Take blood cultures before antibiotics are given.
- If meningococcal disease is specifically suspected (fever and purpuric rash) give appropriate doses of parenteral benzylpenicillin in community settings and IV ceftriaxone in hospital settings.
- Where the source of infection is clear use existing local antimicrobial guidance.
- For **adults aged ≥18 years** with no confirmed diagnosis, use an empirical IV antimicrobial from an agreed local formulary in line with local or national guidelines.
- For **children and young people aged <17 years** (except neonates):
  - with suspected community acquired sepsis of any cause give ceftriaxone 80 mg/kg once a day with a maximum dose of 4g daily at any age,
  - who are already in hospital, or who are known to have previously been infected with or colonised with ceftriaxone-resistant bacteria, consult local guidelines for choice of antibiotic.
- For **children aged <3 months**, give an additional antibiotic active against listeria e.g. ampicillin or amoxicillin.
- Treat **neonates** presenting in hospital in their first 72 hours with suspected sepsis with IV benzylpenicillin and gentamicin.
- Treat **neonates >40 weeks corrected gestational age** presenting with community acquired sepsis with ceftriaxone 50 mg/kg unless already receiving an IV calcium infusion. If **≤40 weeks** corrected gestational age **OR** receiving an IV calcium infusion use cefotaxime 50 mg/kg every 6 to 12 hours, depending on age.

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Intravenous fluids

- In **adults and young people aged >16 years**, use crystalloids that contain sodium in the range 130 to 154mmol/L, with a bolus of 500ml over <15 minutes.
- In **children and young people aged ≤16 years** (except neonates), use glucose-free crystalloids that contain sodium in the range 130 to 154mmol/L, with a bolus of 20ml/kg over <10 minutes. Take into account pre-existing conditions e.g. cardiac disease or kidney disease, because smaller fluid volumes may be needed.
- In **neonates**, use glucose-free crystalloids that contain sodium in the range 130 to 154mmol/L, with a bolus of 10 to 20ml/kg over <10 minutes.
- Reassess the patient after completion of the IV fluid bolus, and if no improvement give a second bolus.
- If there is no improvement after a second bolus alert a consultant to attend.
- Use a pump, or syringe if no pump is available to deliver IV fluids for resuscitation to **children aged <12 years** who need fluids in bolus form.
- If using a pump or flow controller to deliver IV fluids for resuscitation to **adults, children and young people ≥12 years** who need fluids in bolus form ensure device is capable of delivering fluid at required rate e.g. at least 2L/hour in adults.
- **DO NOT** use starch based solutions or hydroxyethyl starches for fluid resuscitation.
- Consider human albumin solution 4 to 5% for fluid resuscitation only in patients with sepsis and shock.

Oxygen

- In **adults** give oxygen to achieve a target SpO2 of 94 to 98% or 88 to 92% for those at risk of hypercapnic respiratory failure.
- **In children** who have signs of shock or SpO2 of <91% when breathing air.
- Consider oxygen for **children** with an SpO2 >92%, as clinically indicated.

Finding the source of infection – see NICE guideline

Information and support – see NICE pathway

- Ensure a care team member is nominated to give information to families and carers of patients with sepsis, particularly in emergency situations. This should include:
  - an explanation that the person has sepsis, and what this means,
  - an explanation of any investigations and the management plan,
  - regular and timely updates on treatment, care and progress.
- Ensure information is given without medical jargon. Check regularly that people understand the information and explanations they are given.
- Give people opportunities to ask questions about diagnosis, treatment options, prognosis and complications. Be willing to repeat any information as needed.
- Give people information about national charities and support groups that provide information about sepsis and causes of sepsis.

Information at discharge

People diagnosed with sepsis

- Ensure people (and their families/carers, when appropriate) have been informed that they have had sepsis.
- Ensure discharge notifications to GPs include the diagnosis of sepsis.
- Give people (and their families/carers, when appropriate) opportunities to discuss their concerns. These may include:
  - why they developed sepsis,
  - whether they are likely to develop sepsis again,
  - if more investigations are necessary,
  - details of any community care needed, e.g. related to peripherally inserted central venous catheters (PICC) lines or other IV catheters,
  - what they should expect during recovery,
  - arrangements for follow-up including specific critical care follow-up if appropriate,
  - possible short-term and long-term problems.
- Give people and their families/carers information about national charities and support groups that provide information about sepsis and causes of sepsis.
- Advise carers they have a legal right to have a carer's assessment of their needs, and give them information on how they can get this.
  See NICE pathway for recommendations on rehabilitation and follow-up after critical illness.
  See NICE pathway for recommendations on the follow-up of people who have had meningococcal septicaemia.

People at increased risk of sepsis

- Ensure people at increased risk of sepsis (e.g. after surgery) are told before discharge about symptoms that should prompt them to get medical attention and how to get it.

People not diagnosed with sepsis

- Give people (and their family/carers, if appropriate) verbal and written information about:
  - what sepsis is, and why it was suspected,
  - what tests and investigations have been done,
  - instructions about which symptoms to monitor,
  - when to get medical attention if their illness continues,
  - how to get medical attention if they need to seek help urgently.
- Confirm that people understand the information they have been given, and what actions they should take to get help if they need it.

Training and education

- Ensure all healthcare staff and students involved in assessing people's clinical condition are given regular, appropriate training in identifying people who might have sepsis. This includes primary, community care and hospital staff including those working in care homes.
- Ensure all healthcare professionals involved in triage or early management are given appropriate, role-specific training in identifying, assessing and managing sepsis. This should include:
  - risk stratification strategies,
  - local protocols for early treatments, including antibiotics and IV fluids,
  - criteria and pathways for escalation in line with their health care setting.

Recommendations – wording used such as 'offer' and 'consider' denote the strength of the recommendation.

Drug recommendations – the guideline assumes that prescribers will use a drug's Summary of Product Characteristics (SPC) to inform treatment decisions.