

# Trauma Training and Workload: A National Survey

K McSorley, J Quinlan

Department of Trauma and Orthopaedics, AMNCH, Tallaght, Dublin 24

## Abstract

Trauma is a major source of mortality and morbidity throughout Ireland. Training in trauma is dependant on experience gained by trainees within specific posts. Trauma services are a topical issue at present with much discussion about delivery and restructuring. With this in mind we conducted an online survey of trainees in emergency medicine, orthopaedic and general surgery to assess current experience and opinions with regard to trauma. The survey was vetted and distributed by the relevant training bodies. 59(98.33%) respondents believed smaller units should be bypassed for major trauma and 55(91.67%) believed that larger hospitals receiving major trauma should have a trauma theatre available 24-hours a day. 55(91.67%) also foresaw themselves covering major trauma as consultants, consequently these trainees will be the consultants developing, moulding and working in this restructured trauma service.

## Introduction

Injuries from trauma remain the biggest cause of mortality in people under 45 years of age<sup>1,2</sup> both in Ireland and worldwide. In the hospital setting trauma is managed by multiple specialties depending on the nature and severity of the injuries; including emergency medicine, general surgery, orthopaedics, anaesthetics, neurosurgery, plastic and cardiothoracic surgery. Taking road traffic accidents (RTAs) as an example of one of the major sources of trauma in Ireland we have seen a 44% reduction in fatalities between 2007 and 2013<sup>3</sup>. However, the World Health Organisation (WHO) is predicting an increase worldwide in the number of fatalities from RTAs in the future<sup>4</sup>, implying a rise in the number of associated trauma patients. Trauma patients remain a major cause of mortality and morbidity, consuming large volumes of healthcare resources. With this in mind we surveyed non-consultant hospital doctors (NCHDs) currently in training in some of the core specialties providing trauma services in Ireland. The aim was to map current opinions on trauma training Irish hospitals and identify and elucidate trainees' aspirations to manage trauma in the future. For all trauma patients the first point of contact with trainees in the hospital setting is the emergency department. From here the bulk of referrals for admission are split between general surgery and orthopaedic surgery, with smaller volumes going to plastic, neuro and cardiothoracic surgery. Consequently, we chose to survey trainees in general and orthopaedic surgery and emergency medicine.

## Methods

An online survey was emailed to all higher specialist trainees in general and orthopaedic surgery and emergency medicine, distributed through the three trainee representative bodies. There were 60 respondents; 16% (10) general surgery, 43% (26) orthopaedics and 40% (24) emergency medicine. This was a non-validated 10-item questionnaire via <http://surveymonkey.com> that was vetted prior to distribution by the head of each training body.

## Results

There was a broad range of responses to the subjective assessment of the burden of trauma on trainees, from under 10% up to 75%, as outlined in Table 1. When asked about referral patterns for specific complex trauma there was a small deficit in trainees' knowledge regarding referring pelvic trauma (6.67% of trainees unaware) thoracic aorta injuries (8.33% unaware) and fractures requiring plastic surgery input (10% unaware). Over 91.67% (n=55) of respondents foresaw themselves covering polytrauma as consultants. 5% (3) of respondents did not foresee themselves involved in these cases and 3.33% (2) were undecided; the most common reason cited was other subspecialty interest (4). Trauma teams composition varied widely with 76.67% (46) of respondents having experienced one. The mix of senior and junior staff is illustrated in Figure 1. When asked about complex polytrauma bypassing smaller units with limited specialties, 98.33% (59) of respondents agreed with it. The limitations of this survey prevented the definition of a "smaller

units" but it might include units without an intensive care unit or limited access to radiology investigations e.g. MRI. Along with this, 91.67% (55) believe that the larger receiving hospital should have a dedicated trauma theatre available 24-hours a day. Trainees are entering specialties earlier and earlier narrowing their clinical experience, 80% (48) of those surveyed said they would favour 3-6 month rotations at Senior House Officer (SHO) or Specialist Registrar level (SpR) out of their chosen specialty in another trauma related specialty e.g. orthopaedic trainees rotating through plastic surgery.

## Discussion

Given that trauma is unpredictable and can affect anyone, at any time, a natural variance in trauma load is to be expected. With appropriate distribution of resources and catchment areas, trauma workload for trainees should have limited variation. However, we observed variation from < 10% up to 90% (Table 1). Implying trainees are experiencing different levels of exposure to trauma. The 10% of trainees whose patient workload is more than 75% trauma will consequently spend more time managing and learning about trauma whilst the 22% of respondents who have less than 10% of their patient load associated with trauma will be less likely to manage any significant complex polytrauma. Does this leave trainees' experience dependent upon the volume of complex trauma presenting to the emergency department while they are on duty? This leads to the potential corollary of limited training in the management, stabilisation and tertiary referral of these challenging cases. With rationalisation and shortening of surgical training there is further potential for decreased exposure.

European Working Time Directive (EWT) restrictions to on-call service and decreased hours will require an increased focus on structured training and an attempt to increase trainees' experience of complex trauma. Given the relatively small catchment areas in Ireland, having specialist centres for spinal, pelvic and cardiothoracic trauma is the best distribution and utilisation of resources. It ensures adequate patient volumes for maintaining skills. It gives trainees experience of higher volumes of specific elements of trauma focused in tertiary referral centres. Depending on a trainee's experience they may or may not have referred to a specific tertiary centre during their training, as they may or may not have experienced trauma requiring such a referral. This was shown by the fact that 100% of those surveyed were aware of how to refer head and spinal injuries whilst 6% and 8% were unsure about less common pelvic and thoracic aorta injuries, respectively. Formal didactic training cannot replace experience but in the absence of encountering these complex cases, formal training on assessment and referral is essential for surgical and emergency medicine trainees to aid initial management, assessment and referral in a timely and appropriate fashion. With decreasing exposure as outlined above and increasing subspecialisation there is scope for consultants in the future managing complex trauma to find themselves out their depth. With trainees focusing on subspecialties earlier and earlier,

Table 1

Trauma as % of Patient Load	Responses %	(n)
< 10%	22.03%	(13)
10-25%	27.12%	(16)
25-50%	18.64%	(11)
50-75%	20.34%	(12)
75-90%	10.17%	(6)
>90%	1.69%	(1)
Unable to answer	1.69%	(1)

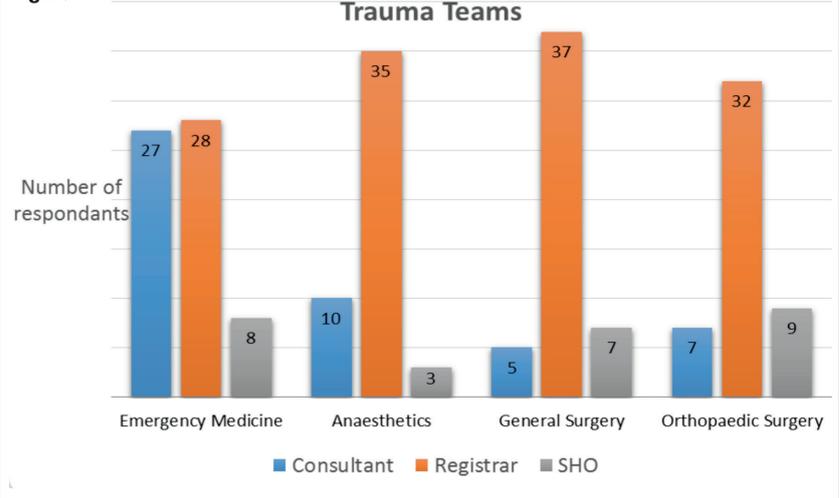
we asked how many of them intended to cover trauma routinely as consultants, 92% (55) of respondents said they would foresee it. Of those surveyed, 5% (3) did not foresee themselves covering major trauma, while the remaining 3% (2) were undecided. A mix of reasons was cited, the majority stating that other subspecialty interest would prevent them covering trauma on call.

Trauma teams are designed to provide advanced simultaneous care from relevant specialties to patients presenting with complex polytrauma. Since 1985 it has been a topic occupying column inches in letters to editors and journal articles<sup>5,6</sup>.

Many different suggestions regarding the optimal composition and co-ordination of trauma teams have been proposed. However, there is yet to be an established standard composition. When asked, 76.67% (46) of respondents had experienced a trauma team in their training. The composition of the teams is illustrated in Figure 1. The mix seen in the table reinforces that there is still no unifying formula for a trauma team. Anaesthetic and general surgical registrars are both present in over 80% of trauma teams. At SHO level, orthopaedics is most commonly represented but still only present in 21% (9) of trauma teams, possibly reflecting the decrease in experience being gained by trainees at this level as described earlier. This shows potential for engaging with SHOs to increase their trauma experience. By ensuring trainee SHOs in emergency medicine, general and orthopaedic surgery are part of a trauma team they will obtain vital experience of initial assessment, resuscitation and management of complex trauma patients. By designating specific trauma hospitals within the newly established hospital groups, complex polytrauma could bypass smaller hospitals with limited specialties. Trauma would then be concentrated in centres with appropriate specialties, facilities and resourcing. Ambulance dispatch, local triage teams and emergency departments would have discretion, supported by agreed management protocols, to decide which cases should bypass to the main trauma centre and which can be managed locally. It would give trainees rotating through the designated trauma centres exposure to higher volumes of trauma while complying to decreased working hours detailed above. With higher volumes, trauma teams could be properly established allowing efficient assessment, resuscitation and management of complex polytrauma requiring input from multiple specialties. This would also make efficient use of on-call 24-hour radiology and theatre resources. With higher throughput of complex trauma these hospitals would need to be allocated appropriate additional funding which fits with the Department of Health's drive towards a payment by results model i.e. money follows the patient<sup>7</sup>. Increasing trauma volumes in specific centres would increase demand on certain resources within the hospitals including designated trauma beds for admissions, radiology, theatre and allied health professionals.

In our survey 92% (55) of respondents supported a 24-hour dedicated trauma operating theatre. This resource would be available in designated centres managing all the complex polytrauma within each hospital working group. This would benefit

Figure 1



all staff involved in operative management of trauma. Theatre nursing staff and anaesthetic trainees would see increased volumes and thus have increased exposure to complex cases requiring urgent surgical intervention. As stated earlier this would also benefit general and orthopaedic surgery trainees as they would experience higher volumes of complex trauma while rotating through dedicated centres. This could assist with maintaining EWTD compliant rosters as NCHDs are exposed to sufficient volumes without working more than 24 hours. It would also ensure that the increased volume of trauma cases would not impact on existing operating lists in larger trauma centres if smaller hospitals were bypassed.

Traditionally all surgical trainees and many emergency medicine trainees would complete 4 six month rotations in different specialties prior to entering a specialist higher training programme. These rotations allowed experience in diverse specialties dealing with different aspects of trauma for example plastic, neuro or vascular surgery. They could then bring this experience to their chosen specialty which would be an asset especially when dealing with a polytraumatised patient. For example general surgeons with neurosurgical experience would be comfortable monitoring minor head injuries. Plastic surgery experience would also be useful for all specialties who find themselves managing traumatic lacerations, be it on the face in the emergency department or wounds from open long bone fractures. The benefits of broader specialty experience during training cannot be over-estimated. As specialty training is recruiting doctors earlier in their career and implementing shorter training schemes there is little scope to gain this broader experience. When surveyed, 80% (48) of respondents believed there should be an option to rotate through other specialties as a trainee to gain this experience. For example emergency medicine trainees could rotate through neurosurgery to gain experience of head injuries and their management. There are several steps outlined above which, if implemented, have the potential to facilitate increased efficiency in patient care while streamlining trauma services. Importantly, the insights gained by continually reviewing current practice within NCHD training ensures that the consultants of tomorrow are trained to significantly higher standards while remaining EWTD compliant.

Correspondence: K McSorley  
Department of Trauma and Orthopaedics, AMNCH, Tallaght,  
Dublin 24  
Email: kevmcsorley@rcsi.ie

#### References

1. Kauvar DS, Wade CE. Impact of hemorrhage on trauma outcome: an overview of epidemiology, clinical presentations, and therapeutic considerations. *J.Trauma*2006;60:S3-11.

2. Scallan E, Fitzpatrick P. Injury in Ireland. 2001;(June).
3. RSA. Death and Injuries on Irish Roads. <http://www.rsa.ie/RSA/Road-Safety/Our-Research/Dea>.
4. Murray CJ, Lopez a D. Alternative projections of mortality and disability by cause 1990-2020: Global Burden of Disease Study. *Lancet* 1997;349:1498-504.
5. Spencer JD. Why do our hospitals not make more use of the concept of a trauma team? *Br.Med.J.*1985;290:136.
6. Georgiou A, Lockey DJ. The performance and assessment of hospital trauma teams. *Scand. J. Trauma.Resusc. Emerg.Med.* 2010;18:66.
7. Reilly Faircare?: a New Direction for Health Care and Policy in Ireland Primary Care Reform is Crucial A 3-Phase Programme. 2009;353:1-4.

## Postnatal MRI Brain in Infants Treated for Twin–Twin Transfusion Syndrome

M Boyle<sup>1</sup>, A Lyons<sup>1</sup>, S Ryan<sup>1,2</sup>, F Malone<sup>3</sup>, A Foran<sup>1</sup>

<sup>1</sup>Department of Neonatology, Rotunda Hospital, Parnell Sq, Dublin 1

<sup>2</sup>Department of Radiology, The Children's University Hospital, Temple St, Dublin 2

<sup>3</sup>Department of Fetal Medicine, Rotunda Hospital, Parnell Sq, Dublin 1

### Abstract

Untreated twin-twin transfusion syndrome (TTTS) is associated with significant mortality and neurological impairment. Fetoscopic laser surgery (FLS) is the treatment of choice. We sought to assess intracranial abnormalities in TTTS twins following treatment. In this prospective, blinded study MRI scans were performed on 3 groups; (1) monochorionic diamniotic (MCDA) twins with TTTS who had undergone FLS (n=10), (2) MCDA twins without TTTS (n=8) and (3) dichorionic twins (n=8). Scans were scored as either normal or abnormal. The primary outcome was a composite of abnormal MRI brain or intrauterine fetal demise. The primary outcome occurred in 6/10 (60%) of the TTTS group versus 3/8 (37.5%) in the MCDA group. The primary outcome was significantly different across all study groups [ $p = 0.029$ ;  $X^2 = 7.112$ ]. We found that twins treated for TTTS are more likely to have abnormalities on MRI brain at term than other twin groups. This group merits term-corrected MRI as part of their postnatal assessment.

### Introduction

Perinatal mortality and morbidity rates are higher in twins than in singleton infants<sup>1</sup>. Monochorionic twins account for the highest risk group<sup>2</sup> and have higher rates of preterm delivery, lower birth weight and neurodisability<sup>3</sup>. A 7-fold increase in neurologic morbidity has been reported in preterm monochorionic twins compared to matched dichorionic twins, the increase attributed to discordant birth weights and co-twin demise in utero<sup>4</sup>. Twin-twin transfusion syndrome (TTTS) affects monochorionic diamniotic (MCDA) pregnancies and represents a severe complication in 10 to 15% of these pregnancies<sup>5</sup>. Unbalanced, interfetal, transplacental blood flow across deep arterial to venous connections results in progressive reduction of amniotic fluid volume and impaired growth in the donor twin, with polyhydramnios and hydrops in the recipient twin<sup>6</sup>. The risk of in-utero demise of untreated twins is 80% to 100%<sup>7</sup> and carries significant risk of neurological impairment in surviving twins. Cerebral palsy rates of 20% in surviving twins have been reported, with the risk significantly higher in the setting of a co-twin demise<sup>8</sup>. Many treatments have been used including, selective fetocide and amniotic septostomy. Current treatment options favour serial amnio reduction and endoscopic laser ablation of the vascular anastomoses. These options have varying success rates, survival outcomes and neurodevelopmental results. Meta-analyses have shown superiority of fetoscopic surgery over other modalities<sup>9,10</sup>. A recent randomised control trial has also shown that fetoscopic laser surgery (FLS) has more favourable survival rates and a significantly reduced risk of neurodevelopmental impairment when compared to amnioreduction<sup>11</sup>. Despite these advances and improved outcomes, significant rates of fetal demise and neurological impairment such as cognitive and motor developmental delay remain<sup>12-14</sup>.

Haemodynamic changes resultant to unbalanced blood flow affects many vital organ functions with cardiac, renal and neurological sequelae<sup>15</sup>. Since FLS has become the preferred choice of treatment, some studies demonstrate haemodynamic changes associated with the procedure, distinct from the primary

disease process. An increase in peak systolic velocity in the middle cerebral artery is observed in recipient twins post FLS. However, these changes are transient and have uncertain long-term consequence<sup>16</sup>. Ultrasonographic evidence of severe cerebral lesions in TTTS infants, post laser surgery, suggests that these lesions result from antenatal injury<sup>17</sup>. Fetal magnetic resonance imaging (MRI) identifies areas of cerebral ischaemia, not obvious on antenatal ultrasound<sup>18</sup>, but to date there is a paucity of published postnatal MRI brain studies. Term corrected MRI brain imaging is beneficial for risk stratification of ex-premature infants in predicting adverse neurodevelopmental outcome<sup>19</sup>. The purpose of this study was to evaluate intracranial abnormalities in twins following FLS, using term corrected MRI brain and comparing them with both MCDA twins without a diagnosis of TTTS and dichorionic (DC) twins, in which this is not a clinical entity.

### Methods

This study was undertaken in the Rotunda Hospital, a national referral centre for FLS in the Republic of Ireland. MRI brain imaging was acquired on 3 twin groups in a prospective, case control manner at term-corrected gestation (37 to 44 weeks). Three study groups were defined as follows (1) twins with an ultrasound diagnosis of twin-to-twin transfusion syndrome who had previously undergone fetoscopic laser surgery, (2) Monochorionic diamniotic twins with normal antenatal ultrasounds outruling a diagnosis of TTTS and (3) Dichorionic twins. Twin infants who had delivered in the study centre having previously undergone FLS were included; matched pairs of MCDA and DC twins were consecutively enrolled for each TTTS case. Cases on whom FLS had been performed but that delivered elsewhere were excluded, as were infants with an antenatal diagnosis of complex congenital anomalies (cardiac, gastrointestinal tract or respiratory), chromosomal disorders or primary brain abnormalities. TTTS was diagnosed using antenatal ultrasound and staged according to Quintero criteria<sup>20</sup>. MRI's were performed on a General Electric (United Kingdom) 1.5T Signa MRI system a departmental neonatal brain protocol. Chloral hydrate (50mg/kg) was used for sedation.