The Royal College of Emergency Medicine

Clinical Audits

EXCELLENCE IN EMERGENCY MEDICINE

Severe Sepsis & Septic Shock in Adults Clinical Audit Information 2016/2017

Background

RCEM clinical standards for severe sepsis and septic shock were first published in May 2009. The standards were based on the early resuscitation bundle published by the Surviving Sepsis Campaign. A national audit of the standards was undertaken for the first time in 2011/12. Following the audit RCEM standards were revised in August 2012 and are based on the 'Sepsis Six'.

The overall mortality rate for patients admitted with severe sepsis is 35% - approximately 5 times higher than for ST elevation myocardial infarction and stroke. Sepsis is responsible for approximately 37,000 UK deaths and 100,000 hospital admissions per year[1] although that is likely to be much greater at 44,000 deaths and 150,000 admissions[2].

Severe sepsis is a time sensitive condition. In the most severe cases (septic shock), one study showed that for every hour appropriate antibiotic administration is delayed, there is an 8% increase in mortality[3]. The Sepsis Six is an initial resuscitation bundle designed to offer basic intervention within the first hour: in a prospective observational study it was independently associated with survival, suggesting that if it alone were responsible for outcome differences the number needed to treat (NNT) to prevent one death is 4.67. This compares to an NNT of 42 for Aspirin in major heart attack or 45-90 for PCI in S-T segment myocardial infarction.

Hospitalizations for sepsis have more than doubled over the last 10 years[4]. Sepsis arises when the body's response to infection causes systemic effects- manifest as two or more SIRS criteria triggered by a new infection[5]. Some patients will develop end-organ dysfunction or severe sepsis. Septic shock is a subset of severe sepsis, identified by sepsis with refractive hypoperfusion. The lactate level in sepsis is highly predictive of death[6] and poor outcomes and, when initially elevated, the degree of reduction following resuscitation ('lactate clearance') predicts survival.

Sepsis is poorly recognized and treated. A 24-month, large scale prospective improvement programme across 30 countries measuring the delivery of the Severe Sepsis Resuscitation Bundle was unreliable: with compliance rising from 10% to 21% in self-selected centres[7].

NHS England has established sepsis as a future indicator in both Domains 1 and 5 of the National Outcomes Framework.

Introduction
Since the last national audit in 2012, there has been a lot of work to bring sepsis high on the UK's national health agenda. RCEM has been represented and involved with the many projects and publications that its members and fellows will be familiar with such as the APPG reports, RCEM Sepsis Toolkits, NCEPOD, NHS England Report and NICE Guidance.

New definitions for sepsis[8,9,10] were released this year and most Emergency Departments (ED), although aware of them, will not have adopted them. The new definitions are complex and there is a lot of work happening to see how EDs can incorporate the new definitions into their usual working practice balanced with the need to manage sepsis in the ED as a time-critical illness.

The new definitions do away with SIRS. Instead, Sepsis is only present when there is evidence of organ failure above a patient's baseline, measured by using the SOFA score. Septic Shock is present when the patient is hypotensive despite adequate fluid resuscitation and requires vasopressors AND has a raised lactate. Establishing core and measuring the current SOFA score in the ED is difficult and for this reason many EDs have not yet begun to adopt them.

The audit standards have therefore remained largely the same with a few changes for those EDs who have switched to using the new definitions. Although the title has not changed, for those that have adopted the new definitions, these should be applied to all adult patients diagnosed or suspected to be diagnosed with Sepsis and Septic Shock in the ED.

Aims and objectives
The audit will be conducted for the third time to continue the work of the 2011 and 2013 data collections. It will identify current performance in EDs against RCEM clinical standards, show the results in comparison with other departments, and also across time if there was previous participation in 2011 or 2013.

There is great scope for improvement in the care provided to septic patients. Results from the 2013 audit show that only 32% of patients were given antibiotics and 40% were given fluids within the first hour of arrival in the ED.

Trends in the recognition and management of adults with severe sepsis or septic shock can be examined further, and improvement objectives can be set if needed. It will be useful to see if there has been further improvement or whether performance has plateaued.

The purpose of the audit is:
1. To benchmark current performance in EDs against the standards
2. To allow comparison nationally and between peers
3. To identify areas in need of improvement
4. To compare against previous performance in 2011 and 2013

Inclusion criteria

- Adult patients aged 18 and over
- Patients who were diagnosed with either severe sepsis or septic shock in the ED, as defined below:
    - Severe sepsis - The presence of one or more organ system dysfunctions in the context of sepsis defines severe sepsis
    - Septic Shock - Patients who have evidence of hypoperfusion (high lactate) or a persistently low blood pressure after initial fluid resuscitation in the context of sepsis have septic shock

Please see the references for detailed definitions of sepsis, organ system dysfunction and high lactate. If your organisation has begun using the new definitions[8], please use them for the purpose of this audit.

The ICD 10 codes below can be used to help initially identify potential cases. This is not an exhaustive list, other search terms can be used but all potential patients should then be reviewed to check they meet the definitions & selection criteria before inclusion in the audit.

- Septicaemia: A41
- Septic Shock: A40
- Meningococcal sepsis: A39

If sepsis coding is poor in your organisation, you may wish to expand your search by identifying patients with infection and reviewing the notes for sepsis. Some relevant infection terms include, but are not limited to: meningitis, respiratory tract infection, urinary tract infection and pyelonephritis.

Exclusion criteria

- Patients aged 17 or under
- Patients not diagnosed with severe sepsis or septic shock
- Patients with hypoperfusion (high lactate) or a persistently low blood pressure without evidence of sepsis or infection
- Patients diagnosed with sepsis or septic shock after being discharged from the ED

Sample size
RCEM recommends auditing a different number of cases depending on the number you expect to see within the data collection period. If this is an area of concern in your ED, you are able to submit data for more cases for an in depth look at your ED's performance.

Basing the audit sample size on the number of cases in this way increases the reliability of your ED's audit results.

Audited cases should be consecutive during the data collection period (1 January 2016 to 31 December 2016).

Expected number of cases	Recommended audit sample
< 50	All eligible cases
50-250	50 consecutive cases
>250	100 consecutive cases

Data collection period
From 1 January 2016 to 31 December 2016.
Note: You can start the audit at any point during the data collection period, as long as you submit the data by 31 January 2017.

Data submission period
Data can be submitted online at the link below between 1 August 2016 to 31 January 2017: https://rcem.l2s2.com

Data Sources
ED patient records (paper, electronic or both).

Standards

STANDARD	GRADE
1. Respiratory Rate, Oxygen Saturations (SaO_2), Supplemental Oxygen Requirement, Temperature, Blood Pressure, Heart Rate, Level of Consciousness (AVPU or GCS) and Capillary Blood Glucose recorded on arrival	F
2. Review by a senior (ST4+ or equivalent) ED medic or involvement of Critical Care medic (including the outreach team or equivalent) before leaving the ED	D
3. O_2 was initiated to maintain SaO_2>94% (unless there is a documented reason not to)	-
a. 50% within one hour of arrival	A
b. 100% within four hours of arrival	D
4. Serum Lactate measured within four hours of arrival	-
a. 50% within one hour of arrival	A
b. 100% within four hours of arrival	D
5. Blood Cultures obtained	-
a. 50% within one hour of arrival	A
b. 100% within four hours of arrival	D
6. Fluids – first intravenous crystalloid fluid bolus (up to 30mL/kg) given:	-
a. 75% within one hour of arrival	D
b. 100% within four hours of arrival	F
7. Antibiotics administered:	-
a. 50% within one hour of arrival	D
b. 100% within four hours of arrival	F
8. Urine Output measurement/ Fluid Balance Chart instituted within four hours of arrival	D

Grade

F - Fundamental: need to be applied by all those who work and serve in the healthcare system. Behaviour at all levels and service provision need to be in accordance with at least these fundamental standards. No provider should provide any service that does not comply with these fundamental standards, in relation to which there should be zero tolerance of breaches.

D - Developmental: set requirements over and above the fundamental standards.

A - Aspirational: setting longer term goals.

Standards definitions

Standard	Term	Definition
Inclusion criteria	Sepsis or septic shock	Please see the references for detailed definitions of sepsis, organ system dysfunction and high lactate. If your organisation has not yet begun using the new 2016 definitions, please use the older 2012 ones for the purpose of this audit.
	Organ system dysfunction	
	High lactate	

Questions

Organisational audit			
Only one response per ED is required for questions Q1a-f			
Q1a	Has your department started to use the new definitions of sepsis (Sepsis-3)?	Yes No	
Q1b	Does your Trust/ organisation have a sepsis lead?	Yes No	
Q1c	Does your department have a formal protocol for the early identification and immediate management of patients with sepsis?	Yes In development No	
Q1d	If yes, does the protocol include guidance on: (tick all that apply)	Which antibiotics to use	
		Investigation and control of the source	
		Antibiotic stewardship	
Q1e	Does your department/ Trust/ organisation provide sepsis education for all ED staff?	Yes No	
Q1f	Does your department provide patient information for patients and/or relatives admitted with sepsis?	Yes No	

Patient audit

Q2	Patient reference	
Q3	Date of arrival *(dd/mm/yyyy)*	dd/mm/yyyy
Q4	Time of arrival *(Use 24 hour clock e.g. 11.23pm = 23:23)*	HH:MM

Tick appropriate response

Q5	Were the following vital signs recorded on arrival: Respiratory Rate, Oxygen Saturations (SaO_2), Supplemental Oxygen Requirement, Temperature, Blood Pressure, Heart Rate, Level of Consciousness (AVPU or GCS) and Capillary Blood Glucose	Yes, all	
		Partially (tick all that apply):	
		-Respiratory Rate	
		-Oxygen Saturations (SaO_2)	
		-Supplemental Oxygen Requirement	
		-Temperature	
		-Blood Pressure	
		-Heart Rate	
		-Level of Consciousness (AVPU or GCS)	
		-Capillary Blood Glucose	
		Not recorded	

Q6a	Was the patient reviewed by a senior (ST4+ or equivalent) ED medic before leaving the ED?	Yes	
		No – reasons recorded	
		Not recorded	

		Time seen	HH:MM
Q6b	Was the Critical Care medic (including the outreach team or equivalent) involved in the patient's care before leaving the ED?	Yes	
		No – reasons recorded	
		Not recorded	
		Time seen	HH:MM

		Yes	*Time (leave blank if unknown)*	*Date (for use if different to date of admission)*	*No – reasons recorded (e.g. done pre-hospital)*	*No / not recorded*
Q7	Was oxygen initiated to maintain SaO_2>94%		HH:MM	dd/mm/yyyy		
Q8	Was serum lactate measurement obtained prior to leaving the ED?		HH:MM	dd/mm/yyyy		
Q9	Were blood cultures obtained prior to leaving the ED?		HH:MM	dd/mm/yyyy		
Q10	Was the first intravenous crystalloid fluid bolus (up to 30ml/kg) given in the ED?		HH:MM	dd/mm/yyyy		
Q11	Were antibiotics administered in the ED?		HH:MM	dd/mm/yyyy		
Q12	Was urine output measurement/ Fluid Balance Chart instituted prior to leaving the ED?		HH:MM	dd/mm/yyyy		

Notes

Question and answer definitions

Term	Definition
Q1c. Formal protocol for the early identification and immediate management of patients with sepsis	This may include a screening tool
Q7. Was oxygen initiated to maintain SaO_2>94%	If the patient's normal SaO_2 are less <94% (e.g. COPD), was oxygen initiated to maintain their target range?
Q10. Was the first intravenous crystalloid fluid bolus (up to 30ml/kg) given in the ED?	If the first bolus was given pre-hospital, please tick 'no – reason recorded'
Q11. Were antibiotics administered in the ED?	If antibiotics were administered pre-hospital, please tick 'no – reason recorded'
Q12. Was urine output measurement/ Fluid Balance Chart instituted prior to leaving the ED?	Please enter the time urine output was measuered

References

[1] Daniels R. Surviving the first hours in Sepsis: getting the basics right (an Intensivist's perspective). *J Antimicrob Chemother* 2011; 66(Suppl ii): 11-23

[2] The UK Sepsis Trust. Our statistics and why it matters. *The UK Sepsis Trust* 2016 http://sepsistrust.org/our-statistics-and-why-it-matters-march-2016/

[3] Kumar A, Roberts D, Wood KE et al. Duration of hypotension prior to initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock. *Crit Care Med* 2006; 34: 1589–96

[4] Hall MJ, Williams SN, DeFrances CJ, et al.: Inpatient care for septicemia or sepsis: A challenge for patients and hospitals. NCHS data brief Hyattsville, MD: *National Center for Health Statistics* 2011; 62

[5] Levy MM, Fink MP, Marshall JC et al. 2001 SCCM/ESICM/ACCP/ATS/SIS international sepsis definitions conference. *Int Care Med* 2003; 29: 530–8.

[6] Trzeciak S, Chansky ME, Dellinger PR et al. Operationalizing the use of serum lactate measurement for identifying high risk of death in a clinical practice algorithm for suspected severe sepsis. *Acad Emerg Med* 2006; 13: 150–1

[7] Rivers E, Nguyen B, Havstad S et al. Early goal-directed therapy in the treatment of severe sepsis and septic shock. *N Engl J Med* 2001; 345: 1368–77

[8] Singer M et al. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). *JAMA*. 2016;315(8):801-810. doi:10.1001/jama.2016.0287.

[9] Shankar-Hari M, Phillips G, Levy ML, et al Assessment of definition and clinical criteria for septic shock. *JAMA*.doi:10.1001/jama.2016.0289

[10] Seymour CW, Liu V, Iwashyna TJ, et al Assessment of clinical criteria for sepsis. *JAMA*. doi:10.1001/jama.2016.0288.