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Original article

The experience and training of British general surgeons in trauma surgery for the abdomen, thorax and major vessels

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***Background*: The report *Better Care for the Severely Injured* [London: The Royal College of Surgeons of England and the British Orthopaedic Association; 2000] states that an experienced general surgeon trained in the techniques required to perform life-saving emergency surgery is vital in the management of major trauma. The experience and training of general surgeons in the UK in the management of trauma to the abdomen, thorax and major vessels has never been assessed.**

***Method*: Postal questionnaire sent to UK general surgical consultants and Higher Surgical Trainees (HSTs).**

***Results*: A total of 854 (48%) questionnaires were completed. Of respondents, 85% believe that major trauma should be directed to hospitals that provide a dedicated trauma service. Of non-vascular specialists, 43% felt their training was adequate to manage vascular trauma and only one-third of general surgical consultants felt adequately prepared to manage acute cardiothoracic injuries. The median number of trauma laparotomies undertaken annually was 2 for blunt injury and 1 for penetrating injury. Of HSTs, 21% had not performed a splenectomy for trauma and 44% had no experience of packing for liver injuries.**

***Conclusions*: There is limited experience and training in the surgical management of torso trauma in the UK. Implementation of the recommendations from *Better Care for the Severely Injured* will be hampered unless steps are taken to maximise experience and improve training.**

Key words: Trauma – General surgeons – Surgical training – Questionnaire survey – Trauma surgery

The strategy document *Our Healthier Nation – A Contract for Health*[2] set out the improvement in outcome from 'accidental injury' as one of the Government's main goals for the development of health care in the UK. This was followed by the publication of the joint report *Better Care for the Severely Injured*[1] by The Royal College of Surgeons of England and the British Orthopaedic Association. The report called for the development of a National Trauma Service and a National Trauma Audit Research Network as a vital step towards improvement in trauma care in the UK.

The outcome from the management of trauma in the UK has been the subject of a number of reports. In 1988, Anderson's study of 1000 trauma deaths stated that one-third occurring after major injury were preventable.[3] In

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Table 1 Questionnaire response by grade and experience

Grade	Number
Consultants > 10 years' experience	333
Consultants 5–9 years' experience	143
Consultants 2–4 years' experience	61
Consultants < 2 years' experience	54
Higher Surgical Trainees	245
Unknown grade	18
Total	854

1992, the Major Trauma Outcome Study report[4] concluded that the initial management of trauma remained unsatisfactory. A recent publication from the UK Trauma Audit and Research Network (UK TARN) suggests that whilst there has been progress in the reduction of preventable trauma deaths there must be improvement[5] if doctors are to attain the preventable death rates of 1–2% that are quoted by leading American trauma centres.[6]

Bain *et al.*[7] have reviewed the role of general surgeons in the management of major trauma in the UK. This prospective audit reported that less than 10% of severely injured patients that they assessed underwent surgery and questioned their involvement in the initial resuscitation. However, the frequency of surgical intervention in trauma at an individual centre depends on a number of factors: aetiology, severity and volume of patients. The study concluded that, when surgery was required, it was vital and life-saving and supported Anderson's[3] findings that missed or inadequately controlled haemorrhage is the single greatest cause of preventable trauma death. Both these papers concur with the standards of care for patients with abdominal injuries published in *Better Care for the Severely Injured*[1] which states that a general surgeon trained in the techniques required to perform life-saving emergency surgery is vital in the management of major trauma.

The experience and training in the management of trauma of UK general surgeons has not previously been assessed, and the ability of general surgeons to meet these standards of care is, therefore, unknown.

Methods

A questionnaire was designed in conjunction with the Raven Department of Education and the Clinical Effectiveness Unit of The Royal College of Surgeons of England. This addressed the attitudes and opinions of general surgeons towards the care of the severely injured patient, their experience in the management of trauma to the chest, abdomen and major vessels, and the exposure of general surgeons in the UK to surgical training for the management of injuries to these structures.

Questionnaires were sent to general surgical consultants and HSTs in the UK using mailing lists compiled by the Association of Surgeons of Great Britain and Ireland, and the Association of Surgeons in Training.

Data were analysed and statistical interpretation performed using STATA version 7. Percentages were calculated in relation to the response to each question as applicable.

Results

A total of 1797 questionnaires were distributed with a return of 854 (48%). Table 1 shows the response by grade and experience.

Of respondents, 8% had trauma experience from overseas with South Africa and Australia being the most common. The respondents were primarily from the main general surgical sub-specialities: vascular 20%, colorectal 28%, upper gastrointestinal 26%, breast 12%, not stated 6%. A total of 245 HSTs completed the questionnaire with an equal distribution of response from all 6 years of higher surgical training.

Of respondents, 76% professed an interest in the management of trauma patients. Significantly more HSTs (89%) than consultants of greater than 10 years' experience (67%) indicated an interest in trauma management (χ^2 = 34.5; df = 1; $P < 0.0001$).

Of respondents, 85% believed that major trauma should be directed to hospitals with a dedicated trauma service, with no significant difference in opinion observed by grade or experience ($\chi^2 = 5.6$; df = 4; $P = 0.233$). Of the surgeons, 92% indicated that they would transfer multisystem injured patients to tertiary centres with a dedicated trauma service after initial resuscitation and stabilisation had been completed if a trauma system were available. Consultants of less than 2 years and HSTs (97%) were more likely than consultants of more than 10 years' experience (87%) to hold this viewpoint ($\chi^2 = 23.0$; df = 1; $P < 0.0001$).

Most respondents (75%) felt that the management of major trauma should be within the scope of the average general surgeon, with 17% disagreeing and 8% holding no opinion. The majority (78%) indicated that they felt competent to participate in the management of patients with multisystem injuries.

The majority of respondents to the questionnaire (85%) indicated that the management of trauma accounted for less than 10% of their acute surgical take. The proportion of acute surgical take dedicated to trauma did not vary by grade/experience ($\chi^2 = 6.2$; df = 4; $P = 0.187$).

The frequency of blunt and penetrating trauma laparotomies performed by respondents in the last 12 months is shown in Table 2. The median number of blunt trauma laparotomies performed was 2 (range, 0–71). The median number of penetrating trauma laparotomies performed was

Table 2 The frequency of trauma laparotomy undertaken by respondents in 12 months

Number of laparotomies	0	1–5	> 6
Blunt trauma (n = 854)	29%	59%	12%
Penetrating trauma (n = 854)	44%	50%	6%

Table 3 Experience in cardiothoracic trauma; percentage who have undertaken emergency thoracotomy or repair of cardiac laceration

	Emergency thoracotomy	Cardiac laceration
Consultants < 2 years' experience	33%	37%
Consultants > 5 years' experience	41%	55%

1 (range, 0–62). The number of blunt trauma laparotomies performed did not vary by grade/experience (F = 2.11; df = 4; P = 0.08). This was also true of the number of penetrating trauma laparotomies performed (F = 0.34; df = 4; P = 0.9). There was no difference in the grade and experience of the respondents who had not operated for trauma in the preceding year.

The respondents indicated their confidence in managing the main types of injury; 95% felt equipped to deal with general surgical injuries versus 74% for retroperitoneal injuries, 64% for major vascular injuries and 30% for cardiothoracic injuries (Fig. 1). There was no difference between the surgeons who had previously indicated an interest in trauma and those who were not interested in trauma in their confidence to manage general surgical and retroperitoneal injuries. However, surgeons who were interested in the management of trauma were significantly more likely than those without this interest to feel equipped to manage cardiothoracic injuries (33% versus 19%; χ^2 = 13.0, P < 0.001); major vascular injuries (68% versus 52%; χ^2 = 16.8, P < 0.001) and multisystem injuries (82% versus 61%; χ^2 = 36.4, P < 0.001).

Of the surgeons completing the questionnaire, 64% thought that their training had adequately equipped them to deal with major vascular trauma. This included 175 respondents with a stated sub-speciality interest of vascular surgery. When non-vascular specialists are reviewed, 43% felt trained to manage vascular injury. Of all the consultants, 76% had been involved in the management of aortic injury and 50% carotid or subclavian trauma.

Cardiothoracic trauma is an area of surgery for the severely injured patient that 70% of general surgeons felt inadequately trained to manage. Of consultants, 58% had not performed an emergency thoracotomy and 60% had never undertaken a median sternotomy for trauma. Only 23% of consultants had performed a lobectomy for trauma and 11% pulmonary tractotomy for penetrating injury, although 55% had repaired a cardiac laceration. Table 3 shows the experience with emergency thoracotomy and repair of cardiac injuries by grade and experience.

Consultant experience with abdominal trauma is widespread. Of the consultant surgeons, 98% had performed a splenectomy for trauma and 98% had repaired a traumatic bowel injury. Attempts at splenic salvage are less frequent, although 76% of the consultants had attempted this. General surgeons are less confident with retroperitoneal trauma with

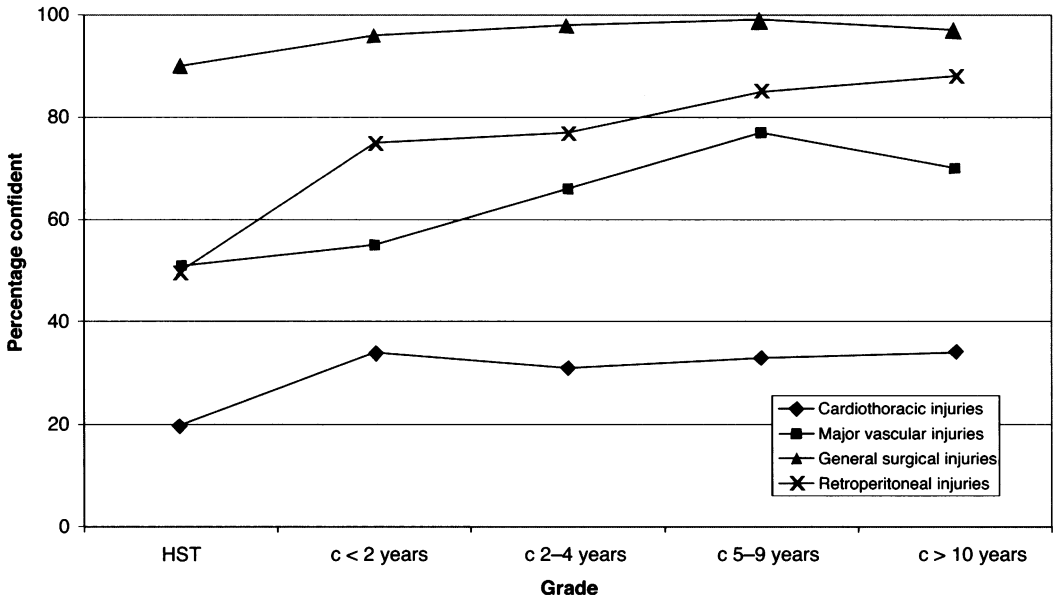

Figure 1 Surgeons' confidence dealing with trauma.

62% of consultants having undertaken a trauma nephrectomy and 62% pancreatic surgery for trauma.

The experience in the UK with specific trauma surgery techniques including damage control, liver packing and non-operative management is variable. Damage-control surgery had been attempted by 48% of the respondents with 40% of HSTs having some experience of damage-control surgery. Liver packing had been employed as a technique in the management of liver injuries by 84% of consultant surgeons and 92% of surgeons of all grades had attempted to manage solid organ injuries non-operatively.

Of HSTs, 90% are confident with the surgical management of abdominal trauma, but less assured with vascular injuries (51%), retroperitoneal injuries (49%) and cardiothoracic injuries (20%). Despite this confidence, 21% of HSTs had not undertaken a splenectomy for trauma, 44% had no experience in the packing of an injured liver, 15% had not repaired bowel injured through trauma and 33% had not repaired a peripheral vascular injury. The experience of HSTs with cardiothoracic trauma is limited with only 27% HSTs having attempted an emergency thoracotomy for trauma and 14% repair of a cardiac injury.

Discussion

The response rate for the questionnaire (48%) was satisfactory for a postal survey, but we acknowledge that the data collected may be skewed as it is likely that more surgeons with an interest in the management of trauma will have completed and returned the questionnaire.

The majority of UK general surgeons who completed the questionnaire are interested in the management of trauma and believe general surgeons should retain the ability to manage trauma. They consider that the best service for severely injured patients would be to manage their injuries at a hospital with a specialist trauma service either through direct referral from the roadside or transfer from an acute receiving hospital after the initial resuscitation and stabilisation.

Most general surgeons feel competent to be involved in the management of multisystem injured patients and undertake abdominal surgery for trauma. However, there is reduced confidence amongst the respondents in the management of retroperitoneal, cardiothoracic injuries and vascular injuries.

There are 230 acute hospitals with accident and emergency departments in the UK that receive injured patients, 22 have neurosurgery services on site and 42 have cardiothoracic centres. There are only 5 hospitals where all the acute services are available on the same site. Although surgical intervention for cardiothoracic injuries is required in less than 10% of blunt thoracic and 15–30% of penetrating thoracic injuries,[8] in hospitals without a cardiothoracic unit it is the general surgical team that must provide the immediate surgical response. The survey revealed that only one-third of general surgical consultants felt that their training had equipped them to deal with these emergencies.

Away from the large teaching centres, few hospitals at present have a dedicated vascular consultant on-call rota.[9] As the majority of major trauma in the UK occurs out-of-hours or at weekends,[10] the management of major vascular injury falls within the remit of the on-call general surgeon many of whom feel they are not sufficiently trained to manage vascular trauma.

The results from the questionnaire suggest that seniority and, therefore, accrued experience play a role in the exposure of consultants to injuries and their management as the more senior consultants had more experience of surgical procedures for both cardiothoracic and vascular injuries than newly appointed consultants. The effect of changes in surgical training on the experience of surgeons in managing injuries cannot be isolated from accrued experience in this study. The reduced training time since the introduction of Calman changes means that many new consultants tackle complex injuries for the first time alone.

The *Curriculum for Higher Surgical Training in General Surgery* states that by the end of training, trainees should have knowledge and experience of the assessment and management of closed abdominal injuries especially hepatic, splenic and pancreatic injuries; stab and gunshot wounds; and arterial injuries.[11] The survey revealed that HSTs in the UK have limited exposure to trauma and the surgical management of specific injuries. Whether the current levels of experience meet the curriculum requirements is a matter for debate. Concerns have similarly been raised with training in emergency general surgery.[12] Bradford and Whittaker highlighted the Calman reforms to the length of surgical training as having a major effect on the ability of HSTs to gain the necessary emergency surgical experience. The dilution of patient numbers throughout the accident and emergency system and reduction in junior doctors' hours will further limit HSTs acquiring experience and training in trauma surgery in the UK. Centralising the management of the severely injured in specialist units may increase and intensify the overall experience of trainees.

Conclusions

This is the first national questionnaire of its kind to address the attitudes, experience and training of general surgeons in the surgical management of trauma to the abdomen, thorax and major vessels to be undertaken in the UK. It has highlighted that there is an interest in the management of

trauma and improving trauma outcome. However, the study has shown that there is limited experience in trauma surgery. Clearly, there are limitations in the training of HSTs and recently appointed consultants in the management of the types of injury that many of them will be expected to deal with during their consultant careers if the current system of trauma care in the UK persists. The results also bring into question the provision of surgical cover for vascular and cardiothoracic trauma at hospitals where there is not a separate rota for these specialities. Whether the national standards for the provision of general surgical care for trauma patients are met will remain open to debate until a consensus is reached on the experience and training surgeons require to be involved with the management of severely injured patients.

We believe that this information is valuable and should be taken into account in the planning of trauma care provision in the UK. It is vital that HSTs and consultants are trained in the surgical techniques required for the management of the severely injured patient if the standards set out for general surgeons in the report *Better Care for the Severely Injured*[1] are to be met and improvements in the care and outcome of trauma patients made.

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