In-theatre training of anaesthetists in a teaching hospital: has it changed over 10 years?

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Background. We wished to ascertain in what way recent changes such as Modernising Medical Careers (MMC) and the implementation of the Working Time Directive (WTD) have affected clinical training and experience for anaesthetists in a teaching centre, in particular the provision of training in specialized fields of anaesthesia provided in the teaching hospital.

Methods. Data were extracted from the computerized system for every operating theatre in this Trust. This provided a continuous record of all operations undertaken, and has previously been validated as an accurate record against individual anaesthetists’ personal logbooks. We compared recent data with that of 10 yr ago.

Results. Comparing data for 1997 and 2008 showed that registrars and post-fellowship senior registrars (SRs) in anaesthesia continue to be well supervised directly by consultants (49% and 39%) and subspeciality training has been protected in our department. Average case numbers for SRs increased from 442 to 623 yr⁻¹, including an increase in emergency workload and theatre cases undertaken during the evening and at night. Although average case numbers for both SRs and consultants increased, we detected a small decrease in average case numbers from 394 to 353 yr⁻¹ for pre-fellowship registrars.

Conclusions. In spite of many pressures on training in the clinical setting, the number of cases and senior supervision in specialist modules for trainee anaesthetists in our teaching hospital has been maintained. Continuous monitoring of in-theatre supervision is one way of confirming that training is not compromised as changes occur in hospital workload.

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teaching hospital. We have documented the pattern of training, supervision, and clinical experience which trainees received in 2008 and in 1997.

Methods

Data were extracted, with permission of the Medical Director, from the computerized system which is based in every operating theatre in this Trust. It provides a continuous record of all operations undertaken with the exception of interventions in the maternity hospital rooms or children’s dental out-patients department, and has previously been validated as an accurate record against individual anaesthetists’ personal logbooks.3 We have interrogated the data to show average individual activity and also overall case numbers. It is important to note that it does not include work outside the theatre environment; that it is only possible to measure quantity, not quality; and that the number of cases is reported and not time spent. In 1997, there were SHO, registrar, and senior registrar groups. In 2008, STs were separated into two groups, junior and senior, allowing inspection of training received at different stages of the programme and also facilitating fairer comparisons with 1997 trainees. After the changes made to our training programme in 2008, there are no SHO or ST1 or 2 trainees in anaesthesia at this hospital.

Definitions

All cases performed in operating theatres by consultant and trainee anaesthetists are included in the data. Direct supervision of a trainee is defined as the trainee working directly with a supervisor senior to themselves who is actually present in the same operating theatre and is further subdivided into registrar or consultant supervisor. Trainees working ‘solo’ in theatre remain under the indirect supervision of a nominated consultant.

National Confidential Enquiry into Perioperative Deaths (NCEPOD) emergency and urgent groups were considered together as emergencies. Elective cases were NCEPOD categories elective and scheduled.5

Consultants are on the Specialist Register held by the UK General Medical Council. Registrars are trainees in anaesthesia who are not yet accredited specialists. For 1997, we report the activity of ‘registrars’ and ‘senior registrars’ (SR). STs in 2008 were separated into two groups to match as well as possible the training posts defined for the 1997 data. STs defined as ‘SRs’ were those trainees with more than 2 yr in a specialty training post (more than 4 yr total anaesthesia training), all of whom had gained Fellowship of the Royal College of Anaesthetists by examination (post-fellowship). Junior ‘registrars’ were defined as those trainees with <2 yr in a specialty training post (2–4 yr total anaesthesia training) who were generally pre-fellowship.

Data collection

All theatre-based information was entered into a commercially available computerized data collection system (Swiftop EDS Healthcare, Bristol, UK) at the time of operation. Details are entered in real time by a member of the theatre team. The system has been in use in our hospital since 1993 and provides a continuous and validated database which we interrogated for two 1 yr time periods separated by 10 yr.

Results

The 1997 sample included 17 716 cases over a 1 yr period, done by consultants, SHOs, registrars, and SRs working in theatre. The 2008 sample included 29 293 cases done by consultants and STs both junior and senior. If two anaesthetists were in theatre together, it is assumed that the more senior was supervising the junior. All trainees working solo were under the indirect supervision of a consultant at all times. Case numbers and supervision are shown in the Venn diagrams (Fig. 1). In 1997, of the department 17 716 total caseload, 1990 cases were done solo by the six SHOs in the department. When making registrar training comparison between 1997 and 2008, we consider the 15 726 registrar and consultant cases from the 1997 data set and the 29 293 registrar and consultant cases from 2008.

All theatre cases, elective and emergency, are included in the analysis. The total number of trainees was unchanged between the two time periods (31.5 whole time equivalents), juniors increasing from 11.5 to 23.5 and seniors reducing from 14 to 8. The number of consultants increased from 28 to 55 whole-time equivalents (Supplementary Table S1). The department caseload increased by 60% over the 10 yr period.

The pattern of work in our department changed from 1997 to 2008 (Supplementary Fig. S1). The number of cardiothoracic and ophthalmology cases nearly doubled, paediatrics and general surgery more than doubled, and maxillofacial and obstetric surgery cases increased by a factor of five over 10 yr. Gynaecology, ENT, and orthopaedic caseload reduced over time. For registrars, average case number by subspecialty decreased by 10% from 394 to 353 per year, caused mainly by a reduction in gynaecology and orthopaedic cases (Fig. 2). SR average annual case number increased from 442 to 623 between 1997 and 2008, including more obstetric, general, and maxillofacial cases in particular.

Direct supervision by a more senior anaesthetist increased from 1997 to 2008 (Supplementary Fig. S2). For registrars, overall direct supervision rate increased from 38% to 56%. There was an increase in consultant supervision from 32% to 49% with little change in the supervision by an SR from 6% to 7%. SRs themselves can only be supervised by consultants, and this rate increased from 31% to 39% between the two time periods. There is
**Fig 1** Theatre case numbers, solo and supervised, for each time period. Data do not include any work undertaken outside the operating theatre. (n), number of these cases undertaken with an SHO.

**Fig 2** Average Registrar and SR caseload by subspeciality, 1997 and 2008.
variation in subspeciality supervision rates within and between the samples. Direct in-theatre supervision by consultants of registrars increased from 1997 to 2008 by 25% for paediatric cases, 21% for maxillofacial (labelled oral on figure), and 19% for ENT cases (Fig. 3). SRs were also more frequently supervised during paediatric and maxillofacial procedures in 2008 than 1997 (Fig. 4). Supervision rate remained high for cardiothoracic cases for all trainees; for registrars, this was 95% in 1997 and 88% in 2008, and for SRs, 81% and 65%, respectively. The minimum supervision rate for any subspeciality is seen in orthopaedics for both groups of trainees in both sample years.

Total department caseload increased by 60% from 1997 to 2008, the increase occurring in the SR and consultant workload (Supplementary Fig. S3). Thirty-eight per cent of consultant cases were used for teaching in the department in 1997, whereas this number decreased to 27% in 2008 (Supplementary Fig. S4): sub-speciality breakdown revealed the greatest change in cardiothoracic cases used for teaching which decreased from 70% to 27% of cases (Supplementary Fig. S5).

Although department caseload increased by 60% from 1997 to 2008, the proportion of emergency cases decreased from 26% to 21% (Table 1). The proportion of cases undertaken out of normal working hours (18:00–08:00) decreased from 16% of caseload in 1997 to 13% of cases in 2008. Only 3% of cases were operated on after midnight in both 1997 and 2008, although this represents a greater number of cases in the more recent sample.

**Table 1** Department in-theatre caseload in 1997 and 2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Cases</th>
<th>Priority (%)</th>
<th>Time of Day (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Elective</td>
<td>Emergency</td>
<td>08:00–18:00</td>
</tr>
<tr>
<td>1997</td>
<td>17716</td>
<td>74</td>
<td>26</td>
</tr>
<tr>
<td>2008</td>
<td>29293</td>
<td>79</td>
<td>21</td>
</tr>
</tbody>
</table>
The average number of cases done by a registrar in 1997 was 394, of which 131 were classed as emergencies (33%). In 2008, the total was 353 with a similar split between elective and emergency work (38%). For SRs, the pattern is different. Total caseload increased from 445 to 621, the increase made up predominantly of emergency cases, which comprised 26% of cases in 1997 increasing to 40% in 2008 (Supplementary Fig. S6).

Consultants undertake very few cases at night. More than 90% of consultant cases were started and completed between 08:00 and 18:00 in 1997 and 2008. Cases outside these hours for registrars increased from 20% to 24% and for SRs from 16% to 23% between the two time periods (Supplementary Fig. S7).

Discussion
We have looked at direct supervision rate and subspeciality training pattern in theatre over two 1 yr time periods separated by a decade as a marker of training in anaesthesia in a teaching hospital department. Data were taken only for theatre activity; intensive care, ward, and clinic work are therefore not included, although they play an important part in the training programme for anaesthetists. The caseload undertaken by our department reflects the tertiary referral status in the provision of specialized areas of hospital care for the South West of England, including paediatrics, obstetrics, ophthalmology, and cardiothoracic, all of which are expanding.

As a group, trainees have maintained an average annual caseload per person of 417 (1997) and 421 (2008) which is remarkably similar to the average annual number of cases for two groups of trainees with different shift patterns (441 and 448) recorded by Al-Rawi and Spargo from logbook reviews of cases recorded by anaesthetists in training in the Wessex region between 1999 and 2006. In our teaching hospital, the overall average masks a 10% decrease in registrar case numbers, whereas SR case numbers have increased by 40%. The difference observed between the two groups may be a consequence of more time spent in intensive care training in the intermediate years. The reduction in registrar cases is seen in orthopaedics and gynaecology and is accompanied by very low supervision rates. It is more likely to represent a decrease in service commitment than a lost training opportunity in the teaching hospital. Anaesthetists in training are attached to our department in order to access the subspeciality training not available elsewhere in our School of Anaesthesia and also to gain experience of working in a teaching hospital. In particular, they must complete cardiothoracic, paediatric, and obstetric modules and also learn about anaesthesia for complex major cases, including maxillofacial surgery. It is reassuring to see that case numbers in these modules have been well maintained. For the SRs, case numbers increased, particularly in paediatrics and obstetrics, and remained unchanged in the cardiothoracic module which, along with well-maintained direct supervision rates, implies that our teaching hospital was able to protect in-theatre training in subspeciality anaesthesia as workload expanded.

SRs in 2008 undertook significantly more of the emergency caseload than their counterparts in 1997. Although the percentage of emergency cases decreased from 26% to 21% for the department as a whole, for SRs emergency caseload increased from 26% in 1997 to 40% in 2008.

As progressive WTDs take effect, trainees are increasingly working in shift patterns. We were concerned that this would increase in-theatre work at night and reduce overall supervision rate, but our fears are not substantiated by these data which suggest that the vast majority of cases are still done during daylight hours. The greatest use of anaesthetists’ time at night in our hospitals is in intensive care units and, although of major significance for training and service, outside the scope of this paper.

Our department of anaesthesia cared for 60% more patients in theatres in 2008 than in 1997 with an increased number of consultants and the same number of trainees. Consultants in the department in 2008 spent less of their theatre time supervising trainees than was the case in 1997. Consultants have been appointed in response to increased service demand, but the number of trainees has remained constant; there is certainly now spare in-theatre training capacity.

The aim of our training programme is to produce skilled, safe, and competent anaesthetists. At the start of training in any new area of anaesthesia, direct supervision is required. As the trainee progresses, this is gradually withdrawn until distant supervision is both safe and appropriate. Overall supervision rate is a coarse tool and breakdown by grade of trainee and subspeciality is perhaps more helpful. For example, our data show the maintenance of high levels of supervision in the cardiothoracic module appropriate to the nature of the cases and stage of training of the registrars. Trainees arrive at the teaching hospital after 2 yr of District General Hospital experience. For this reason, low supervision rates for orthopaedics and gynaecology cases are not necessarily a cause for concern. In these areas of practice, service provision, under indirect supervision, allows consolidation of experience which is an essential part of training.

The Bristol School of Anaesthesia runs a whole training programme of which only a part is situated within teaching hospitals. Although the data we have shown in this paper are reassuring, the findings should not be taken in isolation and similar information from the other hospitals in our school would be needed to get a full picture of the training which our programme provides. In spite of many pressures on training in the clinical setting, the number of cases and senior supervision in specialist modules for trainee anaesthetists in our teaching hospital has been maintained. Continuous monitoring of in-theatre supervision is one
way of confirming that training is not compromised as changes occur in hospital workload.

Supplementary material
Supplementary material is available at *British Journal of Anaesthesia* online.

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