

This National Institute for Health and Care Excellence (NICE) guidance is the current, unaltered NICE guidance at time of publication. BJUI publishes selected NICE guidance relevant to urologists to extend their distribution and promote best practice.

Sepsis: recognition, diagnosis and early management

© NICE (2017) Sepsis: recognition, diagnosis and early management

Overview

This guideline covers the recognition, diagnosis and early management of sepsis for all populations. The guideline committee identified that the key issues to be included were: recognition and early assessment, diagnostic and prognostic value of blood markers for sepsis, initial treatment, escalating care, identifying the source of infection, early monitoring, information and support for patients and carers, and training and education.

Who is it For?

- People with sepsis, their families and carers.
- Healthcare professionals working in primary, secondary and tertiary care.

Recommendations

People have the right to be involved in discussions and make informed decisions about their care, as described in your care [<https://www.nice.org.uk/about/nice-communities/public-involvement/your-care>].

Making decisions using NICE guidelines [<http://www.nice.org.uk/about/what-we-do/our-programmes/nice-guidance/nice-guidelines/using-NICE-guidelines-to-make-decisions>] explains how we use words to show the strength (or certainty) of our recommendations, and has information about prescribing medicines (including off-label use), professional guidelines, standards and laws (including on consent and mental capacity), and safeguarding.

1.1 Identifying People with Suspected Sepsis

This guidance should be used together with the algorithms organised by age group and treatment location and the risk stratification tools [<https://www.nice.org.uk/guidance/ng51/resources/algorithms-and-risk-stratification-tables-compiled-version-2551488301>]. There are algorithms for:

- children under 5 out of hospital [<https://www.nice.org.uk/guidance/ng51/resources/algorithm-for-managing-suspected-sepsis-in-children-aged-under-5-years-outside-an-acute-hospital-setting-91853485524>]
- children under 5 in hospital [<https://www.nice.org.uk/guidance/ng51/resources/algorithm-for-managing-suspected-sepsis-in-children-aged-under-5-years-in-an-acute-hospital-setting-91853485527>]
- children aged 5–11 years out of hospital [<https://www.nice.org.uk/guidance/ng51/resources/algorithm-for-managing-suspected-sepsis-in-children-aged-5-11-years-outside-an-acute-hospital-setting-91853485526>]
- children aged 5–11 years in hospital [<https://www.nice.org.uk/guidance/ng51/resources/algorithm-for-managing-suspected-sepsis-in-children-aged-5-11-years-in-an-acute-hospital-setting-91853485525>]
- children and young people aged 12–17 out of hospital [<https://www.nice.org.uk/guidance/ng51/resources/algorithm-for-managing-suspected-sepsis-in-children-and-young-people-aged-12-17-years-outside-an-acute-hospital-setting-2551485714>]
- children and young people aged 12–17 in hospital [<https://www.nice.org.uk/guidance/ng51/resources/algorithm-for-managing-suspected-sepsis-in-children-and-young-people-aged-12-17-years-in-an-acute-hospital-setting-2551485713>]
- adults aged 18 and over out of hospital [<https://www.nice.org.uk/guidance/ng51/resources/algorithm-for-managing-suspected-sepsis-in-adults-and-young-people-aged-18-years-and-over-outside-an-acute-hospital-setting-2551485716>]
- adults aged 18 and over in hospital [<https://www.nice.org.uk/guidance/ng51/resources/algorithm-for-managing-suspected-sepsis-in-adults-and-young-people-aged-18-years-and-over-in-an-acute-hospital-setting-2551485715>]

There are also risk stratification tools for:

- children under 5 [<https://www.nice.org.uk/guidance/ng51/resources/table-3-risk-stratification-tool-for-children-aged-under-5-years-with-suspected-sepsis-2551487007>]

- children aged 5–11 years [<https://www.nice.org.uk/guidance/ng51/resources/table-2-risk-stratification-tool-for-children-aged-5-11-years-with-suspected-sepsis-2551487008>]
 - adults, children and young people aged 12 years and over [<https://www.nice.org.uk/guidance/ng51/resources/table-1-risk-stratification-tool-for-adults-children-and-young-people-aged-12-years-and-over-with-suspected-sepsis-2551487005>]
- 1.1.1 Think ‘could this be sepsis?’ if a person presents with signs or symptoms that indicate possible infection.
 - 1.1.2 Take into account that people with sepsis may have non-specific, non-localised presentations, for example feeling very unwell, and may not have a high temperature.
 - 1.1.3 Pay particular attention to concerns expressed by the person and their family or carers, for example changes from usual behaviour.
 - 1.1.4 Assess people who might have sepsis with extra care if they cannot give a good history (for example, people with English as a second language or people with communication problems).
 - 1.1.5 Assess people with any suspected infection to identify:
 - possible source of infection
 - factors that increase risk of sepsis (see section 1.2)
 - any indications of clinical concern, such as new onset abnormalities of behaviour, circulation or respiration.
 - 1.1.6 Identify factors that increase risk of sepsis (see section 1.2) or indications of clinical concern such as new onset abnormalities of behaviour, circulation or respiration when deciding during a remote assessment whether to offer a face-to-face-assessment and if so, on the urgency of face-to-face assessment.
 - 1.1.7 Use a structured set of observations (see section 1.3) to assess people in a face-to-face setting to stratify risk (see section 1.4) if sepsis is suspected.
 - 1.1.8 Consider using an early warning score to assess people with suspected sepsis in acute hospital settings.
 - 1.1.9 Suspect neutropenic sepsis in patients having anticancer treatment who become unwell. [This recommendation is from NICE’s guideline on neutropenic sepsis (<http://www.nice.org.uk/guidance/cg151>).]
 - 1.1.10 Refer patients with suspected neutropenic sepsis immediately for assessment in secondary or tertiary care. [This recommendation is from NICE’s guideline on neutropenic sepsis (<http://www.nice.org.uk/guidance/cg151>).]
 - 1.1.11 Treat people with neutropenic sepsis in line with NICE’s guideline on neutropenic sepsis [<http://www.nice.org.uk/guidance/cg151>].
- the very young (under 1 year) and older people (over 75 years) or people who are very frail
 - people who have impaired immune systems because of illness or drugs, including:
 - people being treated for cancer with chemotherapy (see recommendation 1.1.9)
 - people who have impaired immune function (for example, people with diabetes, people who have had a splenectomy, or people with sickle cell disease)
 - people taking long-term steroids
 - people taking immunosuppressant drugs to treat non-malignant disorders such as rheumatoid arthritis
 - people who have had surgery, or other invasive procedures, in the past 6 weeks
 - people with any breach of skin integrity (for example, cuts, burns, blisters or skin infections)
 - people who misuse drugs intravenously
 - people with indwelling lines or catheters.
- 1.2.2 Take into account that women who are pregnant, have given birth or had a termination of pregnancy or miscarriage in the past 6 weeks are in a high risk group for sepsis. In particular, women who:
 - have impaired immune systems because of illness or drugs (see recommendation 1.1.5)
 - have gestational diabetes or diabetes or other comorbidities
 - needed invasive procedures (for example, caesarean section, forceps delivery, removal of retained products of conception)
 - had prolonged rupture of membranes
 - have or have been in close contact with people with group A streptococcal infection, for example, scarlet fever
 - have continued vaginal bleeding or an offensive vaginal discharge.
 - 1.2.3 Take into account the following risk factors for early-onset neonatal infection:
 - invasive group B streptococcal infection in a previous baby
 - maternal group B streptococcal colonisation, bacteriuria or infection in the current pregnancy
 - prelabour rupture of membranes
 - preterm birth following spontaneous labour (before 37 weeks’ gestation)
 - suspected or confirmed rupture of membranes for more than 18 hours in a preterm birth
 - intrapartum fever higher than 38°C, or confirmed or suspected chorioamnionitis

1.2 Risk Factors for Sepsis

- 1.2.1 Take into account that people in the groups below are at higher risk of developing sepsis:

- parenteral antibiotic treatment given to the woman for confirmed or suspected invasive bacterial infection (such as septicaemia) at any time during labour, or in the 24-hour periods before and after the birth (this does not refer to intrapartum antibiotic prophylaxis)
- suspected or confirmed infection in another baby in the case of a multiple pregnancy.

[This recommendation is from NICE's guideline on neonatal infection (<http://www.nice.org.uk/guidance/cg149>).]

1.3 Face-to-Face Assessment of People with Suspected Sepsis

- 1.3.1 Assess temperature, heart rate, respiratory rate, blood pressure, level of consciousness and oxygen saturation in young people and adults with suspected sepsis.
- 1.3.2 Assess temperature, heart rate, respiratory rate, level of consciousness, oxygen saturation and capillary refill time in children under 12 years with suspected sepsis. [This recommendation is adapted from NICE's guideline on fever in under 5s (<http://www.nice.org.uk/guidance/cg160>).]
- 1.3.3 Measure blood pressure of children under 5 years if heart rate or capillary refill time is abnormal and facilities to measure blood pressure, including a correctly-sized blood pressure cuff, are available. [This recommendation is adapted NICE's guideline

on fever in under 5s (<http://www.nice.org.uk/guidance/cg160>).]

- 1.3.4 Measure blood pressure of children aged 5–11 years who might have sepsis if facilities to measure blood pressure, including a correctly-sized cuff, are available.
- 1.3.5 Only measure blood pressure in children under 12 years in community settings if facilities to measure blood pressure, including a correctly-sized cuff, are available and taking a measurement does not cause a delay in assessment or treatment.
- 1.3.6 Measure oxygen saturation in community settings if equipment is available and taking a measurement does not cause a delay in assessment or treatment.
- 1.3.7 Examine people with suspected sepsis for mottled or ashen appearance, cyanosis of the skin, lips or tongue, non-blanching rash of the skin, any breach of skin integrity (for example, cuts, burns or skin infections) or other rash indicating potential infection.
- 1.3.8 Ask the person, parent or carer about frequency of urination in the past 18 hours.

1.4 Stratifying Risk of Severe Illness or Death from Sepsis

- 1.4.1 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 Tables 1, 2 and 3).

Adults, Children and Young People Aged 12 Years and Over

Table 1 Risk stratification tool for adults, children and young people aged 12 years and over with suspected sepsis

Category	High risk criteria	Moderate to high risk criteria	Low risk criteria
History	Objective evidence of new altered mental state	History from patient, friend or relative of new onset of altered behaviour or mental state History of acute deterioration of functional ability Impaired immune system (illness or drugs including oral steroids) Trauma, surgery or invasive procedures in the last 6 weeks	Normal behaviour
Respiratory	Raised respiratory rate: 25 breaths per minute or more New need for oxygen (40% FiO ₂ or more) to maintain saturation more than 92% (or more than 88% in known chronic obstructive pulmonary disease)	Raised respiratory rate: 21–24 breaths per minute	No high risk or moderate to high risk criteria met
Blood pressure	Systolic blood pressure 90 mmHg or less or systolic blood pressure more than 40 mmHg below normal	Systolic blood pressure 91–100 mmHg	No high risk or moderate to high risk criteria met
Circulation and hydration	Raised heart rate: more than 130 beats per minute Not passed urine in previous 18 h. For catheterised patients, passed less than 0.5 mL/kg of urine per hour	Raised heart rate: 91–130 beats per minute (for pregnant women 100–130 beats per minute) or new onset arrhythmia Not passed urine in the past 12–18 hours For catheterised patients, passed 0.5–1 mL/kg of urine per hour	No high risk or moderate to high risk criteria met
Temperature		Tympanic temperature less than 36°C	
Skin	Mottled or ashen appearance Cyanosis of skin, lips or tongue Non-blanching rash of skin	Signs of potential infection, including redness, swelling or discharge at surgical site or breakdown of wound	No non-blanching rash

A downloadable version of this table [<https://www.nice.org.uk/guidance/ng51/resources/table-1-risk-stratification-tool-for-adults-children-and-young-people-aged-12-years-and-over-with-suspected-sepsis-2551487005>] is also available.

1.4.2 Recognise that adults, children and young people aged 12 years and over with suspected sepsis and any of the symptoms or signs below are at high risk of severe illness or death from sepsis:

- objective evidence of new altered mental state
- respiratory rate of 25 breaths per minute or above, or new need for 40% oxygen or more to maintain oxygen saturation more than 92% (or more than 88% in known chronic obstructive pulmonary disease)
- heart rate of more than 130 beats per minute
- systolic blood pressure of 90 mmHg or less, or systolic blood pressure more than 40 mmHg below normal
- not passed urine in previous 18 hours (for catheterised patients, passed less than 0.5 mL/kg/hour)
- mottled or ashen appearance
- cyanosis of the skin, lips or tongue
- non-blanching rash of the skin.

1.4.3 Recognise that adults, children and young people aged 12 years and over with suspected sepsis and any of the symptoms or signs below are at moderate to high risk of severe illness or death from sepsis:

- history of new-onset changed behaviour or change in mental state, as reported by the person, a friend or relative
- history of acute deterioration of functional ability
- impaired immune system (illness or drugs, including oral steroids)
- trauma, surgery or invasive procedure in the past 6 weeks
- respiratory rate of 21–24 breaths per minute
- heart rate of 91–130 beats per minute or new-onset arrhythmia, or if pregnant heart rate of 100–130 beats per minute
- systolic blood pressure of 91–100 mmHg
- not passed urine in the past 12–18 hours (for catheterised patients, passed 0.5–1 mL/kg/hour)
- tympanic temperature less than 36 °C
- signs of potential infection, including increased redness, swelling or discharge at a surgical site, or breakdown of a wound.

1.4.4 Consider adults, children and young people aged 12 years and over with suspected sepsis who do not meet any high or moderate to high risk criteria to be at low risk of severe illness or death from sepsis.

Children Aged 5–11 Years

Table 2 Risk stratification tool for children aged 5–11 years with suspected sepsis

Category	Age	High risk criteria	Moderate to high risk criteria	Low risk criteria
Behaviour	Any	Objective evidence of altered behaviour or mental state Appears ill to a healthcare professional Does not wake or if roused does not stay awake	Not behaving normally Decreased activity Parent or carer concern that the child is behaving differently from usual	Behaving normally
Respiratory	Any	Oxygen saturation of less than 90% in air or increased oxygen requirement over baseline	Oxygen saturation of less than 92% in air or increased oxygen requirement over baseline	No high risk or moderate to high risk criteria met
	Aged 5 years	Raised respiratory rate: 29 breaths per minute or more	Raised respiratory rate: 24–28 breaths per minute	
	Aged 6–7 years	Raised respiratory rate: 27 breaths per minute or more	Raised respiratory rate: 24–26 breaths per minute	
	Aged 8–11 years	Raised respiratory rate: 25 breaths per minute or more	Raised respiratory rate: 22–24 breaths per minute	
Circulation and hydration	Any	Heart rate less than 60 beats per minute	Capillary refill time of 3 seconds or more Reduced urine output For catheterised patients, passed less than 1 mL/kg of urine per hour	No high risk or moderate to high risk criteria met
	Aged 5 years	Raised heart rate: 130 beats per minute or more	Raised heart rate: 120–129 beats per minute	
	Aged 6–7 years	Raised heart rate: 120 beats per minute or more	Raised heart rate: 110–119 beats per minute	
	Aged 8–11 years	Raised heart rate: 115 beats per minute or more	Raised heart rate: 105–114 beats per minute	
Temperature	Any		Tympanic temperature less than 36°C	
Skin	Any	Mottled or ashen appearance Cyanosis of skin, lips or tongue Non-blanching rash of skin		
Other	Any		Leg pain Cold hands or feet	No high or moderate to high risk criteria met

A downloadable version of this table (<https://www.nice.org.uk/guidance/ng51/resources/table-2-risk-stratification-tool-for-children-aged-5-11-years-with-suspected-sepsis-2551487008>) is also available.

1.4.5 Recognise that children aged 5–11 years with suspected sepsis and any of the symptoms or signs below are at high risk of severe illness or death from sepsis:

- has objective evidence of altered behaviour or mental state, or appears ill to a healthcare professional, or does not wake (or if roused, does not stay awake)
- respiratory rate:
 - aged 5 years, 29 breaths per minute or more
 - aged 6–7 years, 27 breaths per minute or more
 - aged 8–11 years, 25 breaths per minute or more
 - oxygen saturation of less than 90% in air or increased oxygen requirement over baseline
- heart rate:
 - aged 5 years, 130 beats per minute or more
 - aged 6–7 years, 120 beats per minute or more
 - aged 8–11 years, 115 beats per minute or more
 - or heart rate less than 60 beats per minute at any age
- mottled or ashen appearance
- cyanosis of the skin, lips or tongue
- non-blanching rash of the skin.

1.4.6 Recognise that children aged 5–11 years with suspected sepsis and any of the symptoms or signs below are at

moderate to high risk of severe illness or death from sepsis:

- not responding normally to social cues or decreased activity, or parent or carer concern that the child is behaving differently from usual
- respiratory rate:
 - aged 5 years, 24–28 breaths per minute
 - aged 6–7 years, 24–26 breaths per minute
 - aged 8–11 years, 22–24 breaths per minute
 - oxygen saturation of less than 92% in air or increased oxygen requirement over baseline
- heart rate:
 - aged 5 years, 120–129 beats per minute
 - aged 6–7 years, 110–119 beats per minute
 - aged 8–11 years, 105–114 beats per minute
 - or capillary refill time of 3 seconds or more
- reduced urine output, or for catheterised patients passed less than 1 mL/kg of urine per hour
- tympanic temperature less than 36°C
- have leg pain or cold hands or feet.

1.4.7 Consider children aged 5–11 years with suspected sepsis who do not meet any high or moderate to high risk criteria to be at low risk of severe illness or death from sepsis.

Children Aged Under 5 Years

Table 3 Risk stratification tool for children aged under 5 years with suspected sepsis

Category	Age	High risk criteria	Moderate to high risk criteria	Low risk criteria
Behaviour	Any	No response to social cues Appears ill to a healthcare professional Does not wake, or if roused does not stay awake Weak high-pitched or continuous cry	Not responding normally to social cues No smile Wakes only with prolonged stimulation Decreased activity Parent or carer concern that child is behaving differently from usual	Responds normally to social cues Content or smiles Stays awake or awakens quickly Strong normal cry or not crying
Respiratory	Any	Grunting Apnoea Oxygen saturation of less than 90% in air or increased oxygen requirement over baseline	Oxygen saturation of less than 92% in air or increased oxygen requirement over baseline Nasal flaring	No high risk or moderate to high risk criteria met
	Under 1 year	Raised respiratory rate: 60 breaths per minute or more	Raised respiratory rate: 50–59 breaths per minute	
	1–2 years	Raised respiratory rate: 50 breaths per minute or more	Raised respiratory rate: 40–49 breaths per minute	
	3–4 years	Raised respiratory rate: 40 breaths per minute or more	Raised respiratory rate: 35–39 breaths per minute	
Circulation and hydration	Any	Bradycardia: heart rate less than 60 beats per minute	Capillary refill time of 3 seconds or more Reduced urine output For catheterised patients, passed less than 1 mL/kg of urine per hour	No high risk or moderate to high risk criteria met
	Under 1 year	Rapid heart rate: 160 beats per minute or more	Rapid heart rate: 150–159 beats per minute	
	1–2 years	Rapid heart rate: 150 beats per minute or more	Rapid heart rate: 140–149 beats per minute	
	3–4 years	Rapid heart rate: 140 beats per minute or more	Rapid heart rate: 130–139 beats per minute	

Table 3 (continued)

Category	Age	High risk criteria	Moderate to high risk criteria	Low risk criteria
Skin	Any	Mottled or ashen appearance Cyanosis of skin, lips or tongue Non-blanching rash of skin	Pallor of skin, lips or tongue	Normal colour
Temperature	Any Under 3 months 3–6 months	Less than 36 °C 38 °C or more	39°C or more	
Other	Any		Leg pain Cold hands or feet	No high risk or high to moderate risk criteria met

This table is adapted from NICE's guideline on fever in under 5s. A downloadable version of this table [<https://www.nice.org.uk/guidance/ng51/resources/table-3-risk-stratification-tool-for-children-aged-under-5-years-with-suspected-sepsis-2551487007>] is also available.

1.4.8 Recognise that children aged under 5 years with suspected sepsis and any of the symptoms or signs below are at high risk of severe illness or death from sepsis:

- behaviour:
 - no response to social cues
 - appears ill to a healthcare professional
 - does not wake, or if roused does not stay awake
 - weak, high-pitched or continuous cry
- heart rate:
 - aged under 1 year, 160 beats per minute or more
 - aged 1–2 years, 150 beats per minute or more
 - aged 3–4 years, 140 beats per minute or more
 - heart rate less than 60 beats per minute at any age
- respiratory rate:
 - aged under 1 year, 60 breaths per minute or more
 - aged 1–2 years, 50 breaths per minute or more
 - aged 3–4 years, 40 breaths per minute or more
 - grunting
 - apnoea
 - oxygen saturation of less than 90% in air or increased oxygen requirement over baseline
- mottled or ashen appearance
- cyanosis of the skin, lips or tongue
- non-blanching rash of the skin
- aged under 3 months and temperature 38°C or more
- temperature less than 36°C.

[This recommendation is adapted from NICE's guideline on fever in under 5s (<http://www.nice.org.uk/guidance/cg160>).]

1.4.9 Recognise that children aged under 5 years with suspected sepsis and any of the symptoms or signs below are at moderate to high risk of severe illness or death from sepsis:

- behaviour:
 - not responding normally to social cues

- no smile
- wakes only with prolonged stimulation
- decreased activity
- parent or carer concern that the child is behaving differently from usual
- respiratory rate:
 - aged under 1 year, 50–59 breaths per minute
 - aged 1–2 years, 40–49 breaths per minute
 - aged 3–4 years, 35–39 breaths per minute
 - oxygen saturation less than 92% in air or increased oxygen requirement over baseline
 - nasal flaring
- heart rate:
 - aged under 1 year, 150–159 beats per minute
 - aged 1–2 years, 140–149 beats per minute
 - aged 3–4 years 130–139 beats per minute
- capillary refill time of 3 seconds or more
- reduced urine output, or for catheterised patients passed less than 1 mL/kg of urine per hour
- pallor of skin, lips or tongue reported by parent or carer
- aged 3–6 months and temperature 39°C or over
- have leg pain or cold hands or feet.

[This recommendation is adapted from NICE's guideline on fever in under 5s.]

1.4.10 Consider children aged under 5 years with suspected sepsis who do not meet any high or moderate to high risk criteria to be at low risk of severe illness or death from sepsis. [This recommendation is adapted from NICE's guideline on fever in under 5s.]

Children, Young People and Adults with Suspected Sepsis

Temperature in suspected sepsis

- 1.4.11 Do not use a person's temperature as the sole predictor of sepsis.

- 1.4.12 Do not rely on fever or hypothermia to rule sepsis either in or out.
- 1.4.13 Ask the person with suspected sepsis and their family or carers about any recent fever or rigors.
- 1.4.14 Take into account that some groups of people with sepsis may not develop a raised temperature. These include:
- people who are older or very frail
 - people having treatment for cancer
 - people severely ill with sepsis
 - young infants or children.
- 1.4.15 Take into account that a rise in temperature can be a physiological response, for example after surgery or trauma.

Heart rate in suspected sepsis

- 1.4.16 Interpret the heart rate of a person with suspected sepsis in context, taking into account that:
- baseline heart rate may be lower in young people and adults who are fit
 - baseline heart rate in pregnancy is 10–15 beats per minute more than normal
 - older people with an infection may not develop an increased heart rate
 - older people may develop a new arrhythmia in response to infection rather than an increased heart rate
 - heart rate response may be affected by medicines such as beta-blockers.

Blood pressure in suspected sepsis

- 1.4.17 Interpret blood pressure in the context of a person's previous blood pressure, if known. Be aware that the presence of normal blood pressure does not exclude sepsis in children and young people.

Confusion, mental state and cognitive state in suspected sepsis

- 1.4.18 Interpret a person's mental state in the context of their normal function and treat changes as being significant.
- 1.4.19 Be aware that changes in cognitive function may be subtle and assessment should include history from patient and family or carers.
- 1.4.20 Take into account that changes in cognitive function may present as changes in behaviour or irritability in both children and in adults with dementia.
- 1.4.21 Take into account that changes in cognitive function in older people may present as acute changes in functional abilities.

Oxygen saturation in suspected sepsis

- 1.4.22 Take into account that if peripheral oxygen saturation is difficult to measure in a person with suspected sepsis, this may indicate poor peripheral circulation because of shock.

1.5 Managing Suspected Sepsis Outside Acute Hospital Settings

- 1.5.1 Refer all people with suspected sepsis outside acute hospital settings for emergency medical care¹ by the most appropriate means of transport (usually 999 ambulance) if:
- they meet any high risk criteria (see Tables 1, 2 and 3) or
 - they are aged under 17 years and their immunity is impaired by drugs or illness and they have any moderate to high risk criteria.
- 1.5.2 Assess all people with suspected sepsis outside acute hospital settings with any moderate to high risk criteria to:
- make a definitive diagnosis of their condition
 - decide whether they can be treated safely outside hospital.
- If a definitive diagnosis is not reached or the person cannot be treated safely outside an acute hospital setting, refer them urgently for emergency care.
- 1.5.3 Provide people with suspected sepsis, 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.

1.6 Managing and Treating Suspected Sepsis in Acute Hospital Settings

Adults, Children and Young People Aged 12 Years and Over with Suspected Sepsis Who Meet 1 or More High Risk Criteria

- 1.6.1 For adults, children and young people aged 12 years and over who have suspected sepsis and 1 or more high risk criteria:
- arrange for immediate review by the senior clinical decision maker² to assess the person and think about alternative diagnoses to sepsis
 - carry out a venous blood test for the following:

¹Emergency care requires facilities for resuscitation to be available and depending on local services may be emergency department, medical admissions unit and for children may be paediatric ambulatory unit or paediatric medical admissions unit.

²A 'senior clinical decision maker' for people aged 18 years or over should be someone who is authorised to prescribe antibiotics, such as a doctor of grade CT3/ST3 or above or equivalent, such as an advanced nurse practitioner with antibiotic prescribing responsibilities, depending on local arrangements. A 'senior decision maker' for people aged 12–17 years is a paediatric or emergency care qualified doctor of grade ST4 or above or equivalent.

- blood gas including glucose and lactate measurement
 - blood culture
 - full blood count
 - C-reactive protein
 - urea and electrolytes
 - creatinine
 - a clotting screen
- give a broad-spectrum antimicrobial at the maximum recommended dose without delay (within 1 hour of identifying that they meet any high risk criteria in an acute hospital setting) in line with recommendations in section 1.7
 - discuss with a consultant.³
- 1.6.2 For adults, children and young people aged 12 years and over with suspected sepsis and any high risk criteria and lactate over 4 mmol/L, or systolic blood pressure less than 90 mmHg:
- give intravenous fluid bolus without delay (within 1 hour of identifying that they meet any high risk criteria in an acute hospital setting) in line with recommendations in section 1.8 **and**
 - refer⁴ to critical care⁵ for review of management including need for central venous access and initiation of inotropes or vasopressors.
- 1.6.3 For adults, children and young people aged 12 years and over with suspected sepsis and any high risk criteria and lactate between 2 and 4 mmol/L:
- give intravenous fluid bolus without delay (within 1 hour of identifying that they meet any high risk criteria in an acute hospital setting) in line with recommendations in section 1.8.
- 1.6.4 For adults, children and young people aged 12 years and over with suspected sepsis and any high risk criteria and lactate below 2 mmol/L:
- consider giving intravenous fluid bolus (in line with recommendations in section 1.8).
- 1.6.5 Monitor people 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 adult patients in acute hospital settings.

[This recommendation is adapted from NICE's guideline on acutely ill patients in hospital (<http://www.nice.org.uk/guidance/cg50>).]

- 1.6.6 Monitor the mental state of adults, children and young people aged 12 years and over with suspected sepsis. Consider using a scale such as the Glasgow Coma Scale (GCS) or AVPU ('alert, voice, pain, unresponsive') scale.
- 1.6.7 Alert a consultant to attend in person if an adult, child or young person aged 12 years or over 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:
- systolic blood pressure persistently below 90 mmHg
 - reduced level of consciousness despite resuscitation
 - respiratory rate over 25 breaths per minute or a new need for mechanical ventilation
 - lactate not reduced by more than 20% of initial value within 1 hour.

Adults, Children and Young People Aged 12 Years and Over with Suspected Sepsis Who Meet 2 or More Moderate to High Risk Criteria

- 1.6.8 For adults, children and young people aged 12 years and over with suspected sepsis and 2 or more moderate to high risk criteria, or systolic blood pressure 91–100 mmHg, 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
- and arrange for a clinician⁶ to review the person's condition and venous lactate results within 1 hour of meeting criteria in an acute hospital setting.
- 1.6.9 For adults, children and young people aged 12 years and over with suspected sepsis who meet 2 or more moderate to high risk criteria and have lactate over 2 mmol/L or evidence of acute kidney injury,⁷ treat as high risk and follow recommendations 1.6.1–1.6.7.
- 1.6.10 For adults, children and young people aged 12 years and over with suspected sepsis who meet 2 or more

³Appropriate consultant may be the consultant under whom the patient is admitted or a consultant covering acute medicine, anaesthetics.

⁴Referral may be a formal referral process or discussion with specialist in intensive care or intensive care outreach team.

⁵Critical care means an intensivist or intensive care outreach team, or specialist in intensive care or paediatric intensive care.

⁶A 'clinician' should be a medically qualified practitioner or equivalent who has antibiotic prescribing responsibilities.

⁷For definition of acute kidney injury, see NICE's guideline on acute kidney injury (<http://www.nice.org.uk/guidance/cg169>).

moderate to high risk criteria, have lactate of less than 2 mmol/L, no evidence of acute kidney injury⁷ and in whom a definitive condition cannot be identified:

- repeat structured assessment at least hourly
- ensure review by a senior clinical decision maker² within 3 hours of meeting 2 or more moderate to high risk criteria in an acute hospital setting for consideration of antibiotics.

1.6.11 For adults, children and young people aged 12 years and over with suspected sepsis who meet 2 or more moderate to high risk criteria, have lactate of less than 2 mmol/L, no evidence of acute kidney injury⁷ and in whom a definitive condition or infection can be identified and treated:

- manage the definitive condition
- if appropriate, discharge with information depending on the setting (see recommendations 1.11.5 and 1.11.6).

Adults, Children and Young People Aged 12 Years and Over with Suspected Sepsis Who Meet Only 1 Moderate to High Risk Criterion

1.6.12 For adults, children and young people aged 12 years and over with suspected sepsis who meet only 1 moderate to high risk criterion:

- arrange clinician⁶ review within 1 hour of meeting criterion for clinical assessment in an acute hospital setting
- perform blood tests if indicated.

1.6.13 For adults, children and young people aged 12 years and over 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 recommendations 1.11.5 and 1.11.6).

1.6.14 For adults, children and young people aged 12 years and over with suspected sepsis who meet only 1 moderate to high risk criterion, have lactate of less than 2 mmol/L, no evidence of acute kidney injury⁷ and in whom a definitive condition cannot be identified:

- repeat structured assessment at least hourly
- ensure review by a senior clinical decision maker² within 3 hours of meeting moderate to high criterion in an acute hospital setting for consideration of antibiotics.

Adults, Children and Young People Aged 12 Years and Over with Suspected Sepsis and No High Risk or Moderate to High Risk Criteria

- 1.6.15 Arrange clinical assessment⁸ of adults, children and young people aged 12 years and over who have suspected sepsis and no high risk or moderate to high risk criteria and manage according to clinical judgement.

Children Aged 5–11 Years

Children Aged 5–11 Years with Suspected Sepsis Who Meet 1 or More High Risk Criteria

1.6.16 For children aged 5–11 years who have suspected sepsis and 1 or more high risk criteria:

- arrange for immediate review by the senior clinical decision maker⁹ 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
 - a clotting screen
- give a broad-spectrum antimicrobial (see section 1.7) at the maximum recommended dose without delay (within 1 hour of identifying that they meet any high risk criteria in an acute hospital setting)
- discuss with a consultant.

1.6.17 For children aged 5–11 years with suspected sepsis and any high risk criteria and lactate over 4 mmol/L:

- give intravenous fluid bolus without delay (within 1 hour of identifying that they meet any high risk criteria in an acute hospital setting) in line with recommendations in section 1.8 **and**
- refer⁴ to critical care⁵ for review of central access and initiation of inotropes or vasopressors.

1.6.18 For children aged 5–11 years with suspected sepsis and any high risk criteria and lactate between 2 and 4 mmol/L:

⁸Clinical assessment should be carried out by a medically qualified practitioner or equivalent who has antibiotic prescribing responsibilities.

⁹A 'senior clinical decision maker' for children aged 5–11 years is a paediatric or emergency care doctor of grade ST4 or above or equivalent.

- 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) in line with recommendations in section 1.8.
- 1.6.19 For children aged 5–11 years with suspected sepsis and any high risk criteria and lactate below 2 mmol/L:
- consider giving intravenous fluid bolus in line with recommendations in section 1.8.
- 1.6.20 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. [This recommendation is adapted from NICE's guideline on acutely ill patients in hospital (<http://www.nice.org.uk/guidance/cg50>).]
- 1.6.21 Monitor the mental state of children aged 5–11 years with suspected sepsis. Consider using the Glasgow Coma Scale (GCS) or AVPU ('alert, voice, pain, unresponsive') scale.
- 1.6.22 Alert a consultant to attend in person if a child aged 5–11 years 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/L after 1 hour.

Children Aged 5–11 Years with Suspected Sepsis Who Meet 2 or More Moderate to High Risk Criteria

- 1.6.23 For children aged 5–11 years 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.
- 1.6.24 For children aged 5–11 years with suspected sepsis who meet 2 or more moderate to high risk criteria and have lactate over 2 mmol/L, treat as high risk and follow recommendations 1.6.16–1.6.22.
- 1.6.25 For children aged 5–11 years with suspected sepsis who meet 2 or more moderate to high risk criteria,

have lactate of less than 2 mmol/L, and in whom a definitive condition cannot be identified:

- repeat structured assessment at least hourly
 - ensure review by a senior clinical decision maker⁹ within 3 hours of meeting 2 or more moderate to high risk criteria in an acute hospital setting for consideration of antibiotics.
- 1.6.26 For children aged 5–11 years with suspected sepsis who meet 2 or more moderate to high risk criteria, have lactate of less than 2 mmol/L, 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 (see recommendations 1.11.5 and 1.11.6).

Children Aged 5–11 Years with Suspected Sepsis Who Meet Only 1 Moderate to High Risk Criterion

- 1.6.27 For children aged 5–11 years with suspected sepsis who meet only 1 moderate to high risk criterion:
- arrange clinician⁶ 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.
- 1.6.28 For children aged 5–11 years 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 recommendations 1.11.5 and 1.11.6).
- 1.6.29 For children aged 5–11 years 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 maker⁹ within 3 hours of meeting a moderate to high risk criterion in an acute hospital setting for consideration of antibiotics.

Children Aged 5–11 Years with Suspected Sepsis and No High Risk or Moderate to High Risk Criteria

- 1.6.30 Arrange clinical assessment¹⁰ of children aged 5–11 years who have suspected sepsis and no high risk

¹⁰This should be by a medically qualified practitioner or equivalent with prescribing responsibilities.

or moderate to high risk criteria and manage according to clinical judgement.

Children Aged Under 5 Years

Children Aged Under 5 Years with Suspected Sepsis Who Meet 1 or More High Risk Criteria

1.6.31 For children aged under 5 years who have suspected sepsis and 1 or more high risk criteria:

- arrange for immediate review by the senior clinical decision maker¹¹ to assess the child and think about alternative diagnoses to sepsis (for example bronchiolitis)
- 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
 - a clotting screen
- give a broad-spectrum antimicrobial at the maximum recommended dose without delay (within 1 hour of identifying that they meet any high risk criteria in an acute hospital setting; see section 1.7).
- discuss with a consultant.

1.6.32 For children aged under 5 years with suspected sepsis and any high risk criteria and lactate over 4 mmol/L:

- give intravenous fluid bolus without delay (in line with recommendations in section 1.8) **and**
- refer⁴ to critical care⁵ for review of central access and initiation of inotropes or vasopressors.

1.6.33 For children aged under 5 years with suspected sepsis and any high risk criteria and lactate between 2 and 4 mmol/L:

- give intravenous fluid bolus without delay (within 1 hour of identifying that they meet any high risk criteria in an acute hospital setting) in line with recommendations in section 1.8.

1.6.34 For children aged under 5 years with suspected sepsis and any high risk criteria and lactate below 2 mmol/L, consider giving intravenous fluid bolus in line with recommendations in section 1.8.

1.6.35 Monitor children aged under 5 years 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.

[This recommendation is adapted from NICE's guideline on acutely ill patients in hospital (<http://www.nice.org.uk/guidance/cg50>).]

1.6.36 Monitor the mental state of children under 5 years with suspected sepsis. Consider using the Glasgow Coma Scale (GCS) or AVPU ('alert, voice, pain, unresponsive') scale.

1.6.37 Alert a consultant to attend in person if a child aged under 5 years 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 over 2 mmol/L after 1 hour.

1.6.38 Give parenteral antibiotics to infants aged under 3 months as follows:

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

[This recommendation is from NICE's guideline on fever in under 5s (<http://www.nice.org.uk/guidance/cg160>).]

Children Aged Under 5 Years with Suspected Sepsis Who Meet 2 or More Moderate to High Risk Criteria

1.6.39 For children aged under 5 years 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 clinician⁶ to review the person's condition and venous lactate results within 1 hour of meeting 2 or more moderate to high risk criteria in an acute hospital setting.

1.6.40 For children aged under 5 years with suspected sepsis who meet 2 or more moderate to high risk criteria and have lactate over 2 mmol/L, treat as high risk and follow recommendations 1.6.31–1.6.37.

¹¹A 'senior clinical decision maker' for children aged under 5 years is a paediatric qualified doctor of grade ST4 or above.

1.6.41 For children aged under 5 years with suspected sepsis who meet 2 or more moderate to high risk criteria, have lactate of less than 2 mmol/L, and in whom a definitive condition cannot be identified:

- repeat structured assessment at least hourly
- ensure review by a senior clinical decision maker¹¹ within 3 hours of meeting 2 or more moderate to high risk criteria in an acute hospital setting for consideration of antibiotics.

1.6.42 For children aged under 5 years with suspected sepsis who meet 2 or more moderate to high risk criteria, have lactate of less than 2 mmol/L, 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 the setting (see recommendations 1.11.5 and 1.11.6).

Children Aged Under 5 Years with Suspected Sepsis Who Meet Only 1 Moderate to High Risk Criterion

1.6.43 For children aged under 5 years with suspected sepsis who meet only 1 moderate to high risk criterion:

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

1.6.44 For children aged under 5 years 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 recommendations 1.11.5 and 1.11.6).

1.6.45 For children aged under 5 years 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 maker¹¹ within 3 hours of meeting a moderate to high risk criterion in an acute hospital setting for consideration of antibiotics.

Children Aged Under 5 Years with Suspected Sepsis and No High Risk or Moderate to High Risk Criteria

1.6.46 Arrange clinical assessment⁸ of children aged under 5 years who have suspected sepsis and no high risk or moderate to high risk criteria and manage according to clinical judgement.

1.7 Antibiotic Treatment in People with Suspected Sepsis

- 1.7.1 Pre-alert secondary care (through GP or ambulance service) when any high risk criteria are met in a person with suspected sepsis outside of an acute hospital, and transfer them immediately.
- 1.7.2 Ensure urgent assessment mechanisms are in place to deliver antibiotics when any high risk criteria are met in secondary care (within 1 hour of meeting a high risk criterion in an acute hospital setting).
- 1.7.3 Ensure GPs and ambulance services have mechanisms in place to give antibiotics for people with high risk criteria in pre-hospital settings in locations where transfer time is more than 1 hour.
- 1.7.4 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. [This recommendation is adapted from NICE's guideline on antimicrobial stewardship (<http://www.nice.org.uk/guidance/ng15>).]
- 1.7.5 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. [This recommendation is adapted from NICE's guideline on meningitis (bacterial) and meningococcal septicaemia in under 16s (<http://www.nice.org.uk/guidance/cg102>).]
- 1.7.6 For all people with suspected sepsis where the source of infection is clear use existing local antimicrobial guidance.
- 1.7.7 For people aged 18 years and over who need an empirical intravenous antimicrobial for a suspected infection but who have no confirmed diagnosis, use an intravenous antimicrobial from the agreed local formulary and in line with local (where available) or national guidelines. [This recommendation is adapted from NICE's guideline on antimicrobial stewardship (<http://www.nice.org.uk/guidance/ng15>).]
- 1.7.8 For people aged up to 17 years (for neonates see recommendation 1.7.12) with suspected community acquired sepsis of any cause give ceftriaxone 80 mg/kg once a day with a maximum dose of 4 g daily at any age. [This recommendation is adapted from NICE's guideline on meningitis (bacterial) and meningococcal septicaemia in under 16s (<http://www.nice.org.uk/guidance/cg102>).]
- 1.7.9 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.

- 1.7.10 For children younger than 3 months, give an additional antibiotic active against listeria (for example, ampicillin or amoxicillin). [This recommendation is adapted from NICE's guideline on fever in under 5s (<http://www.nice.org.uk/guidance/cg160>).]
- 1.7.11 Treat neonates presenting in hospital with suspected sepsis in their first 72 hours with intravenous benzylpenicillin and gentamicin. [This recommendation is adapted from NICE's guideline on neonatal infection (<http://www.nice.org.uk/guidance/cg149>).]
- 1.7.12 Treat neonates who are more than 40 weeks corrected gestational age who present with community acquired sepsis with ceftriaxone 50 mg/kg unless already receiving an intravenous calcium infusion at the time. If 40 weeks corrected gestational age or below or receiving an intravenous calcium infusion use cefotaxime 50 mg/kg every 6–12 hours, depending on the age of the neonate.
- 1.7.13 Follow the recommendations in NICE's guideline on antimicrobial stewardship: systems and processes for effective antimicrobial medicine (<http://www.nice.org.uk/guidance/ng15>) when prescribing and using antibiotics to treat people with suspected or confirmed sepsis.
- 1.8.4 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 (in line with recommendations 1.6.7, 1.6.22 and 1.6.37).
- 1.8.5 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.
- 1.8.6 If using a pump or flow controller to deliver intravenous fluids for resuscitation to people over 12 years with suspected sepsis who need fluids in bolus form ensure device is capable of delivering fluid at required rate for example at least 2000 mL/hour in adults.
- 1.8.7 Do not use starch based solutions or hydroxyethyl starches for fluid resuscitation for people with sepsis. [This recommendation is adapted from NICE's guidelines on intravenous fluid therapy in adults in hospital (<http://www.nice.org.uk/guidance/cg174>) and intravenous fluid therapy in children and young people in hospital (<http://www.nice.org.uk/guidance/ng29>).]
- 1.8.8 Consider human albumin solution 4–5% for fluid resuscitation only in patients with sepsis and shock. [This recommendation is adapted from NICE's guideline on intravenous fluid therapy in adults in hospital (<http://www.nice.org.uk/guidance/cg174>).]

1.8 Intravenous Fluids in People with Suspected Sepsis

- 1.8.1 If patients over 16 years need intravenous fluid resuscitation, use crystalloids that contain sodium in the range 130–154 mmol/L with a bolus of 500 mL over less than 15 minutes. [This recommendation is from NICE's guideline on intravenous fluid therapy in adults in hospital (<http://www.nice.org.uk/guidance/cg174>).]
- 1.8.2 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/L, 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. [This recommendation is from NICE's guideline on intravenous fluid therapy in children and young people in hospital (<http://www.nice.org.uk/guidance/ng29>).]
- 1.8.3 If neonates need intravenous fluid resuscitation, use glucose-free crystalloids that contain sodium in the range 130–154 mmol/L, with a bolus of 10–20 mL/kg over less than 10 minutes. [This recommendation is from NICE's guideline on intravenous fluid therapy in children and young people in hospital (<http://www.nice.org.uk/guidance/ng29>).]

1.9 Using Oxygen in People with Suspected Sepsis

- 1.9.1 Give oxygen to achieve a target saturation of 94–98% for adult patients or 88–92% for those at risk of hypercapnic respiratory failure.
- 1.9.2 Oxygen should be given to children with suspected sepsis who have signs of shock or oxygen saturation (SpO₂) of less than 92% when breathing air. Treatment with oxygen should also be considered for children with an SpO₂ of greater than 92%, as clinically indicated. [This recommendation is adapted from NICE's guideline on fever in under 5s (<http://www.nice.org.uk/guidance/cg160>).]

1.10 Finding the Source of Infection in People with Suspected Sepsis

- 1.10.1 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.
- 1.10.2 Tailor investigations of the sources of infection to the person's clinical history and findings on examination.
- 1.10.3 Consider urine analysis and chest X-ray to identify the source of infection in all people with suspected sepsis.

- 1.10.4 Consider imaging of the abdomen and pelvis if no likely source of infection is identified after clinical examination and initial tests.
- 1.10.5 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.
- 1.10.6 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 $100 \times 10^9/L$ or receiving anticoagulant therapy
 - local superficial infection at the lumbar puncture site
 - respiratory insufficiency in children.

[This recommendation is adapted from NICE’s guideline on meningitis (bacterial) and meningococcal septicaemia in under 16s (<http://www.nice.org.uk/guidance/cg102>).]

- 1.10.7 Perform lumbar puncture in the following children with suspected sepsis (unless contraindicated, see contraindications in recommendation 1.10.6):
- 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 $5 \times 10^9/L$ or greater than $15 \times 10^9/L$.

[This recommendation is adapted from NICE’s guideline on fever in under 5s (<http://www.nice.org.uk/guidance/cg160>).]

1.11 Information and Support for People with Sepsis and Their Families and Carers

People Who Have Sepsis and Their Families and Carers

- 1.11.1 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.

- 1.11.2 Ensure information is given without using medical jargon. Check regularly that people understand the information and explanations they are given.
- 1.11.3 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.
- 1.11.4 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.

Information at Discharge for People Assessed for Suspected Sepsis, but not Diagnosed with Sepsis

- 1.11.5 Give people who have been assessed for sepsis but have been discharged without a diagnosis of sepsis (and their family or 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.
- 1.11.6 Confirm that people understand the information they have been given, and what actions they should take to get help if they need it.

Information at Discharge for People at Increased Risk of Sepsis

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

See NICE’s guideline on neutropenic sepsis (<http://www.nice.org.uk/guidance/cg151>) for information for people with neutropenic sepsis (recommendation 1.1.1.1).

Information at Discharge for People Who have had Sepsis

- 1.11.8 Ensure people and their families and carers if appropriate have been informed that they have had sepsis.
- 1.11.9 Ensure discharge notifications to GPs include the diagnosis of sepsis.

1.11.10 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 relevant
- possible short-term and long-term problems.

1.11.11 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.

1.11.12 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 guideline on rehabilitation after critical illness in adults (<http://www.nice.org.uk/guidance/cg83>) for recommendations on rehabilitation and follow up after critical illness.

See NICE's guideline on meningitis (bacterial) and meningococcal septicaemia in under 16s (<http://www.nice.org.uk/guidance/cg102>) for follow up of people who have had meningococcal septicaemia.

1.12 Training and Education

1.12.1 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.

1.12.2 Ensure all healthcare professionals involved in triage or early management are given regular appropriate training in identifying, assessing and managing sepsis. This should include:

- risk stratification strategies
- local protocols for early treatments, including antibiotics and intravenous fluids
- criteria and pathways for escalation, in line with their health care setting.

Terms Used in This Guideline

Sepsis

Sepsis is a life-threatening organ dysfunction due to a dysregulated host response to infection.

Suspected sepsis

Suspected sepsis is used to indicate people who might have sepsis and require face-to-face assessment and consideration of urgent intervention.

Putting this Guideline into Practice

NICE has produced tools and resources (<http://www.nice.org.uk/guidance/ng51/resources>) to help you put this guideline into practice.

Putting recommendations into practice can take time. How long may vary from guideline to guideline, and depends on how much change in practice or services is needed. Implementing change is most effective when aligned with local priorities.

Changes recommended for clinical practice that can be done quickly – like changes in prescribing practice – should be shared quickly. This is because health professionals should use guidelines to guide their work – as is required by professional regulating bodies such as the General Medical and Nursing and Midwifery Councils.

Changes should be implemented as soon as possible, unless there is a good reason for not doing so (for example, if it would be better value for money if a package of recommendations were all implemented at once).

Different organisations may need different approaches to implementation, depending upon their size and function. Sometimes individual practitioners may be able to respond to recommendations to improve their practice more quickly than large organisations.

Here are some pointers to help organisations put NICE guidelines into practice:

- 1 **Raise awareness** through routine communication channels, such as email or newsletters, regular meetings, internal staff briefings and other communications with all relevant partner organisations. Identify things staff can include in their own practice straight away.
- 2 **Identify a lead** with an interest in the topic to champion the guideline and motivate others to support its use and make service changes, and to find out any significant issues locally.
- 3 **Carry out a baseline assessment** against the recommendations to find out whether there are gaps in current service provision.
- 4 **Think about what data you need to measure improvement** and plan how you will collect it. You may want to work with other health and social care organisations and specialist groups to compare current practice with the recommendations. This may also help identify local issues that will slow or prevent implementation.

- 5 **Develop an action plan**, with the steps needed to put the guideline into practice, and make sure it is ready as soon as possible. Big, complex changes may take longer to implement, but some may be quick and easy to do. An action plan will help in both cases.
- 6 **For very big changes** include milestones and a business case, which will set out additional costs, savings and possible areas for disinvestment. A small project group could develop the action plan. The group might include the guideline champion, a senior organisational sponsor, staff involved in the associated services, finance and information professionals.
- 7 **Implement the action plan** with oversight from the lead and the project group. Big projects may also need project management support.
- 8 **Review and monitor** how well the guideline is being implemented through the project group. Share progress with those involved in making improvements, as well as relevant boards and local partners.

NICE provides a comprehensive programme of support and resources to maximise uptake and use of evidence and guidance. See our into practice (<https://www.nice.org.uk/about/what-we-do/into-practice>) pages for more information.

Also see Leng G, Moore V, Abraham S, editors (2014) *Achieving high quality care – practical experience from NICE*. Chichester: Wiley.

Context

Sepsis is a clinical syndrome caused by the body's immune and coagulation systems being switched on by an infection. Sepsis with shock is a life-threatening condition that is characterised by low blood pressure despite adequate fluid replacement, and organ dysfunction or failure. Sepsis is an important cause of death in people of all ages. Both a UK Parliamentary and Health Service Ombudsman enquiry (2013) and a UK National Confidential Enquiry into Patient Outcome and Death (NCEPOD, 2015) highlighted sepsis as being a leading cause of avoidable death that kills more people than breast, bowel and prostate cancer combined.

Sepsis is difficult to diagnose with certainty. Although people with sepsis may have a history of infection, fever is not present in all cases. The signs and symptoms of sepsis can be very non-specific and can be missed if clinicians do not think 'could this be sepsis?'. In the same way that healthcare professionals consider 'could this pain be cardiac in origin?' when presented with someone of any age with chest pain this guideline aims to make 'could this be sepsis?' the first consideration for anyone presenting with a possible infection.

Detailed guidelines exist for the management of sepsis in adult and paediatric intensive care units, and by intensive care clinicians called to other settings. To reduce avoidable deaths, people with sepsis need to be recognised early and treatment

initiated. This guideline aims to ensure healthcare systems in all clinical settings consider sepsis as an immediate life-threatening condition that should be recognised and treated as an emergency. The guideline outlines the immediate actions needed for those with suspicion of sepsis and who are at highest risk of morbidity and mortality from sepsis. It provides a framework for risk assessment, treatment and follow-up or 'safety-netting' of people not needing immediate resuscitation. The intention of this guideline is to ensure that all people with sepsis due to any cause are recognised and initial treatment initiated before definitive treatment on other specific pathways is instituted.

At the time of writing, the terminology around sepsis is changing and new international consensus definitions have been published. Previous terminology included terms SIRS (systemic inflammatory response syndrome), severe sepsis and septic shock but new terminology suggests using terms sepsis and septic shock only. Sepsis is defined as a life-threatening organ dysfunction due to a dysregulated host response to infection and septic shock as persisting hypotension requiring vasopressors to maintain a mean arterial pressure (MAP) of 65 mmHg or more and having a serum lactate level of greater than 2 mmol/L despite adequate volume resuscitation. Neither of these definitions are useful in early identification of people at risk and the guideline recommends actions according to clinical parameters that stratify risk of severe illness or death from sepsis.

There is significant overlap between this guideline and other NICE guidance, in particular the care of acutely ill patients in hospital, the assessment and initial management of fever in under 5s, bacterial meningitis and meningococcal septicaemia (Meningitis (bacterial) and meningococcal septicaemia in under 16s), neutropenic sepsis, antibiotics for prevention and treatment of neonatal infection, and pneumonia in adults.

More Information

You can also see this guideline in the NICE pathway on sepsis [<http://pathways.nice.org.uk/pathways/sepsis>].

To find out what NICE has said on topics related to this guideline, see our web page on infections [<https://www.nice.org.uk/guidance/conditions-and-diseases/infections>].

See also the guideline committee's discussion and the evidence reviews (in the full guideline [<http://www.nice.org.uk/Guidance/NG51/evidence>]), and information about how the guideline was developed [<http://www.nice.org.uk/Guidance/NG51/documents>], including details of the committee.

Recommendations for Research

The guideline committee has made the following recommendations for research.

1 Epidemiological Study on Presentation and Management of Sepsis in England

What is the incidence, presentation and management of sepsis in the United Kingdom?

Why this is important

The lack of robust UK based epidemiological studies on the incidence and outcomes from sepsis have been clear throughout the guideline development process. A large epidemiological study to collect information about where sepsis is being treated, patient interventions and patient outcomes would provide population based statistics on epidemiology of sepsis which are necessary to support evaluation of interventions, planning of services and service redesign. The mortality and morbidity and service complexity associated with severe infection and sepsis, and the need to use broad spectrum antimicrobials to treat sepsis, justifies the cost required to set up such a study.

2 A Complex Service Evaluation of Implementation of NICE Sepsis Guideline

What effect will the NICE sepsis guideline have on patient care processes and outcomes in the UK over the next 5 years?

Why this is important

Implementation of NICE's guideline on sepsis will be a challenge to the NHS. A robust evaluation of how NHS service providers adhere to the recommended care processes needs to be carried out over the next 5 years.

A complex evaluation is needed to understand the effect of guidelines on services and on patient outcomes. Evaluation should include assessment of costs and cost effectiveness, the use of a universal audit tool for sepsis patient care that includes evaluation of pre-hospital and secondary care and monitoring of broad spectrum antibiotic use, development of multi-resistant organisms and incidence of antibiotic-related infection such as *C. difficile*.

3 Use of Biomarkers to Diagnose and Initiate Treatment

What is the clinical and cost effectiveness of procalcitonin (PCT) point-of-care tests at initial triage for diagnosis of serious infection and the initiation of appropriate antibiotic therapy?

Why this is important

There is an urgent clinical need for accurate biomarkers of serious bacterial infection (SBI) which provide early diagnosis

of SBI, and prompt clinical interventions to improve outcomes. The current tests used in the NHS (white cell count and C-reactive protein) are non-specific and not sensitive enough. Biomarker-guided initiation and termination of antibiotic therapy might be an effective strategy to reduce unnecessary antibiotic use and help prevent further multidrug resistance. The NICE diagnostic guidance on procalcitonin for diagnosing and monitoring sepsis [<http://www.nice.org.uk/guidance/dg18>] has shown there is not enough evidence in this area.

4 Validation of Clinical Early Warning Scores in Pre-Hospital and Emergency Care Settings

Can early warning scores, for example NEWS (national early warning scores for adults) and PEWS (paediatric early warning score), be used to improve the detection of sepsis and facilitate prompt and appropriate clinical response in pre-hospital settings and in emergency departments?

Why this is important

Delay in detecting and treating sepsis increases mortality. Early detection and appropriate management will reduce morbidity and mortality and will reduce NHS costs by reducing critical care admissions, inappropriate antimicrobial use and length of hospital stay. No high quality data exist on the validation or use of early warning scores in pre-hospital settings or in the emergency department settings. The use of scores might improve communication between pre-hospital settings and hospital settings and allow recognition of people who need more urgent assessment.

5 Derivation of Clinical Decision Rules in Suspected Sepsis

Is it possible to derive and validate a set of clinical decision rules or a predictive tool to rule out sepsis which can be applied to patients presenting to hospital; with suspected sepsis?

Why this is important

In primary care and emergency departments people with suspected sepsis are often seen by relatively inexperienced doctors. Many of these people will be in low and medium risk groups but evidence is lacking as to who can be sent home safely and who needs intravenous or oral antibiotics. The consequences of getting the decision making wrong can be catastrophic and therefore many patients are potentially over-investigated and admitted inappropriately. Current guidance is dependent on use of individual variables informed by low quality evidence.

Update Information

September 2017: Recommendation 1.4.3 was corrected to properly divide 2 bullet points. Table 3 and recommendations 1.4.9 and 1.9.2 were corrected to give oxygen saturation as less than 92% in air. Table 2 was amended to include tympanic temperature as a moderate risk factor. Table 3 was amended to add pallor of skin, lips or tongue as an intermediate to high risk factor, and recommendation 1.4.9 was amended to remove pale or flushed as an intermediate risk factor. Minor corrections for consistency have been made between the recommendations, tables and algorithms. The accompanying algorithms have been redesigned to help with readability.

July 2016: The accompanying algorithms and risk tables have had some minor typographical errors corrected, and reference to systolic blood pressure levels wrongly included in some algorithms for children have been removed.

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