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Education

A novel approach to improve undergraduate surgical teaching

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Abstract

Background: Undergraduate surgery is at an important crossroads. Many departments report significant difficulties delivering effective teaching. Our student feedback indicated a dated surgical curriculum lacking structure, quality and uniformity. We report on a new "blended" approach employing a combination of professional DVDs, case based discussions, online material and traditional bedside teaching designed to provide structure, standardization, and equality of learning .

Methods: Year 4 students who had undertaken the new course and year 5 students who had participated in the traditional teaching programme were compared. Students completed a 20 item questionnaire about their experiences of the surgical teaching programme.

Results: One hundred and seventy-one year 4 (70%) and148 year 5 students (66%) responded. Domains relating to "Overall Satisfaction with the course", "Approval of innovative teaching methods and interactivity" and "Satisfaction with the clarity of course information" showed improvements when comparing the new and old programmes. However bedside teaching was not rated as highly in the new programme ($p<0.05$).

Conclusion: This blended approach has resulted in improved student understanding and engagement. The apparent compromise of bedside teaching may be a reflection of higher expectations. We believe that a similar blended approach has the potential to re-invigorate surgical teaching elsewhere.

INTRODUCTION

Surgical teaching in UK medical schools is at a crossroads. Formerly a stalwart in the undergraduate curriculum, "teaching" departments of surgery have seen a steady decline, while at the same time a number of challenges have conspired against the traditional partnership between academia and the National Health Service, which proved so effective in the past, in delivering surgical education to undergraduate students[1, 2].

The first of these challenges has been the increasing trend towards sub-specialisation with both its impact on appropriate "case-mix" for students and on the sometimes (misplaced) lack of confidence specialists may have in teaching general surgical topics. Many younger consultants are now super-specialised [3, 4] and are less comfortable in teaching medical students on surgical topics outside their particular field of expertise[5].

A second challenge has been the "New Consultant Contract", one consequence of which has been a lack of job plan recognition of teaching commitments and corresponding inadequate remuneration in contracts. This, in some cases, has led to previously enthusiastic teachers withdrawing their support for undergraduate surgical teaching because they feel they are undervalued and their contributions largely unrecognised[6].

A further challenge has been the significant increase in the number of students. Over the last decade, our institution has seen a doubling of student numbers with enrolments now approaching 280 students per annum. This has created problems in the delivery of traditional bedside teaching with tutors finding it more difficult to facilitate up to 10 students around the bedside.

These challenges are compounded by the knock on effect of the European Working Time Directive's impact on surgical trainees' availability to teach[7].

The challenges evident on the national stage mirrored the concerns we were having locally. Feedback revealed a wide variation in the student experience with regard to surgical teaching. In some units teaching was highly regarded but in others students felt abandoned.

Will surgical teaching largely become a postgraduate topic? We believe that surgery has an important wider role to play in the undergraduate curriculum. In this paper we explore one route that departments of surgery could follow to promote a re-invigoration of undergraduate surgical teaching.

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The intervention described and evaluated in this paper involved three main strands:

1. The development of a set of teaching and learning materials designed to address the reluctance of some specialists to get involved in general surgical teaching.
2. The re-engagement of NHS colleagues through involvement in the development process above and to thereby help "standardise" the delivery of teaching at multiple sites.
3. The delivery of a blended learning approach, allied to bedside teaching, incorporating multi-media, elearning, pre-prepared materials for case based discussion and tutor notes.

The principle aim was to incorporate, at the centre of the programme, the generic principles enshrined within the GMC's "*Tomorrow Doctors*"[8, 9]. A new curriculum would need to impart skills, knowledge and professional attitudes in a competency based framework and would incorporate "patient safety" as a core element[10].

Initially key stakeholders within the university and NHS teaching hospitals were consulted. After extensive consultation it was finally agreed to institute a new 6 week structured and uniform "blended"[11, 12, 13] teaching programme.

A blended learning programme was developed. This consisted of (a) online preparatory materials (b) topic specific video expert lectures (c) case based discussion materials and (d) follow up bedside teaching.

Fig 1. Phase 3 Students participating in the new Surgical Teaching Programme (with permission)

This new six-week programme was delivered on a daily basis in each of the 10 sites receiving year 3 students; each student receiving 2 hours/ per day of facilitated teaching by an experienced surgeon. The first hour was spent working through a "Tutorial Package" consisting of a DVD based lecture (Figure 1) and case based discussion, on chosen surgical topics, and the second receiving traditional bedside teaching. "Tutorial Packages" were developed with the assistance of regional NHS experts, from across all 10 sites in Northern Ireland, in collaboration with the University. The professionally produced DVDs were of a high standard. The surgical section of the medical education online "Portal" was developed in tandem with the face to face tutorial materials to provide students with learning outcomes, pre-tutorial reading information and revision material. The topics chosen were selected to provide the students with a broad overview of common surgical disorders and exposure to the key principles of surgery. (Table 1) The project took 9 months to complete with production only costs amounting to approximately £20,000.

Table 1:

List of Phase 3 topics covered in DVD/ Case Based Discussion "Tutorial Packages"

Tutorial	**Title**
1	The Acute Abdomen
2	Acute Appendicitis
3	Fluids and Electrolytes
4	Hernia
5	Pre-operative assessment
6	Gallstones
7	Shock
8	Colorectal Carcinoma
9	Abdominal Aortic Aneurysm
10	Pain Control
11	Jaundice
12	Post-operative complications
13	Inflammatory Bowel Disease
14	Haematemesis and Melaena
15	Varicose Veins
16	Blood Transfusion
17	Infection Control
18	Malnutrition and Nutrition Support
19	Benign and Malignant Thyroid Dis.
20	Peripheral Arterial Disease
21	Pancreatitis
22	Breast Cancer
23	Intestinal Obstruction
24	Sepsis
25	Diverticular Disease
26	Perianal Conditions
27	Patient Safety
28	Level of Care and Monitoring
29	Hypercalcaemia and Parathyroid

To gauge the impact on students of these changes we conducted a study aimed to answer the question "What are the attitudes of undergraduate medical students to a new blended video and web assisted undergraduate surgical teaching when compared to the attitudes of students who underwent surgical teaching using traditional teaching methods?"

Phase 3 Surgery Attachment Questionnaire Date Sept 2011

Age_____ Male/Female Undergrad/ Mature Student (please circle)

Did you take an intercalated break last year (Phase 4 students only) Yes/ No

Did you take an intercalated break in the last 2 years (Phase 5 students only Yes/ No

Please circle most appropriate response

		1 Strongly disagree	*2 Disagree*	*3 No opinion*	*4 Agree*	*Strongly agree*
1.	The learning objectives were unclear	1	2	3	4	5
2.	Before attending tutorials I knew what to read up on	1	2	3	4	5
3.	The website material was not easily accessible	1	2	3	4	5
4.	Website material was of a high standard	1	2	3	4	5
5.	The tutorials often did not commence on time as scheduled	1	2	3	4	5
6.	The facilitator was generally present throughout the tutorials	1	2	3	4	5
7.	The facilitator was normally a senior surgeon	1	2	3	4	5
8.	The facilitator was often unprepared to take the tutorial	1	2	3	4	5
9.	The tutorials were well thought out and structured	1	2	3	4	5
10.	The facilitator made use of “up to date” audiovisual aids	1	2	3	4	5
11.	Case based discussion were regularly used during tutorials	1	2	3	4	5
12.	The case based discussion was very interactive	1	2	3	4	5
13.	The facilitators were often unhelpful	1	2	3	4	5
14.	The tutorials were often cancelled or there were “no-shows”	1	2	3	4	5
15.	The tutorials helped in preparation for P3 assessment exam	1	2	3	4	5
16.	Patient safety issues were emphasized during the course	1	2	3	4	5
17.	The tutorials were too advanced	1	2	3	4	5
18.	I was generally very unsatisfied with the course	1	2	3	4	5
19.	I have utilized knowledge gained in subsequent attachments	1	2	3	4	5
20.	Taught bedside teaching was an integral part of the attachment	1	2	3	4	5

Any comments/ suggestions for improvement

Fig 2. Likert Scale Questionnaire

METHODS

Assessment of the effect of change of teaching delivery of this programme involved a Student Information Sheet, Consent Form and a "Likert Scale" paper questionnaire (Figure 2). These were circulated to year 4 students who had undergone and completed the new programme and year 5 students who had participated in the previous teaching programme as a control group. The study was granted University ethical approval, was voluntary and the results anonymised. Results were analysed using independent sample t-test (SPSS).

A statistical power calculation required recruitment of 100 students into both new and traditional teaching groups respectively in order to have 80% power to determine a true mean difference between populations in attitudinal (Likert) scale of 0.4 as statistically significant, assuming a two-tailed test and a significance level of 5%.

Raw data were entered using Microsoft Excel (©Microsoft 2007). Data interpretation was performed using SPSS (©IBM Corporation 2011). Factor analysis (principle components with varimax rotation[14] was undertaken to attempt to identify underlying domains in the questionnaire; i.e. statistical evidence to identify whether responses to multiple questions showed evidence of association or "thematic relationships". The items within the domains were orientated so that a high score represented a positive viewpoint and a low score a negative viewpoint.

For each domain mean scores were projected onto a scale where 100= the best possible outcome and 0=the worst possible outcome. This is analogous to the treatment of Quality of Life Analysis's (QOL) eg. SF36[15]. Domain scores were then analysed by "unpaired" or "independent samples" t Tests.

A value of $P<0.05$ was considered significant.

RESULTS

One hundred and seventy-one of 246 Year 4 students (70%) and 148 of 240 year 5 students (66%) agreed to voluntarily participate in the study. Of the Year 4 students 9 had taken an intercalated degree the previous year and were, therefore, included in the year 5 group. These 9 students had completed their surgical attachments prior to the introduction of the new teaching programme.

There were 65 male (38%) and 106 female (62%) students in the year 4 group (n=171). Eleven of 171 students were graduates (6%).

There were 51 male (34%) and 97 females (66%) in the year 5 group (n=148). Three of 148 students were graduate students (2%).

With respect to demographics, there were neither age nor gender differences in the way students responded to the questionnaire.

Factor analysis (principle components with varimax rotation) was undertaken in an attempt to identify underlying domains in the questionnaire; i.e. statistical evidence to detect whether responses to multiple questions showed evidence of association or "thematic relationships". This was successful in identifying 3 separate domains containing 8, 5 and 4 items respectively; i.e. Seventeen of the 20 questions provided significant results. These three domains related to "Overall

TABLE 2:

Key Domains identified by factor analysis (P<0.001)

Domain 1: Overall course satisfaction	5. The tutorials often did not commence on time as scheduled 6. The facilitator was generally present throughout the tutorials 7. The facilitator was normally a senior surgeon 8. The facilitator was often unprepared to take the tutorial 9. The tutorials were well thought out and structured 13. The facilitators were often unhelpful 14. The tutorials were often cancelled or there were "no-shows" 18. I was generally very unsatisfied with the course
Domain 2: Approval of innovative teaching methods and interactivity	10. The facilitator made use of "up to date" audiovisual aids 11. Case based discussions were regularly used during tutorials 12. The case based discussion was very interactive 15. The tutorials helped in preparation for Phase 3 assessment examination 16. Patient safety issues were emphasized during the course
Domain 3: Satisfaction with the clarity of course information	1. The learning objectives were unclear 2. Before attending tutorials I knew what to read up on 3. The website material was not easily accessible 4. Website material was of a high standard

satisfaction with the course", "Approval of innovative teaching methods and interactivity" and "Satisfaction with the clarity of course information". Students who participated in the new course positively rated all 3 domains as significantly improved when compared to students who had completed the older surgical teaching course ($p<0.001$) (Table 2). Each domain provided reliability coefficients of better than 0.6 (Table 3).

Table 3:

Summary Table of Means and Confidence Intervals relating to Domains 1-3

Domain	Old Teaching Method	New teaching Method	Difference +/- 95% Confidence Intervals
1. Overall course satisfaction	53.0	68.6	15.6 (11.2-20.1)
2. Approval of innovative teaching methods and interactivity	51.0	69.0	18.0 (13.9-22.0)
3. Satisfaction with the clarity of course information	59.4	75.0	15.6 (12.1-19.1)

Students in the new programme did not view "taught bedside teaching as an integral part of their attachment" as favourably as their predecessors in the old programme ($P<0.003$) (Table 4).

Table 4:

Question 20: Cross tabulation of responses:

	SD	D	NO	A	SA	Total
Count "Old Method" As %	12 7.6%	22 14%	14 8.9%	64 40.8%	45 28.7%	157 100%
Count "New Method" As %	24 14.8%	36 22.2%	19 11.7%	44 27.2%	39 24.1%	162 100%
Total Count As %	36 11.3%	58 18.2%	33 10.3%	108 33.9%	84 26.3%	319 100%

Key to abbreviations above:

SD Strongly disagree
D Disagree
NO No Opinion
A Agree
SA Strongly agree

When asked whether they had "utilized knowledge gained in subsequent attachments", there appears to be a linear trend (Table 5) showing that students are probably more likely to use knowledge gained during the new surgical teaching method in subsequent attachments compared to students who participated in the old teaching programme ($P=0.097$).

Table 5:

Cross tabulation showing response to question:

Number 19. " I have utilized knowledge gained in subsequent attachments"

	SD	D	NO	A	SA	Total
Count "Old Method" As %	1 .6%	12 7.6%	35 22.3%	97 61.8%	12 7.6%	157 100%
Count "New Method" As %	2 1.2%	5 3.1%	40 24.7%	87 53.7%	28 17.3%	162 100%
Total Count As %	3 .9%	17 5.3%	75 23.5%	184 57.7%	40 12.5%	319 100%

Key to abbreviations above:

SD Strongly disagree
D Disagree
NO No Opinion
A Agree
SA Strongly agree

DISCUSSION

In 2003, in a leading article entitled "Surgery in the UK Undergraduate Curriculum", in the journal, Surgery Professor Irving Taylor, chairman of the Education and Professional Development Committee of the Society of Academic and Research Surgery, , quoted the erstwhile Education Secretary, Charles Clarke with "The days of great research accompanied by shoddy teaching are gone"[16, 17]. However Taylor commented that, in contrast to what was required to improve surgical teaching, there was, in fact, a reduction in the ability of many traditional "surgical firms", to provide an appropriate environment and resource (staff) to maintain a pre-eminent position as a provider of undergraduate medical education[1, 2]. We believe that the interventions described in this paper have the potential of putting surgery on a road to rediscover the key contribution that surgery can make in the education of medical students.

The primary quantitative study findings are encouraging, providing evidence that the introduction of a regional "blended" learning environment using new web and DVD/ video assisted undergraduate surgical teaching programme was viewed positively by students participating in this programme.

That a blended learning model of undergraduate surgical teaching has met with the approval of students concurs well with the positive findings of other studies in urology, respiratory care and primary care teaching[13, 11, 12].

> In addition to good student feedback, the creation of the surgery teaching DVDs has helped to secure "buy in" from NHS colleagues across Northern Ireland.

However, the evaluation also highlighted that our new "DVD/ Case Based Discussion" Tutorial Packages may have had a deleterious effect on bedside teaching. This is an area we are actively monitoring to ensure that bedside teaching has not been pushed to one side. However from discussion with facilitators we believe this may simply be the result of increased student expectation as a result of the new course.

The main limitations of this study are that it is questionnaire based and focused on one medical school. However this method was well suited to the purpose of demonstrating the impact of a new approach to surgical teaching. The response rates where high in both cohorts (70% and 66% respectively) and statistically significant differerences between the two cohorts were demonstrated. The problems associated with surgical teaching are common across the UK and there is no reason to believe that similar approaches in other school would not also lead to the greater engagement of students and staff outlined in this paper.

Hill assessed the complementary value of traditional bedside teaching and structured clinical teaching in introductory surgical studies. He concluded that both teaching strategies should be regarded as of equal value in the context of teaching surgery to undergraduate medical students[18] and we have endeavoured to reinforce this to both students and teachers; as have other groups[19, 20, 21, 22].

Subsequent to the findings from this study it has been emphasised to those "stakeholders" charged with delivery of teaching that continued emphasis on accompanying bedside teaching is to be encouraged. Novel methods to increase staff participation, include giving feedback to faculty[23], presenting relevant literature and communicating to staff the need to prepare patients for visits may be useful[24]. In our institution we hold face to face meetings with our site coordinators at least once per semester. Furthermore teachers, who regularly teach clinical skills at the bedside, comment that they personally benefit in that their own clinical skills improve[25]. However the teaching sessions are now lengthened, and have an increased intensity with a greater time commitment from faculty, something which is not always appreciated by health service management.

We aim to revise the DVD series on a 5 yearly basis.

Future work will involve longitudinal studies to determine how these new methods of teaching prepare students for Foundation years and beyond, and whether they help generate enthusiasm in some for a future career in surgery. Using these blended teaching modalities, with its online, DVD and around the bedside teaching, should help strengthen the perception of the surgeon as a role model as a teacher and clinician

To our knowledge the "roll out" of a regional blended web and video enhanced structured and uniform undergraduate surgical teaching programme has not been attempted elsewhere in any other geographical locality within the United Kingdom and Ireland.

We suggest our method of blended DVD, online and bedside teaching may benefit students and teachers alike (and in due course our patients) and for this reason others may wish to consider adopting our approach. The blended teaching programme has standardised the curriculum and removed ad-hoc teaching. Initial analysis is positive however the programme requires to be kept under ongoing review.

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