

# Managing suspected sepsis in children aged 5 to 11 in acute hospital settings

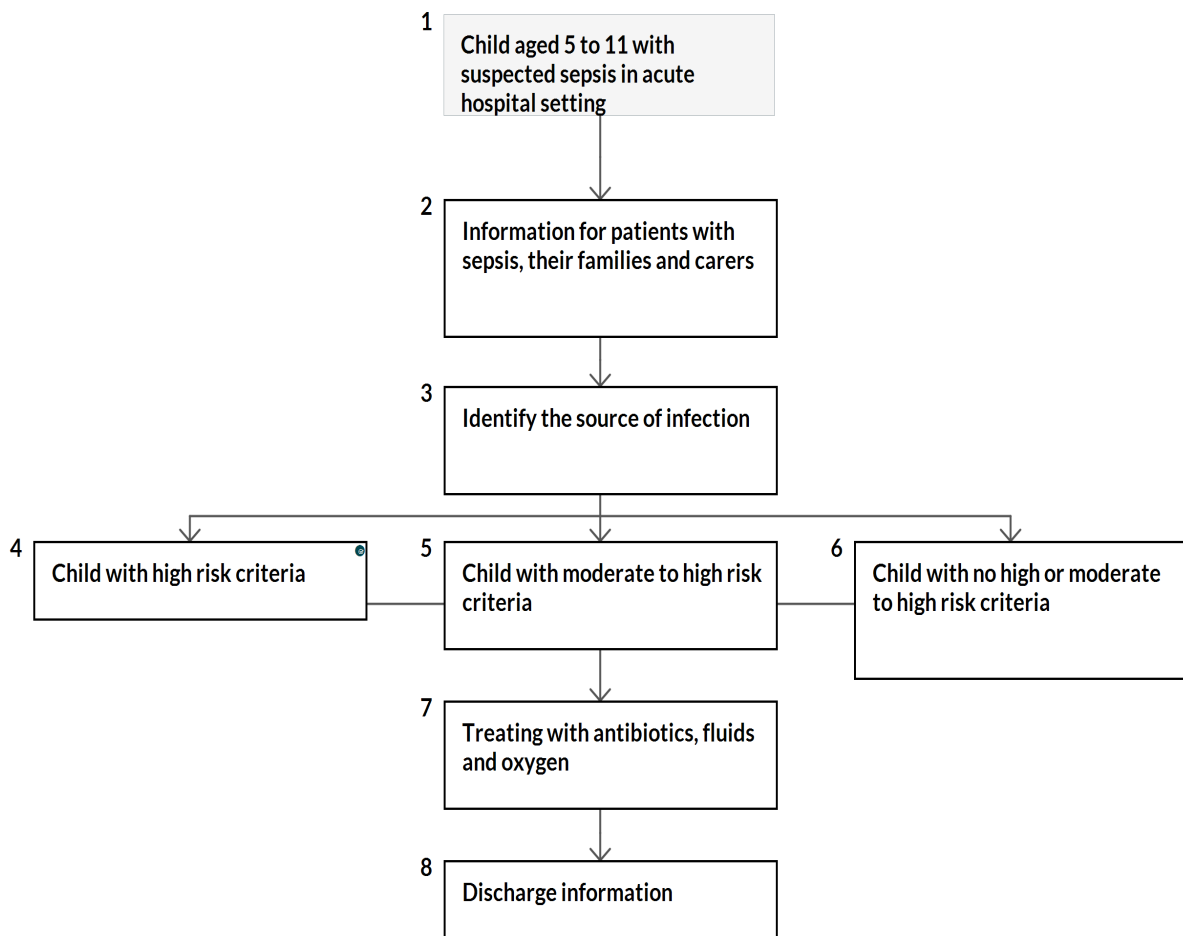
NICE Pathways bring together everything NICE says on a topic in an interactive flowchart. NICE Pathways are interactive and designed to be used online.

They are updated regularly as new NICE guidance is published. To view the latest version of this NICE Pathway see:

<http://pathways.nice.org.uk/pathways/sepsis>

NICE Pathway last updated: 05 November 2020

This document contains a single flowchart and uses numbering to link the boxes to the associated recommendations.



## 1 Child aged 5 to 11 with suspected sepsis in acute hospital setting

No additional information

## 2 Information and support for people with sepsis, their families and carers

Ensure a care team member is nominated to give information to families and carers, particularly in emergency situations such as in the emergency department. 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 using medical jargon. Check regularly that people understand the information and explanations they are given.

Give people with sepsis and their family members and carers opportunities to ask questions about diagnosis, treatment options, prognosis and complications. Be willing to repeat any information as needed.

Give people with sepsis and their families and carers information about national charities and support groups that provide information about sepsis and the causes of sepsis.

NICE has written information for the public on [sepsis: recognition, diagnosis and early management](#)

## 3 Identify the source of infection

Carry out a thorough clinical examination to look for sources of infection, including sources that might need surgical drainage, as part of the initial assessment.

Tailor investigations of the sources of infection to the person's clinical history and findings on examination.

Consider urine analysis and chest X-ray to identify the source of infection in all people with suspected sepsis.

Consider imaging of the abdomen and pelvis if no likely source of infection is identified after clinical examination and initial tests.

Involve the adult or paediatric surgical and gynaecological teams early on if intra-abdominal or pelvic infection is suspected in case surgical treatment is needed.

Do not perform a lumbar puncture without consultant instruction if any of the following contraindications are present:

- signs suggesting raised intracranial pressure or reduced or fluctuating level of consciousness (Glasgow Coma Scale score less than 9 or a drop of 3 points or more)
- relative bradycardia and hypertension
- focal neurological signs
- abnormal posture or posturing
- unequal, dilated or poorly responsive pupils
- papilloedema
- abnormal 'doll's eye' movements
- shock
- extensive or spreading purpura
- after convulsions until stabilised
- coagulation abnormalities or coagulation results outside the normal range or platelet count below  $100 \times 10^9$ /litre or receiving anticoagulant therapy
- local superficial infection at the lumbar puncture site
- respiratory insufficiency in children.

Perform lumbar puncture in the following children with suspected sepsis (unless contraindicated, please see contraindications in the above recommendation):

- infants younger than 1 month
- all infants aged 1–3 months who appear unwell
- infants aged 1–3 months with a white blood cell count less than  $5 \times 10^9$ /litre or greater than  $15 \times 10^9$ /litre.

See what NICE says on [bacterial meningitis and meningococcal septicaemia in under 16s](#).

## 4 Child aged 5 to 11 with high risk criteria

For children who have suspected sepsis and one or more high risk criteria:

- arrange for immediate review by the senior clinical decision maker for children to assess the child and think about alternative diagnoses to sepsis
- carry out a venous blood test for the following:
  - blood gas including glucose and lactate measurement
  - blood culture
  - full blood count
  - C-reactive protein
  - urea and electrolytes
  - creatinine
  - clotting screen
- give a broad-spectrum antimicrobial at the maximum recommended dose without delay (within 1 hour of identifying that they meet a high risk criteria in an acute hospital setting)
- discuss with a consultant.

Monitor children with suspected sepsis who meet any high risk criteria continuously, or a minimum of once every 30 minutes depending on setting. Physiological track and trigger systems should be used to monitor all children in acute hospital settings.

Monitor the mental state of children with suspected sepsis. Consider using the Glasgow Coma Scale (GCS) or AVPU ('alert, voice, pain, unresponsive') scale.

Alert a consultant to attend in person if a child with suspected sepsis and any high risk criteria fails to respond within 1 hour of initial antibiotic and/or intravenous fluid resuscitation. Failure to respond is indicated by any of:

- reduced level of consciousness despite resuscitation
- heart rate or respiratory rate fulfil high risk criteria
- lactate remains over 2 mmol/litre after 1 hour.

### **Lactate over 4 mmol/litre**

For children with suspected sepsis and any high risk criteria and lactate over 4 mmol/litre:

- give intravenous fluid bolus without delay (within 1 hour of identifying that they meet any

- high risk criteria in an acute hospital setting, **and**
- refer to critical care for review of central access and initiation of inotropes or vasopressors.

Referral may be a formal referral process or discussion with specialist in intensive care or intensive care outreach team.

### **Lactate between 2 and 4 mmol/litre**

For children with suspected sepsis and any high risk criteria and lactate between 2 and 4 mmol/litre:

- give intravenous fluid bolus as soon as possible (within 1 hour of identifying that they meet any high risk criteria in an acute hospital setting).

### **Lactate under 2 mmol/litre**

For children with suspected sepsis and any high risk criteria and lactate below 2 mmol/litre:

- consider giving intravenous fluid bolus.

### **Testing for acute kidney injury**

Investigate for acute kidney injury, by measuring serum creatinine and comparing with baseline, in children with acute illness if sepsis is likely or present. (For more information see what NICE says on [person aged 17 or under with acute illness](#) in terms of identifying acute kidney injury.)

## **Quality standards**

The following quality statements are relevant to this part of the interactive flowchart.

### **Sepsis**

2. Senior review and antibiotic treatment
3. Intravenous fluids
4. Escalation of care

## 5 Child aged 5 to 11 with moderate to high risk criteria

### 2 or more high moderate to high risk criteria

For children with suspected sepsis and 2 or more moderate to high risk criteria:

- carry out a venous blood test for the following:
  - blood gas, including glucose and lactate measurement
  - blood culture
  - full blood count
  - C-reactive protein
  - urea and electrolytes
  - creatinine
- arrange for a clinician to review the person's condition and venous lactate results within 1 hour of meeting criteria in an acute hospital setting.

### Lactate over 2 mmol/litre or acute kidney injury

For children with suspected sepsis who meet 2 or more moderate to high risk criteria and have lactate over 2 mmol/litre, treat as high risk and follow recommendations for child aged 5 to 11 with high risk criteria [See page 5].

### Lactate under 2 mmol/litre

For children with suspected sepsis who meet 2 or more moderate to high risk criteria, have lactate of less than 2 mmol/litre, and in whom a definitive condition cannot be identified:

- repeat structured assessment at least hourly
- ensure review by a senior clinical decision maker for children within 3 hours of meeting 2 or more moderate to high risk criteria in an acute hospital setting for consideration of antibiotics.

For children with suspected sepsis who meet 2 moderate to high risk criteria, have lactate of less than 2 mmol/litre, and in whom a definitive condition or infection can be identified and treated:

- manage the definitive condition, and
- if appropriate, discharge with information depending on setting information at discharge for people assessed for possible sepsis, but not diagnosed with sepsis), depending on the

- setting.

### Only 1 moderate to high risk criterion

For children with suspected sepsis who meet only 1 moderate to high risk criterion:

- arrange clinician review within 1 hour of meeting 1 moderate to high risk criterion in an acute hospital setting for clinical assessment **and**
- perform blood tests if indicated.

For children with suspected sepsis who meet only 1 moderate to high risk criterion and in whom a definitive condition can be identified and treated:

- manage the definitive condition
- if appropriate, discharge with information depending on setting (see [information at discharge for people assessed for possible sepsis, but not diagnosed with sepsis](#)).

For children with suspected sepsis who meet only 1 moderate to high risk criterion, and in whom a definitive condition cannot be identified:

- repeat structured assessment at least hourly
- ensure review by a senior clinical decision maker for children within 3 hours of meeting a moderate to high risk criterion in an acute hospital setting for consideration of antibiotics.

### Testing for acute kidney injury

Investigate for acute kidney injury, by measuring serum creatinine and comparing with baseline, in children with acute illness if sepsis is likely or present. (For more information see what NICE says on [person aged 17 or under with acute illness](#) in terms of identifying acute kidney injury.)

## 6 Child aged 5 to 11 with no high or moderate to high risk criteria

Arrange clinical assessment of children who have suspected sepsis and no high risk or moderate to high risk criteria and manage according to clinical judgement. This should be by a medically qualified practitioner or equivalent with prescribing responsibilities.



## 7 Treating child aged 5 to 11 with antibiotics, fluids and oxygen

### Antibiotics

Ensure urgent assessment mechanisms are in place to deliver antibiotics when high risk criteria are met in secondary care (within 1 hour of meeting a high risk criterion in an acute hospital setting).

Ensure GPs and ambulance services have mechanisms in place to give antibiotics for people with high risk criteria in pre-hospital settings in location where transfer time is more than 1 hour.

For patients in hospital who have suspected infections, take microbiological samples before prescribing an antimicrobial and review the prescription when the results are available. For people with suspected sepsis take blood cultures before antibiotics are given.

If meningococcal disease is specifically suspected (fever and purpuric rash) give appropriate doses of parenteral benzyl penicillin in community settings and intravenous ceftriaxone in hospital settings.

For all people with suspected sepsis where the source of infection is clear use existing local antimicrobial guidance.

For people aged up to 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.

For people aged up to 17 years with suspected sepsis 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.

Follow NICE's recommendations on [antimicrobial stewardship](#) when prescribing and using antibiotics to treat people with suspected or confirmed sepsis.

### Diagnostic testing

The following recommendation is from NICE diagnostics guidance on [procalcitonin testing for diagnosing and monitoring sepsis](#).

The procalcitonin tests (ADVIA Centaur BRAHMS PCT assay, BRAHMS PCT Sensitive Kryptor

assay, Elecsys BRAHMS PCT assay, LIAISON BRAHMS PCT assay and VIDAS BRAHMS PCT assay) show promise but there is currently insufficient evidence to recommend their routine adoption in the NHS. Further research on procalcitonin tests is recommended for guiding decisions to:

- stop antibiotic treatment in people with confirmed or highly suspected sepsis in the intensive care unit or
- start and stop antibiotic treatment in people with suspected bacterial infection presenting to the emergency department.

Centres currently using procalcitonin tests to guide these decisions are encouraged to participate in research and data collection (see [section 6.25](#) of NICE diagnostics guidance 18).

## Fluids

Reassess the patient after completion of the intravenous fluid bolus, and if no improvement give a second bolus. If there is no improvement after a second bolus alert a consultant to attend.

Do not use starch-based solutions or hydroxyethyl starches for fluid resuscitation for people with sepsis.

Consider human albumin solution 4–5% for fluid resuscitation only in patients with sepsis and shock.

If children and young people up to 16 years need intravenous fluid resuscitation, use glucose-free crystalloids that contain sodium in the range 130–154 mmol/litre, with a bolus of 20 ml/kg over less than 10 minutes. Take into account pre-existing conditions (for example, cardiac disease or kidney disease), because smaller fluid volumes may be needed.

Use a pump, or syringe if no pump is available, to deliver intravenous fluids for resuscitation to children under 12 years with suspected sepsis who need fluids in bolus form.

## Oxygen

Oxygen should be given to children with suspected sepsis who have signs of shock or oxygen saturation (SpO<sub>2</sub>) of less than 92% when breathing air. Treatment with oxygen should also be considered for children with an SpO<sub>2</sub> of greater than 92%, as clinically indicated.

See what NICE says on [bacterial meningitis and meningococcal septicaemia in under 16s and intravenous fluid therapy in hospital](#).

## 8 Discharge information

Ensure people and their families and carers if appropriate have been informed that they have had sepsis.

Ensure discharge notifications to GPs include the diagnosis of sepsis.

Give people who have had sepsis (and their families and 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, for example, related to peripherally inserted central venous catheters (PICC) lines or other intravenous 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 who have had sepsis and their families and 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's recommendations on [discharge and follow-up for bacterial meningitis or meningococcal septicaemia in under 16s](#).

## Glossary

### Clinician

a medically qualified practitioner who has antibiotic prescribing responsibilities

### Critical care

an intensivist or intensive care outreach team, or specialist in intensive care or paediatric intensive care

### Senior clinical decision maker for children

(a senior clinical decision maker for people aged under 17 years is a paediatric qualified doctor of grade ST4 or above or equivalent)

### Sepsis

sepsis is a life-threatening organ dysfunction due to a dysregulated host response to infection; 'suspected sepsis' is used to indicate people who might have sepsis and require face to face assessment and consideration of urgent intervention

## Sources

[Acute kidney injury: prevention, detection and management](#) (2019) NICE guideline NG148

[Sepsis: recognition, diagnosis and early management](#) (2016) NICE guideline NG51

[Intravenous fluid therapy in children and young people in hospital](#) (2015) NICE guideline NG29

[Procalcitonin testing for diagnosing and monitoring sepsis \(ADVIA Centaur BRAHMS PCT assay, BRAHMS PCT Sensitive Kryptor assay, Elecsys BRAHMS PCT assay, LIAISON BRAHMS PCT assay and VIDAS BRAHMS PCT assay\)](#) (2015) NICE diagnostics guidance 18

## Your responsibility

### Guidelines

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals and practitioners are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to apply the recommendations, and the guideline does not override the responsibility to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian.

Local commissioners and providers of healthcare have a responsibility to enable the guideline to be applied when individual professionals and people using services wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with complying with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

### Technology appraisals

The recommendations in this interactive flowchart represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, health professionals are expected to take these recommendations fully into account, alongside the individual needs, preferences and values of their patients. The application of the recommendations in this interactive flowchart is at the discretion of health professionals and their individual patients and do not override the responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or their carer or guardian.

Commissioners and/or providers have a responsibility to provide the funding required to enable the recommendations to be applied when individual health professionals and their patients wish to use it, in accordance with the NHS Constitution. They should do so in light of their duties to

have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

### **Medical technologies guidance, diagnostics guidance and interventional procedures guidance**

The recommendations in this interactive flowchart represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, healthcare professionals are expected to take these recommendations fully into account. However, the interactive flowchart does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

Commissioners and/or providers have a responsibility to implement the recommendations, in their local context, in light of their duties to have due regard to the need to eliminate unlawful discrimination, advance equality of opportunity, and foster good relations. Nothing in this interactive flowchart should be interpreted in a way that would be inconsistent with compliance with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.