ORIGINAL ARTICLES

Practical Barriers to the Implementation of Early Goal Directed Therapy in the UK: Trainee Skills and Awareness*

SJ McNally[1], M MacKinnon[2], M Hawkins[3]

[1]Honorary Specialist Registrar, University Department of Surgery, Royal Infirmary of Edinburgh, Little France, Edinburgh, EH16 4SA.
[2]Specialist Registrar, Department of Anaesthesia, Western Infirmary, Dumbarton Road, Glasgow, G11 6NT.
[3]Consultant in Anaesthetics and Intensive Care, Department of Anaesthesia, Stirling Royal Infirmary, Livilands Gate, Stirling, FK8 2AU.

Correspondence to

Stephen McNally, NES Clinician Scientist and Honorary Specialist Registrar, MRC Centre for Inflammation Research, Room W2.12, Queen's Medical Research Institute, 47 Little France Crescent, Edinburgh, EH16 4TJ.
Email: stephen.mcnally@gmail.com

*Previously presented as an oral presentation at a meeting of the Scottish Intensive Care Society, Dunblane, January 2007.

Abstract

The Surviving Sepsis Campaign (SSC) recommends Early Goal Directed Therapy (EGDT) in the treatment of septic shock, which requires key critical care skills and knowledge. This study evaluates the availability of these skills in Specialist Registrars in acute hospital specialities in the UK. A questionnaire was sent to Specialist Registrars in Anaesthetics, General Surgery and General Medicine throughout Scotland. One hundred and eighty five responses were obtained. One hundred percent of anaesthetists, 70% of surgeons and 51% of physicians were aware of EGDT. Only 62 trainees (6% of surgeons, 79% of anaesthetists, 19% of physicians) had the full complement of skills and knowledge to implement EGDT. This study demonstrates that non-anaesthetic registrars in the UK lack both knowledge and skills required to provide EGDT. The main deficit was in awareness, demonstrating that knowledge of EGDT is not penetrating into specialities beyond anaesthesia. It is now time for the SSC to specifically target non-anaesthetic specialities.

Key words

Surviving Sepsis Campaign, Early Goal Directed Therapy, Registrars

Introduction

Early Goal Directed Therapy (EGDT), first described by Rivers in 2001, has been hailed as the greatest advance in the treatment of septic shock in recent years.[1] At its heart is aggressive early resuscitation of septic patients, attaining specific physiological endpoints to ensure adequate tissue oxygenation. There is now evidence confirming that EGDT reduces patient mortality from septic shock in other centres.[2,3,4,5] It has been incorporated into the Surviving Sepsis Campaign guidelines, which were launched in 2004 to improve the treatment of patients with sepsis.[6,7] This worldwide campaign has been active in promoting its recommendations, largely through critical care societies and their associated literature.[6,7,8]

There has been a slower uptake of EGDT in the UK.[9] The reasons for this are unclear and may be multifactorial. A study performed in Melbourne found a fairly low rate of sepsis within the population attending the Emergency Department,[10] raising the possibility that differences in case-mix may mean that the provision of EGDT would not be warranted in all centres. However, one recent paper describes a population within the UK which resembles that seen in River's original study.[9] Furthermore, a prospective study from Birmingham demonstrated that compliance with an EGDT-based care bundle was associated with reduced mortality due to sepsis in the UK.[3] Indeed, the number needed to treat in that study was lower than in Rivers' initial work, possibly representing a difference in the level of "standard care" that is currently received by septic patients in the UK.

In the UK, patients with severe sepsis will often initially be treated by trainee doctors outwith critical care i.e. surgical or general medical Specialist Registrars (SpRs). However, the penetration of awareness of EGDT and the Surviving Sepsis Campaign outwith critical care staff has not previously been established. Furthermore, delivery of EGDT demands a number of core critical care skills from the doctor caring for the septic patient, including central and arterial line insertion, and familiarity with vasopressors and inotropes, in addition to a working knowledge of the specific targets required for each physiological variable.

This study aims to determine the availability of these skills in the doctors responsible for initial care of septic patients, and to assess the success of the Surviving Sepsis Campaign in reaching the correct UK audience.

Methods

A questionnaire was designed and formatted for online access using proprietary web-based software. Questions were asked about: year of training and previous critical care experience; central and arterial line insertion; and the use of vasopressors and inotropes. The respondent was also asked about their attitudes towards these practical procedures and their awareness of EGDT and the Surviving Sepsis Campaign guidelines. Email invitations were sent to Specialist Registrars in Anaesthetics, General Surgery and General Medicine throughout Scotland. The survey was open for completion for

three months, and a single email reminder was sent. A power calculation indicated that 30 replies per specialty would be required to detect a 30% difference between specialties (power 0.9; $p<0.05$). The intention was to survey at least 50% of general surgical trainees and an equivalent number from other specialties. Statistical analysis was performed with SPSS 13 using the Chi-squared test.

Results

Population

One hundred and eighty five SpRs in hospital medicine replied from across Scotland: 56 anaesthetists; 50 surgeons; 79 physicians. These included all years of training and all major acute subspecialties as detailed in Table I. Anaesthetic trainees had the greatest previous critical care experience ($p<0.001$), with a median time spent in a dedicated critical care post of seven to 12 months, contrasting with a median duration of one to three months for surgical and medical trainees. Indeed, only 58% of physicians and 67% of surgeons had spent part of their training in a dedicated critical care post.

Table I: Characteristics of the Group of SpRs Studied.
Total number of SpRs in each specialty in Scotland are shown for comparison. Median range of critical care experience is indicated in months.

Specialty	Anaesthesia	General Surgery	General Medicine
Total SpRs in Scotland	200	104	407
Email Invitations	126	99	140
Responses (%)	56 (44%)	50 (51%)	79 (56%)
Median year of training (range)	3 (1-5)	2 (1-6)	4 (1-7)
Median critical care experience	7-12	1-3	1-3

Central Venous Catheterisation

All but one of the trainees surveyed reported being able to insert central lines, but the level of experience differed across the specialities. Anaesthetic trainees had inserted the greatest number of central lines ($p<0.001$), with 95% having inserted over 50 lines during their training, compared with 52% of physicians and 40% of surgeons. The median year of training in each speciality was greater in those trainees who had inserted over 50 lines.

Of the non-anaesthetic trainees, the total number of lines inserted was greater, with a greater duration of dedicated critical care experience, with 27% of those who had one to three months experience having inserted over 50 central lines, compared with 100% of those who had greater than 12 months dedicated critical care experience.

Arterial Catheterisation

All anaesthetic trainees were able to insert arterial lines, compared to only 82% of surgeons and 62% of physicians. Anaesthetic trainees had inserted the greatest number, and 96% of them had inserted over 50. The median range of arterial lines inserted by both surgical and medical trainees was 11 to 20. Fifty five of 56 anaesthetic trainees had inserted over 10 arterial lines in the preceding 12 months. In contrast, 25 of the 90 non-anaesthetic trainees who were able to insert arterial lines had inserted none in the preceding 12 months.

Use of Vasopressors/Inotropes

The majority of SpRs surveyed had experience in managing patients being treated with inotropes or vasopressors (97%). With regards to the likely agents required for EGDT, 156 trainees had experience in managing patients on noradrenaline, and 143 had experience with dobutamine. The trainees also had experience with adrenaline and dopamine (124 and 146 respectively). Dopexamine had been used only by a small minority (19/185). With the exception of dopexamine, all of the above inotropes had been used by over 50% of the trainees in each speciality.

All but one anaesthetic trainee would independently commence inotropes/vasopressors. However, only 81% of physicians and 60% of surgeons would be willing to do so. Noradrenaline was the agent which the greatest number of trainees would commence (122/185). There were marked differences between the three specialties regarding starting noradrenaline and dobutamine: 72% of physicians and 79% of anaesthetists would independently commence dobutamine, compared with only 12% of surgeons; whilst 47% of physicians, 98% of anaesthetists and 40% of surgeons would commence noradrenaline.

Awareness of EGDT and the Surviving Sepsis Campaign

One hundred percent of anaesthetic SpRs were aware of EGDT, and 93% were aware of the SSC. The rates of awareness were lower in the other specialties, with 70% of surgeons and 51% of physicians being aware of EGDT, and 55% of surgeons and 47% of physicians being aware of the SSC.

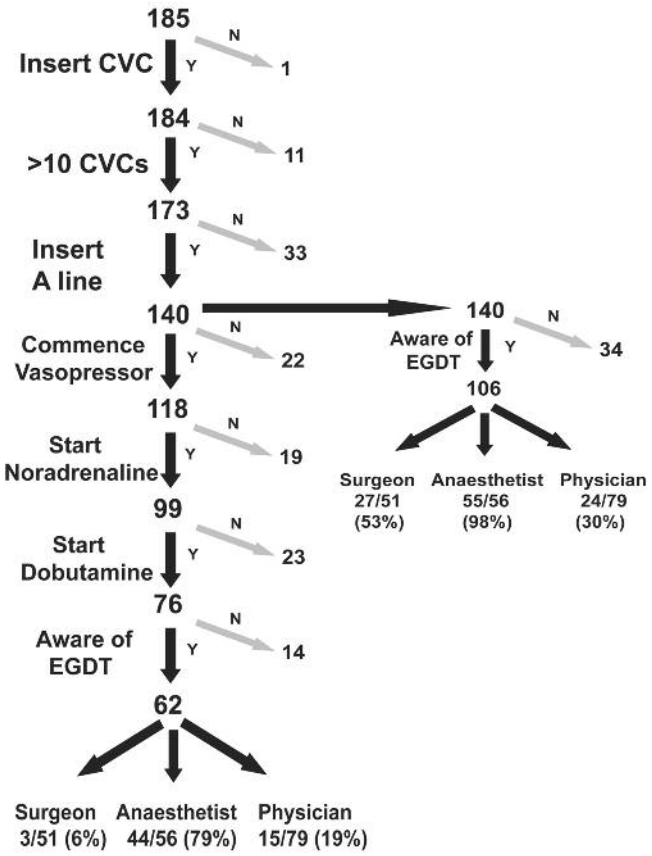
Discussion

Specialist Registrars were chosen as the study population because it is predominantly this grade of doctor that provides the immediate care and resuscitation of patients with septic shock. Even in the future, with the changes to training in the UK, the current president of the Intensive Care Society believes that a "consultant based, although not delivered, service will continue".[11] This survey demonstrates that these SpRs lack some of the essential skills and knowledge required to provide EGDT. Whilst Rivers' initial study[1] was based on management of septic patients within the Emergency Department, in the UK these patients as well as those who develop sepsis whilst already in a hospital ward, are likely to have their care provided by general medical and surgical SpRs, with input from Anaesthetics/Intensive Care SpRs when required. Hence, if EGDT is to be introduced, it is the general medical and surgical SpRs and anaesthetic/ITU trainees that must have the skills and knowledge to implement it.

The Surviving Sepsis Campaign has attempted to raise awareness of EGDT. There have been a number of publications in the critical care literature relating to implementation of EGDT in various settings, and re-enforcing the benefits which it offers in the treatment of sepsis.[2,3,4,5] However, the results of this survey indicate that in the UK the campaign is not penetrating into specialities beyond anaesthetics and intensive care. Trainee surgeons have a better knowledge of EGDT than trainee physicians, perhaps reflecting a greater interest in critical care or simply a product of a closer working relationship with anaesthetic staff.

This study has shown that relatively few trainees outwith anaesthesia have all the skills to provide EGDT. If these results are typical of SpRs in the UK, implementing EGDT will require education and training. Assuming a minimum of 10 central line insertions to indicate competency, only 34% of the trainees questioned would be able to perform all of the required interventions (Figure 1). This group consisted predominantly of anaesthetic trainees, and only three surgical and 15 medical SpRs (6% and 19% of those specialties respectively). The greatest deficits were in their willingness to independently initiate vasopressor/inotropic support and their knowledge of EGDT.

Figure 1: Flow Chart Demonstrating Limiting Factors in the Ability of SpRs to Provide EGDT and the Number of SpRs Who Have the Proposed Minimum Skill Set. *CVC Central Venous Catheter.*



Whilst having all trainees able to perform all required interventions is a laudable aim, it is possibly not realistic. We propose that as a minimum required to initiate EGDT, the individual should have the following competencies: CVC insertion (inserted at least 10 to assure basic competency); arterial cannulation; awarness of EGDT. On this basis, the individual would be able to initiate fluid and antibiotic therapy, establish monitoring (including ScvO2) and would have an awareness of appropriate physiological targets. This would be sufficient for a proportion of patients with sepsis, and if the patient failed to respond, expert advice could be sought from the critical care team. Using this minimum skill set, currently 54% of surgical and 30% of medical trainees would be deemed competent to deliver EGDT. This could potentially be improved to 74% of surgeons and 59% of physicians simply by education regarding EGDT. This is a much more achievable goal than training a large number of trainees in the use of inotropes which they may only use intermittently. If this was coupled with targeted training in arterial catheterisation, this would increase the levels of EGDT competence to 90% of surgeons and 91% of physicians.

In a UK study on compliance with sepsis bundles, Gao altered some of the interventions from Rivers' original protocol. Of particular relevance, the need for CVC insertion was waived due to a lack of adequately trained individuals.[3] This study demonstrated an even greater improvement in hospital mortality than was demonstrated in River's study, the number needed to treat four rather than seven,[1,3] validating this approach. Our 'limited' ECDT bundle would be closer to the Rivers original protocol, so may show more benefit than that described by Gao.

This study has demonstrated that there is a both a skills and a knowledge gap in current SpRs in General Medicine and General Surgery which is a barrier to the adoption of Early Goal Directed Therapy into routine practice. The Surviving Sepsis Campaign needs to target non-anaesthetic specialities in order to achieve its goal of reducing the mortality of patients from severe sepsis in the UK. This, combined with targeted training in specific bedside procedures, would provide registrars with the required skill set to implement Early Goal Directed Therapy in the UK.

Acknowledgements

The authors wish to acknowledge the assistance of Dr J Traynor, Dr N Walker, and Dr L Greig in providing contact details for trainees. SJM is currently funded by a Clinician Scientist Award from NHS Education for Scotland, and a Project Grant from the Chief Scientist's Office.

References

1. Rivers E, Nguyen B, Havstad S, et al. Early goal directed therapy in the treatment of severe sepsis and septic shock. New England Journal of Medicine 2001; 345: 1368-77.
2. Shapiro NI, Howell MD, Talmor D, et al. Implementation and outcomes of the Multiple Urgent Sepsis Therapies (MUST) protocol. Critical Care Medicine. 2006; 34: 1025-32.
3. Gao F, Melody T, Daniels DF, Giles S, Fox S. The impact of compliance with 6-hour and 24-hour sepsis bundles on hospital mortality in patients with severe sepsis: a prospective observational study. Critical Care. 2005; 9: R764-70.
4. Trzeciak S, Dellinger RP, Abate NL, et al. Translating research to clinical practice: a 1-year experience with implementing early goal-directed therapy for septic shock in the emergency department. Chest 2006; 129: 225-32.
5. Kortgen A, Niederprum P, Bauer M. Implementation of an evidence-based "standard operating procedure" and outcome in septic shock. Critical Care Medicine 2006; 34: 943-9.
6. Dellinger RP, Carlet JM, Masur H, et al. Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. Intensive Care Medicine 2004; 30: 536-55.
7. Dellinger RP, Carlet JM, Masur H, et al. Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. Critical Care Medicine 2004; 32: 858-73.
8. Shapiro NI, Howell M, Talmor D. A blueprint for a sepsis protocol. Academic Emergency Medicine 2005; 12: 352-9.
9. Reuben AD, Appelboam AV, Higginson I, Lloyd JG, Shapiro NI. Early goal-directed therapy: a UK perspective. Emergency Medicine Journal 2006; 23: 828-32.
10. Ho BC, Bellomo R, McGain F, et al. The incidence and outcome of septic shock patients in the absence of early-goal directed therapy. Critical Care 2006; 10: R80.
11. A Batchelor. The Future of Intensive Care. The Royal College of Anaesthetists Bulletin, November 2006, 40, 2041-3.