

Abstract

Sepsis is a life-threatening and common condition prompted by a microbial infection. Sepsis is responsible for the death of more people than prostate, bowel or breast cancer collectively, and it causes the second highest mortality rates after cardiovascular disease. The majority of sepsis cases occur in the community, with 30% developing whilst the patient is in hospital. In many instances, sepsis is avoidable and treatable. The aetiology of sepsis is not always known, making diagnosis difficult, with only 50% of cases having a confirmed pathogenic organism. The signs and symptoms most obviously connected with sepsis are confusion or unusual behaviour, hypotension and increased respiratory rate. However, some patients have non-specific symptoms, and just complain of feeling extremely unwell. Any patients who have signs or symptoms should be assessed for the possibility of sepsis, regardless of whether pyrexia is present. To aid in detection and decision making about sepsis, the use of screening tools have been advocated to shorten the period prior to the administration of antibiotics. Scoring systems are particularly important in the assessment of children as children characteristically compensate physiologically for a considerable time and then deteriorate quickly, therefore a crucial focus is to spot a sick child rapidly. Many urgent care out of hours (UCOOH) services are nurse led. Therefore, it often falls on the Advanced Nurse Practitioner's (ANP's) to educate the Health Care Assistants to spot the sick person, especially as they are usually the first person the patients see. Leadership plays a key role for ANP in UCOOH by helping to progress the pathway for patients by ensuring the sickest are prioritised.

Introduction

This article will critically evaluate the prevalence, recognition, assessment, and management of sepsis in an Urgent Care Out of Hours (UCOOH) service in order to optimise care for patients whilst working as an Advanced Nurse Practitioner (ANP). An overview of sepsis is presented focusing on the epidemiology, aetiology and pathophysiology. The process of assessment, diagnosis and management of sepsis is evaluated based on present evidence. Problems associated with the recognition of sepsis are analysed. Lastly, suggestions are made for the development of future practice as an ANP.

Epidemiology

Sepsis is a life-threatening and common condition prompted by a microbial infection that causes the immune system of the body to react robustly; failure to provide timely treatment could lead to death or multiple organ failure (National Confidential Enquiry into Patient Outcome and Death (NCPEOD), 2015). Sepsis is responsible for the death of more people than prostate, bowel or breast cancer collectively, and it causes the second highest mortality rates after cardiovascular disease (National Health Service England (NHSE), 2017). It is difficult to identify exact mortality rates caused by sepsis, with a wide range of numbers reported regarding both deaths and admissions, however it is a primary cause of sudden death. Within England, approximately 123,000 cases are reported annually, leading to an estimated 37,000 deaths (NHSE, 2017). Sepsis costs approximately between £ 1.5 to £ 2 billion to the National Health Service (NHS) annually (United Kingdom Sepsis Trust (UKST),

2017). This figure is set to increase with data showing an increase in incidence, possibly due to an ageing population. However, in many instances, sepsis is avoidable and treatable, plus early identification of the condition can lead to successful treatment (UKST, 2017). With the application of best practice 10,000 cases could be avoided each year (NHSE, 2014).

The majority of sepsis cases occur in the community, with 30% developing whilst the patient is in hospital (Esteban et al. 2007). However, sepsis guidelines report that there is inadequate statistics especially regarding community derived sepsis (National Institute for Clinical Excellence (NICE), 2017). Defining sepsis is challenging due to the complexity of the condition, and usually signifies a science cellular interpretation thus making diagnosis and treatment problematic (Goulden et al., 2018). This is particularly relevant in a fast paced UCOOH environment. The definition of sepsis was modified in 2016 by the Critical Care Task Force, as a “Life-threatening organ dysfunction caused by a dysregulated host response to infection” (Singer et al., 2016). This is a shift away from the outdated definition of sepsis as a reaction to infection initiated by the immune system which triggers a possibly harmful systematic inflammatory response syndrome (SIRS) which is identified by physiological variations identified by deteriorating vital signs, based on temperature, respiratory and heart rate (Dellinger et al, 2008).

Septic shock

The subset of sepsis is septic shock in which there is impaired blood supply and persistent hypotension, despite suitable fluid replacement, it has considerably high mortality and necessitates prompt intervention from clinicians (Singer, et al., 2016).

For every hour that there is a delay in antibiotic therapy, mortality increases by 7.6% (Kumar et al., 2006), therefore rapid recognition is essential.

Aetiology

The aetiology of sepsis is not always known, making diagnosis difficult, with only 50% of cases having a confirmed pathogenic organism (NCPEOD, 2015). The typical contributing pathogens in approximately 90% of cases are bacteria, both gram-negative and gram-positive bacteria with an increase in fungal infections being noted (Pfaller, et al. 2009). Studies show differing data regarding sources of infection. A study of 15000 patients showed urosepsis as 20.8% and respiratory as 44.4% (Dellinger, Levy, Carlet et al, 2008), by comparison in the initial Sepsis Occurrence in Acutely Ill Patients (SOAP) study reported, respiratory infection accounting for 60%; abdomen 26%; the bloodstream 20%; urosepsis 12% and the skin 14% (Vincent, et al., 2006).

Symptoms

Patients who present with infection to UCOOH are assessed for sepsis (NICE, 2017, Freitag, Constanti, O'Flynn et al., 2017). The characteristics most obviously connected with sepsis and septic shock are confusion or unusual behaviour; hypotension and increased respiratory rate (NICE, 2017). Interestingly, patients commonly have non-specific symptoms, and just complain of feeling extremely unwell (UKST, 2017). Further characteristics that may be present include ashen or mottled appearance, decreased urine output, skin, lip or tongue cyanosis, or a non-blanching rash (NICE, 2017). Such variations in presentation contribute to difficulty in identification (NICE, 2017).

Inflammatory response

Working as an ANP, it is essential to have an understanding of subject knowledge and apply that to practise (Health Education England (HEE), 2017). An understanding of the physiological processes that transpire, and the characteristics that present assist in making a diagnosis (Nagalingam, 2018). Due to an inflammatory response interleukins and nitric oxide produce vasodilation, and capillary permeability results in a compromised cardiovascular system and hypotension (Berry et al., 2019). This results in lack of oxygenated blood to the brain due to the body preserving perfusion to the organs; notably this presents as confusion, tachycardia, and reduced urine output (Nagalingam, 2018). Reduced oxygen saturation and tachypnoea are a mechanism of compensation to stabilise the PH in the blood, typically this is the first indication of acute illness (Culligan, 2016).

Clinical decision making

To assist in making clinical decisions and determine at what point periodic infection turns to sepsis, all patients who have signs or symptoms of a possible infection are assessed, regardless of whether pyrexia is present (NICE, 2017). Within UCOOH clinical decision-making processes during a time limited short consultation, depend upon quickly establishing if a patient is exhibiting symptoms of a routine infection or of deterioration and possible sepsis. As an ANP, the ability to synthesis information, formulate decisions and correctly apply these decisions into clinical practice is crucial (Barrett, 2018, HEE, 2017). Adhering to the HEE framework for Advanced Clinical Practice (2017), it is essential as an ANP to be able to make a holistic assessment of

patients including a fully detailed history and to identify associated risk factors. It is paramount that a detailed history is taken, to help acquire a clinical picture (NICE, 2017). If patients lack the ability to give a definite history, family members or friends are asked whether functional decline, cognitive changes or behavioural changes are recent or sudden (NICE, 2017). Importantly, it is essential to be aware of vulnerable groups these include: patients with impaired immunity, age over 65, the very young, recent invasive treatment or surgery, impaired immune function, breach of skin or wound, pregnancy or recent termination; high alcohol intake, intravenous drug users and indwelling catheters (NICE, 2017; Berry et al., 2019). A low threshold for sepsis is maintained when a patient shows signs of infection and acute disease in one of these at-risk groups (NICE, 2017; UKST, 2017).

Vital Signs

Critical to the identification of a deteriorating patient are vital signs; these include, blood pressure; heart rate; respiratory rate; and temperature (NHSE, 2017; NICE, 2017). Despite this, inconsistency has been found in the completion of vital signs by health care professionals in Primary Care and UCOOH (NCEPOD, 2015). This clearly presents safety risks for patients and reduces chances of patient survival (Parliamentary and Health Service Ombudsman (PHSO), 2013, National Health Service Improvement (NHSI), 2016).

Screening tools

To aid in detection and decision making about sepsis, the use of screening tools have been advocated to shorten the period prior to the administration of antibiotics

(NCEPOD, 2015). There are many screening tools available which are subject to much debate. The quick Sequential Organ Failure Assessment tool (qSOFA) endorsed by the Third International Consensus Definitions for Sepsis and Septic Shock, facilitates rapid assessment; it comprises three features to identify risk, which are respiratory rate of greater than 22 breaths per minute, a systolic blood pressure of less than 100mmHg and a change in mental status (Singer, Deutschman, Seymour et al., 2016). This tool is useful within a non-hospital setting and has been integrated into the General Practice Sepsis Decision Support Tool (UKST, 2016). However, should only be used for patients aged over 12, who are not pregnant.

A whole system approach has been adopted by NHSI (2018) with the introduction of the National Early Warning 2 Score (NEWS2), (Royal College of Physicians (RCP), 2017). This is advocated as the preliminary screening tool for sepsis for adults in all NHS acute hospital and ambulance trusts as well as in the community (NICE, 2017, NHSE, 2017). This tool reliably detects deterioration, prompting review, management, and escalation of care (RCP, 2017). The universal use of the NEWS2 will aid standardisation and permit a common line of communication throughout the NHS. Within a leadership role as an ANP it is vital to promote use of NEWS2 by all staff, encouraging communication throughout the management of a patient (HEE, 2017, NHSI, 2018).

NEWS2 involves physiological readings including level of consciousness, systolic blood pressure, heart rate, respiratory rate, oxygen saturation and temperature, with scoring adjusted with the need for oxygen therapy (RCP, 2017). Each value is measured, and the greater the score, the risk of the patient deteriorating increases (RCP, 2017). However, NEWS2 should not be used as a decision tool, but as an aide to decision making (Inada-Kim and Nsutebu, 2018). It is only useful if vital signs

are recorded accurately (NCEPOD, 2015). Whilst the perception of NEWS2 may cause an increase in Emergency Department demand and unnecessary referrals, it has been found that when used correctly, with sound clinical judgement, it is unlikely to do so and use does improve patient outcomes (Scott, et al., 2019).

Patients who present with symptoms of altered behaviour, delirium or acute confusion are considered high risk and require admission (NICE, 2017). However, not all symptoms are obvious and can be missed, leading to poor outcomes (LaMantia, et al., 2014). The Arousal, Attention, Abbreviated Mental Test 4, Acute change tool (4AT) is supported for the rapid assessment of delirium (MacLulich, Ryan, Cash, 2011). According to SIGN (2020), no formal training is needed for its use, it is quick to apply and has high sensitivity (Healthcare Improvement Scotland, 2019). However, the authors would argue that health care staff would in the least, need to become familiar with the tool and the mode of questioning before its application.

Assessment of children

The assessment of children in UCOOH can be challenging. Children characteristically compensate physiologically for a considerable time and then deteriorate quickly, therefore a crucial focus is to spot a sick child rapidly (Snelson, 2011). Initial characteristics such as a child appearing very unwell, drowsy or with altered consciousness, tachycardia, tachypnoea, mottling of the skin or non-blanching rash, cyanosis, pyrexia, reduced urine output, or a capillary refill time of less than three seconds or more, can suggest that that a child has mild to moderate high risk criteria for sepsis (NICE, 2017). Early warning signs of deterioration are

crucial to aid decision making, however, presently there is no universal paediatric early warning score for the recognition of sepsis (Royal College of Paediatrics and Child Health (RCPCH, 2018). Assessments are based on clinical reasoning, NICE sepsis risk stratification tools (2017) and NICE fever guidelines using a fever traffic light system for under five year old's (2013) to aid safe decision making. Children showing any red or amber features are referred urgently to secondary care (NICE, 2017), however other factors such as vulnerability, source of infection and age help to dictate a referral outcome (NICE, 2017).

Urgent management

Rapid management of patients is undertaken if infection or risk factors for sepsis are suspected, or if a NEWS2 score of five or more is calculated (Berry, et al., 2019). In UCOOH if sepsis is suspected and a risk of severe illness is indicated then urgent referral and transfer of the patient to secondary care via 999 is undertaken without delay (NHSE, 2017). Whilst waiting for transfer an ABCDE approach is adopted (Resuscitation Council UK (RCUK), 2015). The Sepsis Six is an evidence-based care bundle introduced for the management of sepsis aimed to increase patient outcome with adherence among staff developed in 2005 by UKST (2017). Once sepsis is recognised, six interventions must be implemented within one hour to avoid deterioration, this includes oxygen therapy to maintain saturations between 94-98%, if critically ill, high flow oxygen is administered (RCUK, 2015). Intravenous fluids, antibiotics, urine output and lactate level measurements and blood cultures are required (UKST, 2016). However, in UCOOH not all these interventions are available. If meningococcal disease is suspected, 999 transfer to secondary care is

arranged; whilst waiting for conveyance oxygen, IV fluids and intramuscular antibiotics are administered in accordance with organisational guidelines. NICE guidelines (2017) are followed to manage risk and uphold safety (HEE, 2017). The administration of antibiotics in the pre-hospital UCOOH is avoided unless suspected meningococcal disease or there is risk of delayed transfer to secondary care. This is due to sepsis having a wide range of pathogens (NCPEOD, 2015) and therefore aides in the early management until cultures can be taken in hospital, to establish the cause of infection with appropriate antibiotic administration (NICE, 2017).

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Safety netting

Both written and verbal safety netting advice is given as essential to those patients who are scored as being at low risk of severe illness, and who are not admitted to hospital (NHSE, 2017). This advice includes a clear description of worsening symptoms, signs to monitor, and how and when to access further care in case of deterioration (NICE, 2016, 2017). Essentially, patients or carer's level of understanding around safety netting advice are assessed, and any associated referrals for observational reasons are made as a duty of care (Nursing and Midwifery Council (NMC), 2018).

Communication

A high number of acutely unwell patients attend UCOOH (Balla, et al., 2011). This poses risks and uncertainty when working in this environment. Even though effective use of history taking, examination including vital signs, may enhance sepsis detection, adoption of a clinical decision within UCOOH setting care that is only premised on crucial signs can invalidate other critical clinical information. Various other aspects of the consultation may help determine the reason to refer a patient to secondary care. Thus, to improve patient care for patients with suspected sepsis, prior knowledge, pattern recognition of clinical signs and symptoms, intuition and gut feeling are utilised to adopt a holistic approach alongside clinical history and examination (Barratt, 2018). Gut feeling has been acknowledged by health care professionals as a significant contributing factor in their clinical reasoning and decision making when dealing with unwell patients (Roland 2014; Stopler et al., 2011; Stopler et al., 2009;). In contrast, poor communication has been found in several adverse events regarding sepsis (PHSO, 2013, Royal College of Emergency Medicine (RCEM), 2017).

Effective communication is integral to the ANP role (HEE, 2017, Department of Health, 2010). Poor communication may lead to various negative outcomes including compromise of patient safety, dissatisfaction of patients and relatives and discontinuity of care (Vermeir et al., 2015). One of the crucial factors to improve outcomes in sepsis, is to standardise the language utilised, communicate and express concern by providing full physiological observations, a NEWS2 score, a copy of written notes as well as a verbal handover which ensures that patients being referred to secondary care receive the best patient centred care with optimal outcomes.

Role of biomarkers

Clinical history, vital signs, implementation of NEWS2, are all significant in the diagnosis of sepsis, however biomarkers also play a crucial role in early detection, outlining its severity (Morris et al., 2017). Point of care (POC) testing may be valuable in the application of prescribing appropriate antibiotics instead of broad spectrum, to decrease treatment delays. C-reactive protein (CRP) may indicate a sign of infection and has been shown to be a useful POC test to guide antibiotic treatment for patients presenting with respiratory tract infections (Schot et al., 2018). To aid in the diagnosis of sepsis, NICE (2017) recommend POC testing with at risk patients in secondary care by measuring lactate levels, however, no suggestion is made regarding pre-hospital settings. Evidence clearly shows a reduction in Intensive Care admissions and mortality with the use of POC testing (Singer, et al., 2014). However, there may be potential disadvantages of POC testing in UCOOH including, increased assessment time, false readings leading to reassurance of deterioration and inappropriate escalation of care, cost of equipment and staff training (Morris, et al., 2017). With no research to validate the possibility of ruling in or ruling out sepsis using CRP, as well as any other biomarker within primary care, further research into this area is required.

Education and Leadership

In a recent retrospective study regarding the management of sepsis in UCOOH settings found that 48% of patients had contacted out-of-hours (OOH) prior to being admitted to intensive care for community acquired sepsis, notably in 43% of these patients infection was not suspected, and mortality rates were high (Loots, Smits,

van Steensel, et al., 2018). Essentially education of clinicians is needed to target poor outcomes of sepsis, and NICE (2017) highlight the need for all healthcare staff involved in assessing patients to be provided with appropriate regular training, to identify sepsis in the community. There is a duty of care when working autonomously (NMC, 2018), and participation in ongoing education and reflection is crucial to maximise clinical knowledge and skills as well personal potential to develop and lead both services and care (HEE, 2017). The HEE 'Think Sepsis' e-learning program has been undertaken to improve the management and diagnosis of patients presenting with sepsis, and this is recommended to colleagues (HEE, 2018). HEE have recommended that healthcare staff at all levels are trained in the recognition and management of sepsis in primary care following on from the recommendations of the NICE guideline on sepsis (Alder et al., 2016). The Royal College of Nursing are urging sepsis training to be mandatory throughout the UK to aid in a standardised approach to its treatment and management (Hackett and Snell, 2019).

Leadership role

Many UCOOH are nurse led. Therefore, it often falls on the ANP's to educate the Health Care Assistants to spot the sick person, especially as they are usually the first person the patients see. Therefore, regular educational sessions, and reflection on outcomes are part of the ANP role (HEE, 2017). Leadership plays a key role for the growth of future practice (HEE 2017). This is crucial in the early detection and management of sepsis. The role of ANP is helping to progress the pathway for patients by ensuring the sickest are prioritised, appropriately placed and that deterioration guided by NEWS2 is effectively communicated and acted upon.

Benchmarking care using NICE (2017) guidelines and ensuring up to date evidence-based practice is utilised, helps prevent variation in practice. Ongoing peer review amongst colleagues and critical reflection assists in enhancing knowledge and aids in the early identification and prompt treatment of sepsis (HEE, 2017). ANPs are well placed to deliver health education to patients and families to heighten public awareness and allow for early recognition of sepsis (HEE, 2017, Culligan, 2016).

Conclusion

The correct management of patients who present to the UCOOH with potential sepsis is challenging for ANPs because the signs and symptoms may vary and be understated (UKST, 2017). Reducing mortality and morbidity is a major healthcare challenge and early identification of sepsis is crucial, with immediate implementation of evidence-based guidelines and scoring tools to improve outcomes without variation (NICE, 2017, RCP, 2017). It is paramount that ANP's have essential knowledge regarding the pathophysiology, presentation, assessment and management of patients presenting with symptoms of infection, which may lead to sepsis. This allows patients to be managed safely which is fundamental to the work of the Advanced Practitioner (HEE, 2017). It is also essential that all health professionals who consult with undifferentiated patients in the UCOOH have the necessary skills. This is facilitated by drawing on the leadership and education skills that are developed as an ANP.

Sepsis management has progressed rapidly with the introduction of national guidelines (NICE, 2017), however, care has been predominantly focused within acute care settings. Now, with a large number of patients presenting with sepsis in the community (Esteban, et al. 2007), integrated care is required between primary

care, out of hours services, including NHS 111 and the ambulance service (NHSE, 2019). Therefore, excellent communication skills, robust governance with clear documentation, education of all staff, patients and relatives, will allow for safe, high quality, patient centred care.

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