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Sepsis Decision Support Tool for Primary Dental Care

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A guide for managing suspected sepsis in patients in the primary dental care setting.

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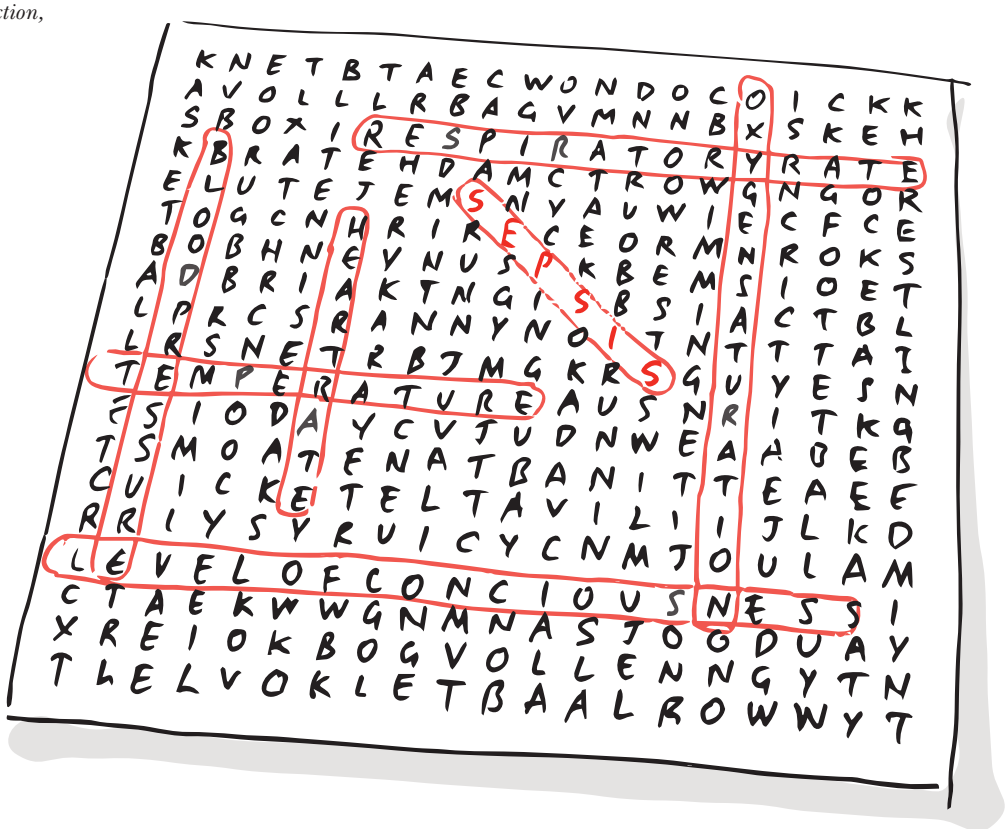

Sepsis is a 'life-threatening organ dysfunction due to a dysregulated host response to infection'.[1] If not spotted and treated quickly, sepsis can lead rapidly to septic shock, multiorgan failure and ultimately, death. Sepsis has been acknowledged as a medical emergency. Caught early, the outlook is good for the vast majority of patients. It is therefore crucial not to delay seeking medical treatment. International recommendations suggest that treatment should be commenced within one hour of a suspicion of sepsis, as this can halt the progression and hugely improves outcomes for patients.[2] Approximately 52,000 people die from sepsis in the UK each year.[2]

Sepsis is almost unique among acute conditions in that it affects all age groups, and it can present in any clinical area and health sector, including primary dental care, where over 70% of cases arise in the community.[3] Sepsis can occur as part of the body's response to any type of infection, including dental. Although associated with odontogenic infections, it is rarely reported in the literature, which consists mainly of case reports involving various dental procedures that can result in transient bacteraemia, precipitating systemic spread of infections.

Spontaneous dissemination of odontogenic infections is believed to be very unusual in healthy individuals but the few cases that are reported are associated with medically compromised patients, who are more susceptible to systemic (rather than local) infections.[4] Consequently, as dental care professionals, it is vital that we are aware of sepsis and consider the possibility in all our patients presenting with dental infections. Thankfully, death from odontogenic infections is rare.[4]

For the general dental practitioner

Sepsis is considered a medical emergency as it is a life-threatening condition that can affect multiple organs and it can rapidly progress to septic shock. Seventy per cent of cases occur in the community setting (which includes primary dental care settings). As general dental practitioners, we should screen all patients presenting with oral, dental and facial infections for potential signs of sepsis. We should be particularly cautious with immunocompromised patients (including diabetic patients and patients undergoing chemotherapy) and patients who have had recent surgery (including invasive dental procedures and oral surgery). The Sepsis Decision Support Tool for Primary Dental Care (SepDenT) has been developed as a tool for general dental practitioners to screen potentially septic patients and to arrange early transfer to a general hospital for emergency treatment of sepsis. For the best outcome, treatment for sepsis should ideally commence within one hour of potential diagnosis.

The National Institute for Health and Care Excellence (NICE) has published guidance with regard to sepsis that includes recommendations for managing suspected sepsis outside of acute hospital settings.[1] We felt there was a need to produce a specific protocol for use in the primary dental care setting as the algorithms presented by NICE are medically orientated. For this reason, the UK Sepsis Trust (in collaboration with the oral surgery department at Birmingham Dental Hospital) has developed the Sepsis Decision Support Tool for Primary Dental Care (SepDenT), with the emphasis being on rapid diagnosis and transfer of dental patients 'suspected of sepsis' to an acute hospital setting. Rapid treatment in a hospital with the recommended 'sepsis six' interventions (Figure 1) has been shown to double survival rates among patients with sepsis.[5]

This tool consists of three algorithms to be applied according to the age of the patient: children aged <5 years, children aged 5–11 years, or adults or young people aged ≥12 years. The SepDenT can be downloaded from the UK Sepsis Trust website at: https://sepsistrust.org/professional-resources/clinical. Alternatively, it can be obtained directly on request from the UK Sepsis Trust.

When to suspect sepsis

Think 'Could this be sepsis?' in dental patients presenting with signs or symptoms of orofacial infections (step 1 of the SepDenT). Sepsis can have non-specific, non-localised presentations such as feeling very unwell without a high temperature. Emphasis should be placed on obtaining a thorough history regardless of communication difficulties, which may occur in cases of patients with English as a second language or people with communication problems. Communication aids should be considered in such situations. Consideration must be given to the concerns expressed by the patient, parent or carer.

For the general dental practitioner – step 1 of the SepDenT

1. In the context of presumed infection, are any of the following true?
(Consider other common sources: chest, UTI, abdominal organs)

	Tick
Patient looks very unwell	☐
Family or carer is very concerned	☐
There is ongoing deterioration	☐
Physiology is abnormal for this patient (check HR, oxygen saturation and BP)	☐

If a patient is considered at low risk of sepsis (ie does not fulfil at least one of the criteria of step 1 of the SepDenT), then investigate for and treat potential causes of infection (eg extraction of a non-vital tooth that may have the potential to progress to sepsis if left untreated).

Low risk of sepsis: consider other diagnoses. Use clinical judgment to diagnose and treat potential sources of infection (eg perform tooth extraction).

The following should be assessed in patients suspected of sepsis (steps 2 and 3 of the SepDenT):
- temperature;
- heart rate;
- respiratory rate;
- blood pressure (assessment of capillary refill time is recommended instead of blood pressure in children aged <12 years);
- level of consciousness;
- oxygen saturation.

For the general dental practitioner
General dental practices need not invest in expensive pulse oximeter machines. Instead, general dental practitioners should consider buying fingertip LED SpO_2 pulse oximeter, digital blood pressure and digital temperature machines, which are cheap and useful for having available in general practice as part of the medical emergency equipment. However, these are not yet included on the Resuscitation Council UK's recommended equipment list for primary dental care settings.[6]

Temperature
Temperature cannot be relied on as the sole predictor of sepsis; for example, the presence or absence of fever or hypothermia cannot rule sepsis in or out. Instead, ask the patient, parent or carer about any recent fever or rigors. Certain groups of patients with sepsis may not develop a raised temperature. These include:
- the frail or elderly;
- those undertaking cancer treatment;
- young infants or children.

Recommended temperature parameters indicating possible underlying sepsis:
- ≥12 years: ≤36°C;
- 5–11 years: <36°C;
- <5 years: <36°C (if under 3 months: >38°C).

For the general dental practitioner
Patients presenting without a fever or raised temperature should not be excluded from suspicion of sepsis. Consider all parameters, according to the SepDenT.

Heart rate
Heart rate should be interpreted in context, taking the following into consideration:
- baseline heart rate tends to be lower in fit adults and the young;
- baseline heart rate in pregnancy is raised from normal by 10–15 beats per minute;
- older patients may develop arrhythmia instead of an increased heart rate in response to infection;
- heart rate response may be affected by medicines (eg beta-blockers).

Recommended heart rate parameters indicating possible underlying sepsis:
- ≥12 years: >90 beats per minute OR new dysrhythmia;
- 5–11 years: bradycardia (<60 beats per minute) OR moderate tachycardia (>105 beats per minute);
- <5 years: bradycardia (<60 beats per minute) OR moderate tachycardia (>130 beats per minute).

Blood pressure
Ideally, blood pressure should be compared with previous baseline measurements. Normal blood pressure does not exclude sepsis in children. Blood pressure should be taken with a correctly fitting cuff and you should only consider taking a blood pressure measurement in children aged <5 years presenting with abnormal heart rate (see section above) or abnormal capillary refill time.

Recommended blood pressure parameters indicating possible underlying sepsis:
- ≥12 years: systolic blood pressure ≤100 mmHg (or ≥40 mmHg below normal/baseline value);
- ≤11 years: capillary refill time ≥3 seconds.

Level of consciousness
Mental state should be compared with normal function, where even subtle differences are interpreted as significant. Consultation with the patient, parent or carer is recommended. Behavioural changes or irritability can be signs of changes in cognitive function in children and in adults with dementia.

For the general dental practitioner
The Glasgow Coma Scale (GCS) and the AVPU (Alert, Voice, Pain, Unresponsive) scale can be used to assess a patient's level of consciousness. The GCS assesses three patient components: eye movement, verbalisation and motor function. Each of these components is individually assigned a value and the scores for all three components are totalled, giving a maximum of 15 (where 15 indicates full consciousness).[7]

The AVPU scale is a simplification of the GCS. 'A' is defined as a fully awake patient who demonstrates spontaneous eye opening, who responds to voice and who has bodily motor function. 'V' is defined as a patient responding to verbal stimulus through any of the three component measures of eye movement, verbalisation or motor response. 'P' is defined as a patient responding to pain stimulus only. 'U' is defined as an unresponsive patient, not responding to verbal or pain stimulation.

We would recommend the use of the AVPU scale by general dental practitioners as a simplified screening tool for the assessment of level of consciousness in their patients. This should be in addition to focusing on the concerns of family members and carers, especially in young and special care patients.

Oxygen saturation
Peripheral oxygen saturation is difficult to measure in a septic patient and may indicate poor peripheral circulation related to shock.

Recommended oxygen saturation parameters indicating possible underlying sepsis:
- ≥12 years: oxygen administration required to maintain SpO_2 ≥92% (88% in COPD);
- 5–11 years: SpO_2 <90% on air;
- <5 years: SpO_2 <90% OR nasal flaring.

Examine the skin, identifying mottled or ashen appearance, cyanosis of the skin, lips or tongue, non-blanching rashes and breaches of skin integrity (cuts, burns, other rashes or skin infections). Ask the patient, parent or carer about the frequency of urination in the past 18 hours (eg not passed urine in past 12–18 hours or no wet nappies for infants).

Summary
Assess the patient to identify:
- possible sources of infection (step 1 of the SepDenT) and treat them (for example, by extracting the causative tooth);
- factors that increase risk of sepsis, included in the list of red flags (step 2 of the SepDenT) and amber flags (step 3 of the SepDenT) (see section below on patients at greater risk of developing sepsis);
- presence of indicators of clinical concern (eg new onset abnormalities of behaviour, circulation or respiration) and act on this (step 3 of the SepDenT).

Assessment for factors that increase the risk of sepsis and indicators of clinical concern will ascertain whether a diagnosis of sepsis is likely and the need for urgent transfer of the patient to an acute hospital setting.

As dental care professionals, it is vital that we are aware of sepsis and consider the possibility in all our patients presenting with dental infections

THE SEPSIS SIX

To manage sepsis, it's become clear that a rapid response, managing the patient using the basics of care and escalating when the patient doesn't respond is more effective than any complex pathway.

The Sepsis Six was developed by founders of the UK Sepsis Trust in 2005 as an operational solution to a set of complex yet robust guidelines developed by the International Surviving Sepsis Campaign.

1. GIVE 0_2 TO KEEP SATS ABOVE 94%
2. TAKE BLOOD CULTURES
3. GIVE IV ANTIBIOTICS
4. GIVE A FLUID CHALLENGE
5. MEASURE LACTATE
6. MEASURE URINE OUTPUT

Figure 1 The recommended 'Sepsis Six' interventions[2] (reproduced with permission from the UK Sepsis Trust)

Patients at greater risk of developing sepsis include:[1]
- the very young (<1 year), older people (>75 years) and very frail patients;
- immunocompromised patients, including:
  - those undergoing chemotherapy (suspect neutropaenic sepsis in patients having anticancer treatment who become unwell and immediately refer to secondary care),
  - those with an impaired immune function (eg diabetes, splenectomy or sickle cell disease),
  - those on long-term steroids,
  - those on immunosuppressant therapy for non-malignant disorders such as rheumatoid arthritis;
- patients sustaining trauma or who have undergone surgery or other invasive procedures in the past six weeks;
- patients with breach of skin integrity (eg cuts, burns, blisters or skin infections);
- intravenous drug users;
- patients with indwelling lines or catheters;
- women who have given birth or had a termination of pregnancy or miscarriage in the past six weeks.

It would be pertinent to ensure that these patients at increased risk of sepsis are given specific advice on the signs and symptoms of sepsis following invasive dental procedures and surgery that should instruct them on how to seek urgent medical attention if sepsis is suspected.

Conclusions

Although reports of death related to dental infections are rare, dental care professionals are increasingly treating patients with complex medical conditions in primary dental care settings, including immunocompromised patients, who have been reported to be at increased susceptibility to sepsis. Utilisation of the SepDenT by dental care professionals will aid prompt transfer of patients presenting with orofacial infections suspected of sepsis to an acute hospital setting for early treatment that will ultimately improve sepsis survival rates.

For the general dental practitioner – steps 2 and 3 of the SepDenT for adults and young people aged ≥12 years

2. Is ONE red flag present?

	Tick
New deterioration in GCS/AVPU	☐
Systolic BP ≤90 mmHg (or ≥40 mmHg below normal)	☐
Heart rate ≥130 per minute	☐
Respiratory rate ≥25 per minute	☐
Needs oxygen to keep SpO_2 ≥92% (88% in COPD)	☐
Non-blanching rash or mottled/ashen/cyanotic	☐
Not passed urine in past 18 hours	☐
Recent chemotherapy (within past 6 weeks)	☐

N

3. Is ONE amber flag present?

	Tick
Relatives worried about mental state/behaviour	☐
Acute deterioration in functional ability	☐
Immunosuppressed (without recent chemotherapy)	☐
Trauma, surgery or procedure in past 6 weeks	☐
Respiratory rate 21–24 OR dyspnoeic	☐
Systolic BP 91–100 mmHg	☐
Heart rate 91–130 OR new dysrhythmia	☐
Not passed urine in past 12–18 hours	☐
Tympanic temperature ≤36°C	☐
Clinical signs of wound, device or skin infection	☐

If under 17 and immunity impaired, treat as red flag sepsis

Y

Sepsis likely

Use clinical judgment to determine whether patient can be managed in the primary care setting. If treating in the primary care setting, consider:

- identifying and treating potential sources of infection;
- planned second assessment +/- blood results;
- brief written handover to colleagues;
- specific safety netting advice.

Y

Red flag sepsis

Immediate actions:
Dial 999 and state the patient has 'red flag sepsis'
Arrange blue light transfer
Administer oxygen to maintain saturations >94%

Communication:
Write a brief clear handover including observations and antibiotic allergies where present
Ensure paramedics pre-alert as 'red flag sepsis'

In the absence of factors that increase risk of sepsis and indicators of clinical concern (ie no red or amber flags), give safety netting advice to the patient, parent or carer. This consists of contacting emergency services or seeking prompt medical assessment if the condition fails to improve or gradually worsens. This should be followed by providing written information leaflets describing the signs and symptoms of sepsis and giving emergency contact information.

Give safety netting advice: call 999 if patient deteriorates rapidly, or call 111/arrange to see GP or GDP if condition fails to improve or gradually worsens. Provide an information leaflet on the signs/symptoms of sepsis and emergency contact details.

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