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# The teaching of surgery in the undergraduate curriculum. Part II — Importance and recommendations for change

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**KEYWORDS** 

Teaching; Curriculum; Education; Undergraduate Abstract In the past decade, the teaching of surgery in the undergraduate curriculum has undergone considerable changes in quantity, mode and method of delivery. This is a result of the radical reforms of higher education, the health service and the undergraduate medical curriculum. The changes are complex and require us to ask the questions: how important is the teaching of surgery in the modern medical undergraduate curriculum and is there a need for change? We aim to tackle these questions and propose practical action which medical schools can take to ensure that they deliver effective surgical teaching within the modern medical curriculum and health service.

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# The importance of teaching surgery at the undergraduate level

In order to judge the importance and value of teaching surgery, there is a need to define what surgery is and hence what constitutes the teaching of surgery. For many people the term surgery equates with the physical procedure of operating.<sup>1</sup> When one defines "Surgery" in narrow terms as

\* Corresponding author. *E-mail address:* riaz.agha@kcl.ac.uk (R.A. Agha). a series of mechanical steps, the teaching of Surgery invariably becomes confined and restricted to these narrow limits. The perception is thus born, that teaching surgery simply consists of imparting of the technical and procedural aspects of individual operations.

Learning technical aspects alone is considered 'less worthy' of being included in the medical undergraduate curriculum and indeed the majority of medical students who will not become surgeons do not need to learn such potentially redundant detail which could lead to the removal of other

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more generic components from the course. However, this analysis would be true if these definitions of surgery and the teaching of surgery were true. But are they?

Surgery is much more of a global term and the teaching of surgery also includes learning about specific clinical conditions such as the acute abdomen, surgical emergencies such as testicular torsion and trauma, and gaining more exposure to seriously ill patients who may well require a surgical procedure. Exposure to these conditions also trains the student's mind in careful, accurate assessment and rapid decision-making.<sup>2</sup> Gilligan et al.<sup>3</sup> suggested that whilst no differences were found in ability between the surgeons and geriatricians at the start of training, there were significant differences in personality, with surgical trainees showing a marked preference for making decision in a logical and objective way rather than a subjective one. McManus et al.<sup>4</sup> suggest that these differences may either be the result of selfselection, the effect of socialization in undergraduate or postgraduate training, or due to specialist selection. Exposure to common 'surgical' problems such as skin lesions, 'lumps and bumps' and hernias can also be beneficial for the overall education of the student.<sup>5</sup>

It is also important to recognise that surgical teaching is not restricted to the operating theatre. The surgeon also sees patients in clinic, where an accompanying medical student can learn the generic skills of taking histories, doing clinical examinations and ordering the appropriate investigations. Whilst a surgical rotation or environment is not the only place to gain such generic skills, it certainly does provide a good opportunity for their acquisition. Surgical Clinics can form a good learning environment with patients often having clear histories and prominent physical signs.

Students also have the opportunity to build on their communication skills and learn how to explain complex procedures and prognosis as well as gain consent or break bad news empathetically and in a way the anxious or even depressed patient can understand. This setting also improves a student's knowledge of the indications for a particular operation, the skill of careful patient selection, the limitations of surgery as well as its curative value. O'Riordan and Clark<sup>6</sup> found that 98% of day case patients scheduled to undergo an operation in 3 h (on average) were willing to participate in student teaching prior to surgery. Students have also been shown to gain significant knowledge and skills in this environment.<sup>7</sup>

The operating theatre provides a unique educational experience for undergraduates, allowing for the integration and consolidation of knowledge. There is a need for students to observe normal and abnormal tissues as well as procedures directly in order to gain a true understanding of what is involved and how anatomy relates to pathology. This allows the student to occupy a better position from which to explain such procedures in the future - possibly as a pre-registration house officer on the ward with an anxious patient the night before their operation or at preassessment. Furthermore, the student will not have the opportunity to see such a wide variety of surgical procedures again once undergraduate studies are concluded. The concept of the multidisciplinary team also comes to life in the operating theatre,<sup>8</sup> as the whole team is in the same room at the same time with the maintenance of a professional interaction for the benefit of the patient.

Following conclusion of the operation, medical students may have the opportunity to learn about post-operative complications and the need for careful, regular observation and contingency planning. The criteria needed for discharge together with the decision-making skills involved are also developed to a fuller degree on a surgical firm.<sup>3</sup> The entire surgical spectrum from clinic to longterm follow-up provides the student with special insights into patient care and the opportunity at each stage to see the direct application of the principles of anatomy and physiology to clinical practice; each time relating the visible pathology and the clinical scenario to their background knowledge and understanding. Furthermore the student has the opportunity to consider with others the important ethical, moral, legal and psychosocial issues related to surgery including discussions on cost-benefit analysis which tend to be particularly acute in surgical practice.<sup>2</sup>

The discussion of morbid anatomy and pathology in multidisciplinary meetings is central to the functioning of most specialist firms. Such environments also provide a rich teaching milieu within which students can become familiar with a broad range of important clinical scenarios and their management within a multidisciplinary team.

One aspect which should not be overlooked in this discussion is the importance placed on surgery by students and their desire to learn this discipline, disinterested and demotivated students are unlikely to be productive in any capacity. Porter et al.<sup>9</sup> showed that students were readily interested in learning about Plastic Surgery and considered the teaching to be relevant to their future career as doctors, irrespective of whether they actually wanted to be surgeons or not. The limited exposure to Plastic Surgery in the curriculum has

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been a long-standing concern.<sup>10–12</sup> Students who do not have any experience of Plastic Surgery may not recognise the parameters of the discipline and thus unable to refer patients appropriately.<sup>13</sup> A broad education would also dictate that the students gain knowledge and experience of dealing with skin cancer and wound management, two examples which form a significant proportion of Plastic Surgical case loads.<sup>13</sup> Furthermore, Plastic Surgeons will be unable to act as role models for impressionable students and will be unable to give advice for tailored careers.<sup>13</sup>

'Relegating' surgery to a highly specialised postgraduate discipline may also lead students to hold the view that it is a remote, possibly difficult and unimportant 'fringe' discipline. The number of trainees entering surgery may consequently decline, in a time when there is a well-recognised and urgent need for more consultant surgeons in the UK.<sup>14</sup>

## The need for change in the teaching of surgery to undergraduates

Whilst surgical teaching may provide an excellent educational opportunity, its importance has been questioned and its deliver criticised (see part I). At first questioning the importance of surgery in the undergraduate curriculum seems controversial. The long-standing tradition of teaching surgery to medical students provides some degree of inertia towards discussing reform let alone implementation of change. However, surgical teaching itself may be in need of genuine reform.

A significant degree of surgical teaching is often delivered in the operative setting which has mixed results for the student. Lyon<sup>8</sup> showed that whilst some students find it valuable, others were unable to cope with the emotional impact of surgery. Many students described the operating theatre as intimidating due to lack of preparation and the lack of a defined role within the surgical team.<sup>8</sup> The imparting of technical details is at times a feature of 'teaching' sessions in the operating theatre. There are often too many people in the operating theatre with students usually not being able to get involved in any meaningful practical way.<sup>8</sup>

Lyon found that students who report time spent in the operating theatre as a useful experience are those who adopt active learning strategies to successfully manage their learning across three key 'challenging domains': the physical and emotional impact of the environment and the surgery itself, the educational task and the social relations of work in the operating theatre.

Medical students on surgical firms often receive poor feedback which lacks details and is not constructive for the student's development.<sup>15</sup> Ephgrave et al., hypothesised that this was due to students' being assigned to whole firms which resulted in lack of personal accountability and altering the format to assign students to particular individuals would result in more constructive feedback.

Surgery and surgeons are arguably the most stereotyped of all specialities.<sup>16</sup> A detailed study by Allen<sup>17</sup> of 229 doctors who qualified in 1986 identified one key reason for deciding against a speciality to be the dislike of the type of person in that speciality. In particular, surgeons were not seen as good role models by many women respondents, who felt that they still held a commonly held view that women and surgery do not mix. Furthermore, surgeons were perceived as different and tending to have personalities which they did not want to emulate.<sup>17</sup>

Williams and Cantillon<sup>18</sup> carried out in-depth structured study with 15 female PRHOs. Of these 11 stated that they had had negative experiences of surgery as a medical student, for two main reasons: a lack of involvement in the experience and the perceived personality of the surgeons they were attached to, the statements from interviewees included:

- "we used to stand at the back...couldn't see what was going on"
- ''I couldn't hack it with all those arrogant people''

At PRHO level the volume of ward work often made it difficult to get to theatre:

- "I've been to theatre once...they're very encouraging about going to theatre.... It's just whether you have the time do to it"
- "he [consultant] said I'm welcome to com up to theatre, but I've been on call when he's operating"

A survey in 1968<sup>19</sup> showed that house surgeons spent about 20% of their total working time in theatres, whereas in 1991, Dowling and Barrett<sup>20</sup> found that surgical PRHOs were almost entirely ward-based, with theatre or outpatient attendances being rare. Polk<sup>21</sup> has suggested that decreasing exposure to surgery will lead to decreasing interest in surgical careers and this has been borne out by a reduction in the number of trainees in the UK applying for posts in general surgery.<sup>22</sup>

However, Williams and Cantillon<sup>18</sup> found that when surgical PRHO's did manage to get to theatre, their experiences were significantly better compared with those at medical school, possibly because PRHOs are allowed to be 'closer' and more involved:

- ''I sutured an appendectomy last night, it was terribly exciting and I love suturing. It was wonderful, and I loved giving this person a lovely scar''
- "Now I'm getting the chance to go in [to theatre] I'm actually quite enjoying it"
- "I just like the fact that you get to see a bit of anatomy, practical skills"

Furthermore, the perception of the personality of surgeons also changed with the citing of desirable characteristics such as 'push' and determination, although some PRHO's still provided negative views on surgery requiring less 'thought' or intelligence and being 'just a practical task'. Some PRHO's also thought that surgeons took a narrow view of patients and failed to understand them holistically, or took an 'uncaring' view:

- "I don't like the way surgeons think...when you go on the ward round you just talk about the leg and whatever — and there's someone sitting there"...most surgeons that I see, I see them and I think, I don't want to be like that"
- "I guess that's surgery again, just kind of, "Well, its your surgical problem, we'll fix it', or, "no, we can't fix it, go home'...the whole patient care bit needs sorting out."

The views expressed in this study by Williams and Cantillon<sup>18</sup> are significant and in our experience true for a proportion of medical students. Furthermore, these aspects of surgery and surgical teaching may be relatively more off-putting to women who are more likely to have patientoriented communication styles<sup>23</sup> and who are less likely to articulate the desirable characteristics of surgeons such as 'drive' and determination.<sup>24</sup> This also tends to maintain the gendered stratification of medical caregivers and the division of medical knowledge into biological and social aspects<sup>25</sup> within surgery which is undoubtedly detrimental to patient care.

It also has important ramifications when viewed in the context of Allen's<sup>17</sup> study which showed that 70% of the women who said they had been put off a specialty at medical school cited surgery. In 2001, up to 70% of students in some medical schools were female, yet women only constituted 16% of Surgical SpR's and only 6.3% of Consultant Surgeons in the same year.<sup>26</sup> This may also be due in part to a 'self-fulfilling prophecy' as some women considering a surgical career are deterred by the lack of women already in a surgical career and they would rather not fight a perceived uphill task for the rest of their lives.<sup>18</sup> The lack of role models and possible encouragement is thus perpetuated and Kvaerner et al.<sup>27</sup> showed that medical specialities with high proportions of women have more female leaders (and thus role models). This is clearly unsustainable for the surgical profession and increasing numbers of surgeons coming from a decreasing male pool could affect the future standards of the profession.<sup>26</sup>

However, attempts to improve this situation could be undermined by a reduction in surgical teaching in the undergraduate curriculum. If female students cannot get exposure to surgery in medical school or during the PRHO year then they will have little opportunity to challenge their own stereotypes and come to an evidence-based decision on their future career. Furthermore such stereotypes could be passed onto succeeding generations.

## The way forward for medical schools

There are a number of steps that medical schools and surgeons can take to ensure that students receive the best surgical education under the new curriculum. Firstly, medical students need to be recognised as adult learners. The enthusiasm with which adults engage in an educational process is closely linked to their motivation and this is affected by a number of factors,<sup>28–30</sup> shown in Table 1.

These values promote learner-centred and problem oriented approaches to learning, which

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aim to produce doctors equipped with the adult learning skills that are necessary for a future of life-long learning and continuous medical education. Many medical schools are increasingly moving towards recognising and implementing such principles.<sup>31</sup> However, there is still a long way to go with medical curricular undergoing a process of incremental change rather than a paradigm shift.

One key area that requires more development is "teaching the teachers" or providing the necessary training for tutors to deliver the new curriculum in an effective way.<sup>28–30</sup> It is ironic that the majority of junior doctors on whom the burden of teaching lies<sup>32</sup> have not received guidance on how to be better teachers.<sup>33,34</sup> Teacher training courses have been shown to improve teaching skills,<sup>35</sup> increase participants' enthusiasm and reflection about their teaching<sup>33</sup> which may modify their methods.<sup>36</sup> The GMC has also recognised this need when they produced *The doctor as teacher*.<sup>37</sup>

The role of the surgeon as a teacher has been a time-honoured tradition. If this is to be maintained then surgeons need to adapt to the changes in the medical curriculum and take on a new role<sup>34</sup> with the support and provision of training ideally coming from the medical school. The changing role of teachers is shown in Table 2.

Medical schools may need to revise their process of assessment as well to take into account the changes that have come about with the new curriculum. Evidence shows that both students and tutors perceive the current curriculum to be misaligned or to provide good preparation for the PRHO year but insufficient preparation for the proceeding 'gateway' exams.<sup>38–40</sup> Whilst this shows that GMC guidance on preparing students for the PRHO year has been largely followed, the internal examinations within each medical school need to be brought into alignment as well to provide coherency. However, previously Mandel

| Table 2The changing role of tutors in medicaleducation (taken from Hamdorf and $Hall^5$ ) |                                    |
|---|------------------------------------|
| Traditional style<br>of teaching  | New style of teaching              |
| Focus on teachers   | Focus on students and teachers     |
| Students subservient  | A partnership                      |
| Didactic teaching   | Tutors as facilitators of learning |
| Emphasis on what<br>is taught   | Emphasis on what<br>is learnt      |

et al.<sup>41</sup> found that the skills taught were not those necessarily required for clinical practice, again constituting misalignment and suggesting that the right balance is difficult to achieve, especially when so many changes are occurring. Curricular misalignment causes resentment amongst students,<sup>42</sup> furthermore, heavy workloads and 'high stakes' assessment are precisely the factors that influence students towards using surface study approaches in order to 'keep up', irrespective of their personal motivation or intelligence.<sup>43,44</sup>

Problem-based learning (PBL) is well aligned<sup>45</sup> and is thought to form an ideal learning environment encompassing the principles of adult learning in a practical way.<sup>46</sup> Medical schools should move towards incorporating more problem-based learning into their curriculum and ensure that the curriculum prepares candidates well for the assessments and the subsequent PRHO year. Surgeons may not get fully involved in this form of teaching as it is further away from the traditional clinical environments of ward rounds and operative teaching. Medical schools must actively encourage the participation of surgeons in their PBL programs.

Based on the discussion in parts 1 and 2 of this debate, medical schools should take the following steps outlined in Table 3 below to deliver an effective surgical curriculum within modern NHS and medical curriculum.

Campbell and Johnson<sup>48</sup> have pointed out how changes in medical education often follow fashions and trends rather than 'established educational principles and theories, critically evaluated experiences, or the results of valid research'. There was little evidence to suggest a move from a specialty-based course to a system-based course, but it happened in the majority of medical schools anyway. Most new medical schools now begin with an almost entirely problem-based approach,<sup>31</sup> again despite any rigorous experimental proof of its efficacy. However, the benefits and logic of PBL has been discussed in this article and elsewhere and we believe that increasing the PBL component of the curriculum would be beneficial.

## Conclusion

Surgeons instinctively take the view that surgery is an essential part of the undergraduate curriculum, while others argue that the teaching of surgery should be confined to the postgraduate stages of education. The debate has been polarised by changes in higher education, NHS reforms, changes in medical education and an inability to define what surgery is. Surgical teaching when organised

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## Table 3 A plan for the way ahead for medical schools

## Steps that medical schools should take to deliver an effective surgical curriculum

## General changes

- Audit recent changes and build an evidence-base
- Consult surgeons and others on proposed changes to the surgical curriculum
- Identify educational priorities and a core of surgical teaching
- Identify changes that need to occur, gain agreement and secure resources accordingly
- Implement changes at an acceptable rate
- Embed clear lines of accountability for all aspects of surgical teaching
- Monitor progress with the defined goals as reference points

## Specific changes

- Medical schools should introduce professional and financial rewards for surgeons who devote significant time and effort to teaching medical students. Such rewards should be monitored regularly and adjusted in the light of 3-dimensional feedback involving students, colleagues and the medical faculty
- Medical schools should obtain detailed feedback from undergraduates about their surgical placements, particularly experiences in theatre (such findings should be formally presented to surgeons involved in teaching on a regular basis)
- Surgeons must be encouraged to get involved with the personal and professional welfare of students from the first year on, taking on roles as clinical advisers and mentors. They should also be actively reminded of their eminent status as influential role models to the students who are attached with them
- Surgeons should be actively involved in medical education committees with a permanent seat for a surgical lead and the setting up of a surgical consultation committee which meets regularly to discuss proposed changes and improvements to the curriculum with the main educational committee
- Surgeons should be encouraged to take on medical students as part of their research teams and students should be informed of such opportunities. Medical schools should also advocate such involvement to ensure that their most vital asset their students are allowed to 'grow and develop' to pay future dividends in a better RAE assessment
- Surgeon's who are keen on teaching should allow certain theatre lists to be identified as ''teaching lists'' where medical students would be actively engaged in a partnership of learning
- Guidance should be issued to both surgeons running such 'teaching lists' and to the attending students themselves on what the goals of the session are, what questions to ask and what practical experience they can expect to gain
- Surgeons should be allowed to lead certain PBL sessions and should be encouraged to do so
- Teacher training should be given to all staff involved in teaching, especially surgical teaching (where surgeons would be reminded of their duty to teach as embodied in the Hippocratic Oath<sup>47</sup>
- Special surgical interest groups and journal clubs should encourage interested students to attend
- Medical schools should provide all students with comprehensive careers advice and aim to dispel any myths about surgery or surgical careers and highlight the introduction of part time and flexible working arrangements

appropriately can not only enrich undergraduate educational experience but is also essential in the acquisition of generic skills and provides unique insights into disease and patient care.

The challenge lies in trying to accommodate such a programme of teaching within the framework of the changes in medical education and the new dynamics of the modern healthcare service. Surgical undergraduate teaching has diminished within teaching hospitals not only in the UK but worldwide.<sup>49</sup> It is imperative that surgical teaching should form part of the curriculum as changes in higher education, healthcare and the medical curriculum continue. Ultimately this rests with creating an infrastructure and enthusiasm which allows for effective delivery. The challenge is now for medical schools and surgeons to form an effective partnership to deliver the best surgical teaching for the benefit of the students.

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