Modular emergency general surgery training: A pilot study of a novel programme

RJ Egan¹, T Abdelrahman¹, S Tate¹, J Ansell¹, R Harries², L Davies³, GWB Clark³, WG Lewis³;
on behalf of the Wales Deanery Emergency General Surgery Working Group

¹Wales Deanery, Neuadd Meirionnydd, Cardiff, UK

²RCSENG, London, UK

³University Hospital of Wales, Cardiff, UK

ABSTRACT

INTRODUCTION Pan-speciality consensus guidance advocates mandatory emergency general surgery (EGS) training modules for specialist registrars (StRs). This pilot study evaluated the impact of EGS modules aimed at StRs over 1 year.

METHODS Eleven StRs were allocated a focused 4-week EGS module, in addition to the standard 1:12 on-call duty rota, in a tertiary surgical centre. Primary outcome measures included the number of indicative emergency operations and validated Procedure Based Assessments (PBAs) performed, both during the EGS module and over the training year.

RESULTS StRs performed a median of 11 (range 5–15) laparotomies during the EGS module versus 31 (range 9–49) over the whole training year. StRs attended 43.7% of available laparotomies during the module (range 24.1–63.7%). EGS modules provided more than one-third of the total emergency laparotomy experience, and a quarter of the emergency colectomy, appendicectomy and Hartmann's procedure experience. There were no differences in EGS module-related outcomes between junior and senior StRs. Significantly more PBAs related to laparotomy and segmental colectomy were completed during EGS modules than the on-call duty rota, at 32% versus 14% ($p<0.001$) and 48% versus 22% ($p=0.019$), respectively. Performance levels were maintained following module completion.

CONCLUSIONS These findings provide an important baseline when considering future modular EGS training.

KEYWORDS

Surgical training – Emergency surgery – Emergency laparotomy – Work-based assessments

Accepted 17 January 2016

CORRESPONDENCE TO

Richard Egan, E: richardjohnnegan@hotmail.com

Emergency surgical hospital admissions account for half of all UK general surgery presentations, resulting in as many as 50,000 emergency laparotomies per annum.^{1,2} Concerns over variable and suboptimal outcomes, in particular high operative mortality (ranging from 4% to 42%), has led to new service frameworks being suggested, and a joint position document being published by the Association of Coloproctology of Great Britain and Ireland, the Association of Upper Gastro-intestinal Surgeons and the Association of Surgeons of Great Britain and Ireland.^{3–5}

To ensure consultant-led, robust, sustainable and safe emergency general surgery (EGS) services, training must be delivered and protected so that the competencies required for a Certificate of Completion of Training (CCT) are achieved.² Indeed, the pan-association consensus document argues the need for longer attachments and specialist fellowships in EGS, with mandatory 6-month modules an inherent part of the training pathway.⁵ All general surgical trainees must achieve EGS competencies as defined in the 2015 general

surgical curriculum prior to CCT, as demonstrated by work-based assessments (WBAs).^{6,7} Minimum operative requirements include 100 emergency laparotomy cases (including a minimum of 20 segmental colectomy and five Hartmann's procedures), and 80 appendicectomies registered in a surgical logbook, alongside a minimum of three Level 4 procedure-based assessments (PBA) in each indicative procedure and 10 Level 4 case-based discussion (CBD) assessments relating to EGS.⁶

Due to the European working time directive (EWTD) being allied to subspeciality development, trainees now have approximately 50% less EGS experience than previously.^{2,5} Moreover, proposals described in the Shape of Training review have raised concerns over further reductions in EGS training.^{8,9} A recent curriculum concordance analysis by the Speciality Advisory Committee in General Surgery by Thomas et al reported that two-thirds of trainees achieved the minimum CCT operative caseload requirement of 1600, with three-quarters meeting the target number of laparotomies.

The necessary PBA requirements for the six indicative procedures in general surgery were achieved by only 3% of trainees.¹⁰

The aims of this study were to implement, and evaluate the impact of, a novel EGS training module in a busy tertiary referral centre to determine whether a dedicated month of EGS exposure would improve trainees' experience.

Methods

An EGS module was instituted in August 2014 at the University Hospital of Wales, Cardiff. This module was approved by the medical workforce department, and was judged to be EWTD and New Deal compliant. Each specialist registrar (StR) was allocated a 4-week emergency surgery block in addition to the normal 1:12 on-call duty rota. The agreed hours of work were Monday to Wednesday (8am–9pm) and Thursday (8am–5pm), although a degree of flexibility was encouraged to maximise training opportunities. Trainees had no elective commitments during this attachment. The EGS or Confidential Enquiry into Post-Operative Deaths (CEPOD) StR had the following roles and responsibilities:

- > Attend the daily 8am and evening consultant post-take ward round
- > Manage the CEPOD emergency operating list, including reviewing and consenting all patients
- > Priority access to all emergency laparotomies
- > Update the National Emergency Laparotomy Audit (NELA) database prospectively and complete/lock previous cases, where possible.¹¹

Eleven consecutive StRs with National Training Numbers, comprising three at level ST3, one at ST4, two at ST6, two at ST7 and three at ST8, who completed the above EGS module were included. Data was extracted from trainee logbooks and on-line Intercollegiate Surgical Curriculum Programme portfolios for the EGS module and the overall training year, from 6 August 2014 to 17 July 2015. Trainees were blinded to the data collection process. Total procedure numbers performed were ascertained using the prospective digital theatre management system, CEPOD theatre procedure books and the NELA database.

Descriptive statistics were used, where appropriate, with parametric data expressed as mean±standard deviation and non-parametric data as median (range or interquartile range [IQR]). Proportions were compared using Chi-squared or Fisher's exact tests, with $p < 0.05$ considered significant. Statistical analyses was performed using SPSS Statistics version 20 (IBM Corporation, Armonk, New York, USA).

Results

The index procedures performed during the 50-week study period are shown in Table 1. Figure 1 compares operative numbers for StRs in the first half of higher surgical training (intermediate and first year of higher I, or ST3–5) with those in the second half (second year of higher I and higher II, or ST6–8). Although senior trainees performed more index

Table 1 Index procedures performed during the 50-week study period and 4-week emergency block

Procedure	Appendicectomy	Laparotomy	Segmental Colectomy	Hartmann's Procedure
N*	302	354	104	38
Median [range]**	25 [13–46]	31 [9–49]	7 [1–31]	5 [0–6]
EGS Block*, n (%)	82 (27%)	120 (34%)	25 (24%)	10 (26%)
Median [range]	7 [3–14]	11 [5–15]	2 [0–5]	1 [0–4]

* = total number of procedures for all 11 StRs
** per StR
EGS = emergency general surgery

Figure 1 Comparison of logbook numbers between ST3-5 and ST6-8 trainees

procedures than their less experienced counterparts over the training year, the numbers of indicative procedures performed during the EGS block were comparable.

A total of 275 laparotomy procedures were performed during the EGS modules, of which 120 (43.7%) were undertaken by the EGS StR (range 24.1%–63.7% for individual EGS StRs). This figure excludes laparotomies performed at weekends between EGS modules, totalling 30 additional cases. There were 49 laparotomies in which a second, non-EGS module StR attended, and these were double-counted in the overall figures.

PBA assessments relating to specific emergency index procedures are summarised in Table 2. Each trainee completed a median of 11 (range 4–28, IQR 9–12) PBA assessments for index emergency procedures over the 50-week study period,

Table 2 Proportion of index procedures with accompanying PBA assessment over the whole year and during the emergency block			
Procedure	Whole year*	EGS block	p value
Appendicectomy	10/220 (5%)	5/82 (6%)	0.561
Laparotomy	33/234 (14%)	38/120 (32%)	<0.001
Segmental Colectomy	17/79 (22%)	12/25 (48%)	0.019
Hartmann's Procedure	12/28 (43%)	6/10 (60%)	0.468
* Excluding those performed during the EGS block All values = n (%), unless otherwise stated EGS = emergency general surgery; PBA = procedure based assessment			

and a median of 4 (range 0–15, IQR 3–8) during the 4-week EGS module. A total of 133 PBAs were undertaken during the training year, with median scores of 4 for most index procedures before, during and after the EGS block.

Fifteen CBDs were performed during the EGS module, at a median of 1 (range 0–3) per StR and a median score of 4 (IQR 3–4).

Discussion

This study showed that a 4-week EGS module provided a period of high-volume exposure to intense EGS. Of the 354 laparotomies undertaken by the StRs during the training year, a third were performed during the EGS module, while approximately a quarter of the other index procedures were performed over the same period. Hence, between a quarter and a third of the indicative operations were performed within less than 10% of the available training time over the year. Extrapolating these figures to a unit with a similar workload implies that a similarly designed 6-month EGS placement might be expected to deliver approximately 70 laparotomies, 42 appendicectomies, 12 segmental colectomies and six Hartmann's procedures. Two such placements during a higher surgical training programme would more than fulfil the requirements for CCT target of EGS indicative procedures. Historical data also suggests that the operative numbers in our unit are predictable and sustainable.

The median number of index procedures during the EGS module was comparable across trainee grades. This is important because, in broad terms, the more senior trainees performed more operative procedures than their junior counterparts during the rest of the training year, suggesting equanimity of access to training opportunities during the EGS module and the requisite level of supervision for all. Frequently, the majority of contemporary EGS training is provided 'on the hoof' during pressurised periods of on-call shift work. Reports of poorer outcomes for patients admitted outside traditional working hours than those admitted during normal working hours suggest that this model of training is not only suboptimal in terms of trainee educational

value but also threatens patient safety.² Moreover, when questioned, a majority of trainees state that they would value 6-month EGS attachments during higher surgical training,⁵ and it has been suggested that such modules may both improve the trainee-trainer relationship and facilitate structured skill progression.² This potential benefit might arguably mitigate the adverse influence of EWTD-related restrictions on training time in EGS, although the impact is debatable, with Mahesh et al reporting an increase in the proportion of cases offered for training at a high-volume cardiac centre following implementation of the EWTD.¹²

In a recent survey of 276 UK surgical trainees, only 15.4% stated that they would accept a full-time EGS consultant role, with less than 5% expressing an interest in EGS as a primary career.⁵ The concept of a post-CCT non (sub)-consultant surgeon grade to provide EGS has proven unpopular with trainees, and has been opposed by the Association of Surgeons in Training.^{15,14} Furthermore, newly appointed consultants feel less confident than before about joining the consultant adult emergency rota without support, again suggesting a training deficit.⁵ Although a significant minority of patients admitted to tertiary centres require specialist emergency surgery and intensive care input, Garner et al estimated that a consultant with a relevant alternative subspecialist interest performed 30% of complex emergency surgeries, with the majority out-of-hours.^{15,16}

There is now an increased focus on gaining, proving and documenting competency in indicative emergency operations. WBA tools are an integral part of modern surgical training, and can facilitate competency progression.¹⁵ Such tools have replaced the unreliable methods of technical skills assessments used previously.¹⁷ PBA assessments are now a well-established, validated method for trainee assessment.^{18,19} These assessments have been shown in prospective studies to have good construct validity, which is mandatory for a competency evaluator, and excellent reliability, while being superior to other assessment tools.^{18,20,21} It has been suggested that WBA assessments should continue throughout training, at an approximate rate of one per week.¹⁵ A total of 76 WBAs relating to the four index procedures (61 PBAs, 15 CBDs) were undertaken during the EGS blocks, at approximately seven per month. This compares favourably with the mean number of 3.8 WBAs completed per month by ENT trainees within the Wales Deanery, and further demonstrates that the EGS module delivered WBAs at volumes consistent with CCT targets.²²

As a significantly higher proportion of laparotomy and segmental colectomy cases were associated with a PBA assessment during the EGS block than during the general on-call rota, the EGS module environment arguably encouraged the completion of assessments to demonstrate competence progression. Nevertheless, the number of CBD assessments completed was modest overall and, although it was generally considered a positive tool for training by trainees, concerns have been raised over the implementation of such assessment tools, which may influence their utilisation in this setting.²³ More likely, however, is a perception by trainees that EGS modules are designed to improve technical, operative competencies, with more emphasis placed on

PBA completion. This rota-based model for EGS meant that high volumes of operative cases could be performed by trainees, which were associated with PBAs whenever possible. The downside of such a module is a relative lack of continuity of care. This results from being on-call with several consultants during a 4-week block, and the resultant operative commitments reducing unavailability for the on-going care of emergency admissions. An alternative team- or ward-based model may nullify some of these concerns, at the price of reduced operative experience. An additional benefit of team-based EGS training is the rapid development of a trainer–trainee relationship, which further enhances, for example, targeted competency training and assessment completion, particularly CBDs.

Overall, the median PBA score achieved for each index procedure was high, at 4 in most cases before, during and after the EGS module. The high pre-EGS scores for trainees make it difficult to demonstrate improvements during the block, although our data does suggest that trainees were not becoming de-skilled following completion of the module. This is probably because between 66% and 76% of all index procedures were available for non-EGS module StRs, both during parallel daytime emergency operating sessions and out-of-hours. This allowed adequate exposure to emergency surgery as part of the normal on-call rota to maintain competency, at least to the level attained during the EGS modules.

Conclusions

This novel 4-week EGS block delivered a high volume of index emergency procedures, allied to a learning environment suitable for PBA completion at a higher rate than would be expected during standard training. These findings provide an important baseline when considering future possible modular based EGS training.

References

1. Barrow E, Anderson ID, Varley S *et al.* Current UK practice in emergency laparotomy. *Ann R Coll Surg Engl* 2013; **95**: 599–603.
2. Sharrock AE, Gokani VJ, Harries RL *et al.* Defining our destiny: trainee working group consensus statement on the future of emergency surgery training in the United Kingdom. *World J Emerg Surg* 2015; **10**: 26.
3. *The Future of Emergency General Surgery. A Joint Document. March 2015.* Anderson IA, ed. London: Association of Surgeons of Great Britain and Ireland, 2015.
4. Saunders DI, Murray D, Pichel AC *et al.* Variations in mortality after emergency laparotomy: the first report of the UK Emergency Laparotomy Network. *Br J Anaesth* 2012; **109**: 368–375.
5. Awad S, Herrod PJ, Palmer R *et al.* One- and two-year outcomes and predictors of mortality following emergency laparotomy: a consecutive series from a United Kingdom teaching hospital. *World J Surg* 2012; **36**: 2,060–2,067.
6. Intercollegiate Surgical Curriculum Programme. The Royal College of Surgeons of England. <https://www.iscp.ac.uk/Default.aspx> (cited August 2015).
7. Beard JD. Assessment of surgical skills of trainees in the UK. *Ann R Coll Surg Engl* 2008; **90**: 282–285.
8. Allum B. *JCST Newsletter – July 2015.* London: Joint Committee on Surgical Training, 2015. pp2.
9. Shape of Training Expert Advisory Group. *Securing the future of excellent patient care.* Greenaway D, ed. London: General Medical Council, 2013.
10. Thomas C, Griffiths G, Abdelrahman T *et al.* Does UK surgical training provide enough experience to meet today's training requirements? *BMJ Careers* 2015;
11. National Emergency Laparotomy Audit. The Royal College of Anaesthetists. <http://www.nela.org.uk> (cited August 2015).
12. Mahesh B, Sharples L, Codispoti M. Effect of the full implementation of the European Working Time Directive on operative training in adult cardiac surgery. *J Surg Educ* 2014; **71**: 492–499.
13. Shalhoub J, Vesey AT, Fitzgerald JE. What evidence is there for the use of workplace-based assessment in surgical training. *J Surg Educ* 2014; **71**: 906–915.
14. Shalhoub J, Giddings CE, Ferguson HJ *et al.* Developing future surgical workforce structures: a review of post-training non-Consultant grade specialist roles and the results of a national trainee survey from the Association of Surgeons in Training. *Int J Surg* 2013; **11**: 578–583.
15. Privette AR, Evans AE, Moyer JC *et al.* Beyond emergency surgery: redefining acute care surgery. *J Surg Res* 2015; **196**: 166–171.
16. Garner JP, Prytherch D, Senapati A *et al.* Sub-specialization in general surgery: the problem of providing a safe emergency general surgical service. *Colorectal Dis* 2006; **8**: 273–277.
17. Moorthy K, Munz Y, Sarker SK *et al.* Objective assessment of technical skills in surgery. *BMJ* 2003; **327**: 1,032–1,037.
18. Marriott J, Purdie H, Crossley J *et al.* Evaluation of procedure-based assessment for assessing trainees' skills in the operating theatre. *Br J Surg* 2011; **98**: 450–457.
19. Memon MA, Brigden D, Subramanya MS *et al.* Assessing the surgeon's technical skills: analysis of the available tools. *Acad Med* 2010; **85**: 869–880.
20. Okoro T, Sirianni C, Brigden D. The Concept of Surgical Assessment: Part 3 – Characteristics of the Ideal Assessment Tool. *Ann R Coll Surg Engl (Suppl)* 2010; **92**: 1–2.
21. Beard JD, Marriott J, Purdie H *et al.* Assessing the surgical skills of trainees in the operating theatre: a prospective observational study of the methodology. *Health Technol Assess* 2011; **15**: i-xxi, 1–162.
22. Fishpool SJC, Stew B, Roberts C. Otolaryngology WBAs in the Wales Deanery: the first six years. *Ann R Coll Surg Engl (Suppl)* 2014; **96**: 164–166.
23. Phillips A, Lim J, Madhavan A *et al.* Case-based discussions: UK surgical trainee perceptions. *Clin Teach* 2016; **13**: 207–212.