

# Sepsis and chronic wounds: the extent of the issue and what we should we be aware of

## CONTRIBUTORS

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In 2013, the UK identified sepsis management as an NHS clinical priority. The literature strongly suggests that sepsis is a massive problem for healthcare services throughout the world and, in those areas where robust statistics are available, the disease burden is high and incidence and mortality are increasing dramatically. Reasons given for this include antibiotic resistance, increased bacterial virulence and an aging population. The economic burden is similarly high, making improvement in diagnosis and care clinical priorities. Gaps in care delivery have been identified and there is evidence of an opportunity for cost-effective quality improvement. Those clinicians involved in wound management, whether acute or chronic, have a major part to play. Wounds of all aetiologies represent a risk for the development of severe sepsis, defined below. Appropriate and timely management of wound bioburden and infection is integral to the avoidance of morbidity due to sepsis.

Whilst it is widely recognised that patients with burns, traumatic soft tissue injuries and surgical wounds can, and do, develop life-threatening infection (Johnston et al, 2013), it is less so for most 'chronic' wound patients.

Sepsis, once referred to as 'septicaemia' is defined as 'a systemic inflammatory response syndrome (SIRS) initiated by infection' (Kleinpell et al, 2013). It is one of the main causes of morbidity and mortality worldwide with an annual incidence of 60 per 100,000 patients in the UK (Shahin et al, 2012) and 300 per 100,000 in the USA (Angus et al, 2001). This accounts for over 37,000 deaths per annum according to the UK Sepsis Trust (McPherson et al, 2013). It is estimated to be the third most common cause of death in the USA where the incidence has been increasing by 8–13% annually over the past decade (Marik, 2014). According to Prucha et al (2015), 'sepsis is the most frequent cause of death in non-coronary intensive care units. In the past ten years, progress has been made in the early identification of septic patients and in their treatment and these improvements in support and therapy mean that the mortality is gradually decreasing but it still remains unacceptably high.'

In pathophysiological terms, sepsis is an immune-inflammatory condition in which cytokines such as TNF- $\alpha$  and IL-1 $\beta$  mediate a systemic response to infection (Surbatovic et al, 2013). One of the key events in the development of sepsis is the activation of immune cells by pathogenic bacteria or their products (e.g. cell wall components and toxins). The clinical picture varies with the degree of infection. Sepsis *per se* is the presence of the SIRS criteria of hyperthermia (38.3°C), acutely altered mental state, heart rate >90 per minute, white cells <4 or >12 x 10<sup>9</sup> per litre, plus tachypnoea >20 per minute (Table 1). Severe sepsis and septic shock are further complications with additional criteria (Daniels, 2010).

The risk factors for sepsis have been divided into two groups: a) risk factors for infection, and b) risk factors for organ dysfunction

(Mayr et al, 2014). Thus for wound patients, age, perfusion, nutritional status, immune status, site and depth of wound, and comorbidities amongst other factors constitute infection risk. More than half of all severe sepsis cases occur in patients over 65 years (Mayr et al, 2010) or those with diabetes. In this context it is obvious that aged patients with pressure ulcers and double incontinence are 'at risk', as are patients with large body surface area burns. These examples, to the experienced wound clinician, will be widely-known risk factors.

Sepsis, together with bacteraemia, is recognised as a major hazard in patients with chronic wounds (Brem et al, 2003), being reported variously in diabetic foot ulcers (Sapico et al, 1982), pressure ulcers (Jaul, 2010; Messer, 2010), and leg ulcers (Ebright, 2005).

Every clinician involved in wound management should be aware of, and recognise, sepsis and its potential for morbidity and mortality. The simple criteria of **hyperthermia, acutely altered mental state, increased heart rate, plus tachypnoea** should be evident to all healthcare professionals and alert them to the possibility of ongoing serious acute illness. The death rate from sepsis and its

**Table 1. Diagnostic features suggestive of sepsis**

Diagnostic criteria	Threshold
Fever	>38.3°C
Tachycardia	>90/minute
Systolic blood pressure	<90 mmHg
Procalcitonin	>0.5 ng/ml
Lymphocytopenia	<4.0 or >12 x 10 <sup>9</sup> /l
Neutrophil/lymphocyte ratio	>10
Thrombocytopenia	<150 x 10 <sup>3</sup> ul
Lactate	>2.0 mmol/l

complications is far too high. To reduce this, a change in clinical practice is essential. The modern, evidence-based requirements for early and accurate diagnosis and appropriate intervention are well-documented (Koh et al, 2012; Martin, 2012; Schorr et al, 2014).

Whilst we cannot be precise on the contribution of wounds in general to sepsis, it is quite clear that any wound has the potential to lead to an increased clinical risk. As ever, early recognition, appropriate referral and intervention are likely to reduce morbidity. *Richard White*

### 1. To what extent do you feel that chronic wounds contribute to sepsis/SIRS in both community and acute settings?

**SJ:** Identifying the cause of the infection that has resulted in sepsis would allow that cause to be treated. Unfortunately, it is not always possible to identify the cause of the sepsis. According to the Parliamentary and Health Service Ombudsman Annual Report (2013), the most common causes of severe sepsis are pneumonia, bowel perforation, urinary infection and severe skin infection. In the presence of a chronic wound, infection of that wound would have to be considered as a likely cause in any patient with systemic sepsis. The extent of the size of pressure sores are often greatly underestimated. Even small ulcers can be extensively undermined, resulting in a large amount of necrotic tissue and a large surface area for the entry of bacteria. When, as is so often the case, the patient has underlying comorbidities that reduce their ability to resist infection, sepsis/SIRS is the outcome.

**AE:** Sepsis can be triggered by an infection in any part of the body and these common sites of infection are primarily the lungs, abdomen, pelvis, the urinary tract and the skin. Sepsis is a more common reason for hospital admission than heart attack, and has a higher mortality (Parliamentary and Health Service Ombudsman, 2013). There can be no question that patients

with chronic wounds contribute to sepsis both in the acute and primary care settings. We are seeing an increasing and ageing population living with multi-morbidity such as diabetes, obesity, compromised immune systems and cancers. These conditions place such individuals at a higher risk of developing infection and subsequent sepsis. Individuals with conditions such as chronic oedema or lymphoedema are at continued, increased risk of cellulitis, which if not effectively diagnosed, treated and managed can lead to an increased risk of sepsis. Clinical findings such as chronic leg ulcers and diabetic foot ulcers are the resultant manifestations of continuums of chronic underlying disease processes, where significant tissue damage and compromise have already occurred, and are therefore associated with insufficient healing and an increased risk of infection. Individuals with significant end stage, severe peripheral arterial disease (critical limb ischaemia) are often unable to promote healing of their lower limb tissues with resultant subsequent ulceration and tissue loss. The compromised blood flow to their lower extremities, means the ability to manage an effective response to localised infection becomes less likely increasing the risk of sepsis.

**KC:** The relationship between chronic wounds and sepsis has never been subjected to scrutiny in terms of prevalence/incidence or audit so we can only rely on intuition to assist in gauging the extent that chronic wounds contribute to the occurrence of sepsis in hospital and community settings. In order to manage a healthcare challenge successfully it is vital that the size of the problem is officially understood and acknowledged. A confounding problem in the UK is that, we have no idea of the national prevalence of pressure ulcers so how can we hope to understand the extent of the chronic wound/sepsis situation. Is it time to seek information through the Freedom of Information Act?

### 2. Do you think that nurses, both hospital and community, are sufficiently aware of sepsis and its risks for wound patients?

**SJ:** For every 6 hours delay in the diagnosis of sepsis, survival decreases by 10%. Therefore identifying sepsis early is critical. Nurses are the front line troops in medicine, and are best placed to flag up that a patient is becoming unwell. Sadly evidence indicates that delayed recognition of sepsis is common. Assessment of the patient in both primary/community settings and on hospital wards consists of evaluating physical signs and symptoms. Excessive systemic inflammatory response is one of the predominant mechanisms for SIRS. Scoring systems may be used to predict who is likely to develop severe sepsis and/or to help make a diagnosis in people with sepsis or severe sepsis. Any patient with a wound containing necrotic tissue is at risk of developing sepsis — this must be borne in mind every time you see such a patient.

**AE:** Over the last decade or so, nurses have been made more aware of the problems associated with infections, antibiotic resistance with the increase in methicillin-resistant staphylococcus aureus (MRSA) and related bacterial infections and the problems which these issues can bring to the various clinical settings and the implications for the patients that they are caring for. Despite various tools to assist the practitioner, there is still a way to go with recognising and appropriately managing chronic wounds which will always have an increased bacterial load by their very nature within the clinical setting. Routine swabbing of chronic leg ulcers is costly and often of little clinical value and can lead to inappropriate prescribing of antibiotic therapy. We cannot just look at the wound presented to us as clinicians, there is a fundamental need to assess the individual as a whole and identify factors which could increase their clinical risk of sepsis. Sepsis can be difficult to recognise in the early

stages (Peters and Cohen, 2013) and as nurses we are presented with individuals at an ever increasing risk of developing sepsis, so further continuing education needs to occur at both local and national levels. We also need to highlight the importance of prevention of sepsis within our daily clinical practice. Nurses involved in the specialist care of patients with both acute and chronic wounds have a fundamental role to play in highlighting the importance and danger of sepsis occurring in clinical practice.

**KC:** Nurses, both in the hospital and community, should be aware of sepsis risks. It has been pointed out that for wound patients, age, perfusion, nutritional status, immune status, site and depth of wound, and comorbidities constitute infection risk. These factors should be included as components of 'standard' assessment and therefore cannot be considered obscure. Awareness of the risk of sepsis to wound care patients amongst 'general' nurses should therefore not be below the radar and for those working in tissue viability there should be heightened awareness. In this context, it is important to note that standards of care for sepsis are achieved in only 20% of cases. This is despite internationally recognised guidelines being accepted by relevant professional bodies.

### 3. Do you think that doctors, both hospital and community, are sufficiently aware of sepsis and its risks for wound patients?

**SJ:** Clinicians often struggle to identify early cases of sepsis that need urgent treatment to prevent progression to severe sepsis. Consensus definitions for sepsis in the critically ill population couple criteria for SIRS with the documented presence of infection, following the guidelines from the American College of Chest Physicians (ACCP), Society of Critical Care Medicine (SCCM) and the European Society of Intensive Care Medicine (ESICM). These

guidelines were not designed to help clinicians recognise sepsis. They were designed to establish whether patients were eligible to join clinical trials! Nevertheless, they are useful for clinicians in diagnosing sepsis. Unfortunately some doctors (particularly non-surgeons) ignore any chronic wounds patients may have. They may not even take the dressings down! In assessing a patient with sepsis, the whole patient needs to be examined in order to find a cause. This includes taking down every dressing and examining every wound.

**AE:** When you consider the figures presented as evidence before us — 37,000 people in the UK dying as a result of sepsis each year (Parliamentary and Health Service Ombudsman, 2013) — there is little doubt that there is a fundamental need to heighten the awareness of the recognition, diagnosis and treatment of patients with sepsis with medical practitioners, in addition to the prevention in the first instance. It is probably high on the agenda for critical care practitioners but we need to ensure it has a heightened awareness and importance in a more generalist setting to promote early intervention. The UK Sepsis Trust (2105) advocates the use of the Sepsis six tool which recommends six urgent interventions with a diagnosis of sepsis: high flow oxygen, blood cultures, broad spectrum antibiotics, intravenous fluid challenges, serum lactate and haemoglobin levels and close, accurate urinary output monitoring. There is little question that the clinical signs of suspected sepsis should be seen as a clinical emergency. Modern medicine and its achievements clearly saves lives but with this comes an increased risk of sepsis.

**KC:** Doctors working in the hospital or community setting should be acutely aware of the risk of sepsis in all patient groups. However, and this also applies to nurses, there are acknowledged difficulties with recognising sepsis through accurate diagnosis. There are also challenges

involved in the treatment of sepsis. Blood cultures often return negative findings leaving the clinician with little option but to prescribe broad-spectrum antibiotics. Administering antibiotics that are not specifically targeted increases the risk of bacterial selection for resistance. However, waiting for a positive blood culture before prescribing antibiotics is not acceptable as mortality increase by 10% for every 6 hour delay in prescribing.

### 4. Does your department or Trust have a comprehensive guideline for the recognition, diagnosis and management of sepsis/SIRS?

**SJ:** Yes, we have very clear guidelines, including:

- a) Recognition and assessment: symptoms, signs and investigations
- b) Life-threatening features
- c) Initial management with a sepsis care bundle, including antibiotic treatment and fluid resuscitation
- d) Subsequent management.

Early identification of sepsis allows appropriate treatment to be started quickly. People with sepsis or suspected sepsis can deteriorate quickly, and appropriate monitoring can identify this deterioration and detect response to treatment. These guidelines provide a framework for current intensive care management. Catecholamines remain the primary vasopressors used to treat hypotension during septic shock after IV fluid resuscitation. In septic shock, the use of low-dose corticosteroids has been proposed as an adjunctive therapy to reduce mortality and improve shock reversal. Sepsis is a major cause of death in the intensive care units, with a mortality rate of about 30%. When severe sepsis resolves, recovery is normally complete. In the event of death, the Coroner's office needs to be informed.

**AE:** Our trust in line with many, has a comprehensive guideline for the

recognition, diagnosis and management of sepsis. Again, like most there is a very effective and vital infection control department. The problem for practitioners both medical and nursing, is that we are increasingly presented with a variety of information, best practice guidelines, policies and these are continually changing, becoming increasingly complex and evolving in the light of clinical research and evidence, that it becomes increasingly challenging for clinicians to keep up to date, to find the time to access and read this information and prioritise the relevance of the information, in addition to attempting to apply it in practice. We have to see sepsis prevention and management as a clinical priority.

### 5. What steps would you take a) locally, and b) nationally to reduce the incidence of sepsis/SIRS in wound patients?

**SJ:** Locally, we are working towards developing better aids to diagnose sepsis earlier. The use of standard markers of infection can be misleading in sepsis as apparently normal test results (such as for white cell count) may be associated with an overwhelmed immune response. Blood culture, although helpful, is of limited value due to frequent absence of bacteraemia in many cases of obvious life threatening sepsis. Neutrophil function is thought to be important in the development of sepsis and work is currently on-going in Birmingham to elucidate this further.

Nationally, I am looking forward to July 2016 when the NICE guidelines: 'Sepsis: the recognition, diagnosis and management of severe sepsis' are due to be published.

To prevent infection developing, I hope that better use of the various debridement techniques now available, and the use of topical antimicrobials, e.g. prontosan will prevent and manage wound biofilm and reduce the progression from contamination to colonisation to local infection and then systemic infection.

**AE:** Sepsis leads to shock, multiple organ failure and death if not recognized early and treated promptly. Individuals with wounds we have identified are already compromised and have a potential source of sepsis. Local wound care policies and assessment forms used in clinical practice need to highlight the increased risk of potential sepsis within this cohort of patients, in order for practitioners to be increasingly vigilant regarding the risk of developing sepsis. Patients at increased risk of sepsis need to be identified and closely monitored and action swiftly taken if sepsis is suspected. Practitioners need to manage the bioburden effectively within chronic wounds and not rely on anti-bacterial dressings to prevent infection developing.

From a national perspective, there is continuing need to advance the sepsis agenda and to continue to heighten the awareness of sepsis with all levels of clinicians, through effective communication and education. This will not only save lives but fundamentally improve the outcomes for individuals presenting with clinical sepsis. The National Institute for Health and Care Excellence (NICE) are currently developing guidance on the recognition, diagnosis and management of sepsis and this is due for publication in July 2016. There needs to be clear, uniform, succinct and accessible guidance to increase awareness, increase early identification and improve the management of patients with sepsis. This will in turn reduce the variation seen in clinical practice and improve outcomes for all concerned, and possibly prevent missed opportunities to save lives.

**KC:** There has to be widespread and effective education amongst clinical and lay communities to raise awareness of the risk of sepsis and in its recognition; like the very successful national campaign to raise awareness of stroke and the importance of obtaining early intervention. It is important to note that annual deaths from lung cancer in the UK are broadly similar to the sepsis mortality rate. With sepsis and wounds

early intervention is key to success but we also have to be aware of the dangers of over-diagnosis, e.g. pseudosepsis. **WUK**

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