Can acute medicine units in the UK comply with the Surviving Sepsis Campaign's six-hour care bundle?

Gregor McNeill, Mark Dixon and Paul Jenkins

ABSTRACT – The Surviving Sepsis Campaign (SSC) advocates a six-hour resuscitation care bundle to be used in the initial management of the acutely ill patient. This survey was designed to investigate the number of acute medicine units (AMUs) in the UK capable of, and successful in, implementing this bundle. Questionnaires were sent to each of the 265 AMUs across the UK. The questionnaire asked 10 questions about delivery of the six-hour resuscitation bundle. Twenty AMUs (12%) had the minimum facilities to comply. Regional variation was noted. This survey shows that few AMUs in the UK appear to be able to resuscitate a patient with sepsis using the SSC resuscitation care bundle.

KEY WORDS: acute medicine unit, resuscitation care bundle, sepsis, survey, tissue hypoxia

Introduction

Over the past 10 years there has been considerable advance in the management of the acutely ill medical patient. Recommendations published by the Royal College of Physicians (RCP) in 2004 catalysed the nationwide development of acute medicine units (AMUs) and acute medicine is now recognised as a sub-specialty, with a representative sub-committee in the RCP.[1] The advent of dedicated areas for the management of the acute medical patient and the accepted role for acute physicians should contribute to improved outcome for this group of patients.

The National Confidential Enquiry into Patient Outcome and Death published a report entitled *An acute problem?* in May 2005 which clearly highlighted deficiencies in pathways of care of the acutely ill medical patient.[2] Analysis of care prior to admission to an intensive care unit (ICU) showed treatment of patients was often inappropriate or delayed. The majority of patients were referred to the ICU by junior medical staff without the involvement of a consultant physician. A key finding was that:

> *patients often had prolonged periods of physiological instability prior to admission to an intensive care unit. In patients who had been in hospital more than 24 hours prior to ICU admissions, 66% exhibited physiological instability for more than 12 hours.*

It is clear, therefore, that there is still considerable room for improvement in the treatment of the acutely ill patient.

Sepsis continues to be a major cause of death in ICUs.[3] The Surviving Sepsis Campaign (SSC) began in 2002 as a collaboration between 11 different international organisations with an interest in the management of patients with sepsis. The aim of the campaign was to improve all aspects of diagnosis and treatment with a goal for reduction in mortality from severe sepsis by 25% within five years.

Much of the evidence base supporting the SSC recommendations comes from the work on early goal directed therapy (EGDT) by Rivers *et al.*[4] This study focused on the management of patients with sepsis in a large North American tertiary referral centre. The study showed that early use of a standardised method of resuscitation targeting potential markers of sympathetic stress such as serum lactate, as well as markers of tissue hypoxia, such as central venous oxygen saturation, led to a significant reduction in overall mortality.

In order to improve uptake of this treatment pattern in patients with sepsis, the SSC developed two care bundles. First, a six-hour resuscitation care bundle (Box 1) to be implemented in the initial

Box 1. Surviving Sepsis Campaign six-hour resuscitation care bundle.

- Serum lactate measured
- Blood cultures obtained prior to antibiotic administration
- From the time of presentation, broad-spectrum antibiotics administered within 3 hours for ED admissions and 1 hour for non-ED intensive care unit admissions
- In the event of hypotension and/or lactate >4 mmol/l:
  - deliver an initial minimum of 20 ml/kg of crystalloid (or colloid equivalent)
  - apply vasopressors for hypotension not responding to initial fluid resuscitation to maintain mean arterial pressure >65 mm Hg
- In the event of persistent hypotension despite fluid resuscitation (septic shock) and/or lactate >4 mmol/L (36 mg/dl):
  - achieve central venous pressure of >8 mm Hg
  - achieve central venous oxygen saturation (ScvO2) of >70%

ED = emergency department.

Gregor McNeill
MBChB MRCP,
Specialist Registrar in Acute Medicine, Ipswich Hospital

Mark Dixon
MBChB FRCA,
Consultant in Critical Care, Norfolk and Norwich University Hospital

Paul Jenkins
MA MB FRCP,
Consultant in Acute Medicine, Emergency Assessment Unit, Norfolk and Norwich University Hospital

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assessment area and, secondly, a 24-hour management bundle to be continued in the ICU (Box 2).

Aspects of both care bundles, however, are controversial. Although it is accepted that serum lactate is a marker of sympathetic stress, its role as a guide to tissue hypoxia and the adequacy of resuscitation has been questioned.[5] Indeed, the bundles have yet to be fully prospectively evaluated in a multicentre trial. In addition, there is concern about whether the benefits seen by Rivers *et al* in a single US centre can be replicated in the UK healthcare system where the initial resuscitation phase may be based in an AMU. In Australia, even in the absence of an EGDT strategy, initial resuscitation by emergency care specialists in a dedicated emergency care department has produced low rates of mortality.[6] It is unclear how strictly the care bundles need to be adhered to in order to improve outcome. Partial compliance with the SSC bundles has been shown observationally to have a significant impact on mortality in medical and surgical patients with sepsis within a UK setting.[7]

Despite these limitations, the resuscitation bundle is useful in indicating the minimum resources an AMU will require to initially assess and stabilise patients with sepsis. Patients need to be managed in an area within the medical unit suitable for close physiological monitoring. The acute medical team needs rapid access to an arterial blood gas machine equipped to measure initial serum lactate levels. The capacity to accurately measure central venous pressure (CVP) and administer inotropic agents is also required. Close liaison between acute and intensive care medicine is also vital in ensuring timely transfer of appropriate patients to higher levels of care.

The aim of this survey was to gather information from AMUs nationally in order to assess their ability to implement the six-hour resuscitation bundle.

Method

Questionnaires were sent to the lead nurse in each of the 265 AMUs across the UK. Ten questions were asked about the delivery of the six-hour resuscitation care bundle (Box 3).

Results

General

Of the 265 questionnaires sent out, 162 were returned giving a response rate of 61% (Table 1). Fifty-seven units (35%) reported implementation of the sepsis care bundles in their hospital. In addition, 115 units (71%) had access to a critical care outreach team and 64 AMUs (40%) had enhanced care beds. Minimum facilities to comply with the six-hour resuscitation bundle were considered to be:

- availability of enhanced care beds
- ability to measure arterial blood gas lactate
- ability to measure CVP
- ability to administer inotropes.

Box 2. Surviving Sepsis Campaign 24-hour management bundle.

- Low-dose steroids administered for septic shock in accordance with a standardised ICU policy
- Drotrecogin alfa (activated) administered in accordance with a standardised ICU policy
- Glucose control maintained > lower limit of normal, but <8.3 mmol/l
- Inspiratory plateau pressures maintained <30 cm H_2O for mechanically ventilated patients

ICU = intensive care unit.

Box 3. Acute medicine unit (AMU) questionnaire.

1. Has your unit implemented the SSC guidelines?
2. Does your unit have access to a critical care outreach team?
3. Does the AMU have enhanced care or high dependency beds?
4. Where is the location of the nearest arterial blood gas machine?
5. How far away is the arterial blood gas machine?
6. Does the arterial blood gas machine have the ability to measure serum lactate, sodium, potassium or glucose?
7. Is the unit able to routinely insert CVP lines?
8. Is the unit able to measure CVP?
9. Does the unit use manometer or transducer methods to measure CVP?
10. Is the unit able to administer inotropes?

CVP = central venous pressure; SSC = Surviving Sepsis Campaign.

Table 1. General acute medicine unit (AMU) facilities.

	England	Wales	Scotland	Northern Ireland	UK
Number of hospitals to respond (%)	127 (59)	9 (75)	20 (77)	6 (60)	162 (61)
AMUs who implemented guidelines (%)	48 (38)	2 (22)	7 (35)	0	57 (35)
Outreach team available (%)	104 (82)	6 (67)	4 (20)	1 (17)	115 (71)
Enhanced care beds (%)	45 (35)	2 (22)	12 (60)	5 (83)	64 (40)
Minimum facilities available within AMU (%)	14 (11)	2 (22)	2 (10)	2 (33)	20 (12)
Minimum facilities available and guidelines implemented (%)	5 (4)	1 (11)	0	0	6 (4)

Of the 162 units, 20 (12%) had these minimum facilities. Six hospitals (4%) had all the required facilities within their AMU and had successfully implemented the sepsis care bundles.

The availability of arterial blood gas analysis

Of the 162 AMUs, 52 (32%) had an arterial blood gas (ABG) machine sited in their department. In 51 units (31%) the nearest ABG machine was in the accident and emergency department, 26 (16%) were located in the ICU, 26 (16%) were located in the biochemistry department, three (2%) were located in high dependency units, and four (3%) in other locations. The ABG machine was, on average, 90 metres from the AMU, with a median distance of 20 metres. Of the ABG machines, 74 (46%) were able to measure a lactate, 115 (71%) were able to measure sodium, 116 (72%) measured potassium and 85 (53%) were able to measure glucose.

The ability to measure central venous pressure

Of the 162 units, 133 (82%) were able to insert CVP lines, 142 (88%) were able to measure CVP (79 (56%) using a digital transducer, and 74 (52%) using a fluid level manometer).

The ability to administer inotropes

Of the 162 units, 103 (64%) were able to routinely administer inotropes.

Regional variation

The results were subsequently analysed by region and the following trends were found:

- enhanced care beds were more commonly included in AMUs in Northern Ireland and Scotland compared to England and Wales
- fewer AMUs in Northern Ireland were able to manage CVPs than in the rest of the UK
- all Northern Irish AMUs were able to administer inotropes
- there were more critical care outreach teams in England than in the rest of the UK
- more AMUs in England had implemented the SSC guidelines than in the rest of the UK
- although there were some AMUs in Scotland and Northern Ireland that had the minimum required facilities, none of these units had implemented the care bundles.

Discussion

This survey provides evidence that few AMUs in the UK have systems in place to resuscitate a patient with sepsis using the evidence-based techniques proposed by the SSC resuscitation care bundle.

Acute medicine units developed in hospitals in order to meet local requirements resulting in considerable heterogeneity in working practices. Greater uniformity should accrue as acute medicine matures as a specialty and this should be welcomed. The need for more uniformity will also be recognised by initiatives exemplified by the SSC.[5]

The key insight gained from the available evidence is that early and more intensive intervention in the management of patients with severe sepsis can have a major impact on later morbidity and mortality. For the AMU physician the emphasis is no longer on simply making a diagnosis of sepsis. The knowledge that early recognition of sepsis and of tissue hypoxia with appropriate management improves outcome mandates a response from those involved in the delivery of acute medicine.

This survey has focused on the aspects of the bundle concerned with diagnosis, in particular the use of serum lactate in the initial resuscitation phase. An ABG machine located close to the point of care makes this much easier and more likely to happen.

The broader issue of implementing change within units in response to developments in practice is important. When clinical evidence supports the use of a drug it is not difficult to include the prescription of this drug in the treatment of patients with a certain condition. In their development AMUs, like ICUs, will have to develop processes which ensure that the required package of care can be delivered efficiently to all patients. Installation of an ABG machine in an AMU is a step forward but change of the sort involved in effective management of sepsis demands considerable planning. Education of staff, capital resources and clinical audit are all essential if change is to be delivered effectively.

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