I. Clinical pharmacology and therapeutics in undergraduate medical education in the UK: current status

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- 1 Medical undergraduate education is currently undergoing major changes in the UK in response to calls for the development of a core curriculum. Teaching in clinical pharmacology and therapeutics will also change to meet these demands. A postal survey was conducted to assess the current status of teaching in these subjects.
- 2 A questionnaire based on previous similar surveys conducted elsewhere was sent to departments or individuals in 27 medical schools in the UK; 22 (81%) replied.
- 3 Departmental priorities were defined as (in order): clinical research, undergraduate teaching, basic scientific research and clinical service provision. No change in these priorities in the future was foreseen by respondents.
- 4 Teaching methods were for the most part traditional, with the lecture as the most widely used and important technique. Specific clinical teaching was conducted by some and was considered very important by them. Teaching by problem solving was much less common.
- 5 Respondents were asked for free text comments; many of the remarks suggested dissatisfaction with the resources and time currently available for teaching in clinical pharmacology and therapeutics. Some expressed significant concerns that their teaching commitment would be reduced further by the development of the core curriculum.

Keywords clinical pharmacology therapeutics undergraduate education

Introduction

The General Medical Council (GMC) [1] has stressed the need for reform of the medical undergraduate curriculum, in particular in relation to the excessive burden of factual knowledge taught passively to students. This new approach emphasises the development of skills in self directed learning, essential for the practice of a subject which changes as rapidly as medicine. The GMC defined the main aim of undergraduate education as promoting an understanding of health and disease (including prevention and treatment) in the individual and in relation to society. A secondary aim was the development of an attitude to learning based on curiosity and the exploration of knowledge. To this end, the GMC suggested a reduction in formal lecturing, and more guidance for students in self directed learning, increased clinical contact at an early stage and training in scientific method. A core curriculum, occupying no more than two thirds of teaching

time, would be required for all students, with additional opportunities for study in depth of particular areas. The core curriculum would be broadly similar nationally, though with some local variations, and would be implemented over a 10 year period. This document was broadly in line with proposals from other studies [2]. Some authors have emphasised the increasingly important role of information technology in medicine and in teaching as part of this process of change [3].

The 'principles of therapy' were identified as one of the components of any core curriculum, but therapeutics was not specifically mentioned later in the GMC paper [4]. Defects in undergraduate teaching in clinical pharmacology, both in content and methods, have been identified previously [4–9], such that theoretical knowledge cannot be applied to practice. These problems are international [10, 11] and not limited to the UK, nor are they confined to clinical pharmacology. A very topical

result of this failure of education in clinical pharmacology and therapeutics is perhaps the spiralling national drug bill which has prompted government action [12]. One approach to improving teaching has been the emphasis of common medical topics, of learning rather than teaching, and of methods rather than facts, integrated with other subjects and with a strong base in problem solving [5–8]. Many clinical pharmacologists are therefore keenly aware of the need to change their courses, but changes made in isolation in different medical schools may result in needless repetition and wasted effort [4].

We therefore undertook a survey of the teaching of clinical pharmacology and therapeutics to medical students in the UK, to provide a necessary background to inform the inevitable and overdue debate about our teaching. The survey was in two major sections: the first (reported here) considered the current status of the teaching of clinical pharmacology and therapeutics, and the second [13] the possibility of defining a core curriculum in clinical pharmacology in the UK and the responses of academic clinical pharmacologists to GMC calls for changes in undergraduate education.

Methods

A postal survey of medical school departments of clinical pharmacology or therapeutics (head of department) or of individuals known to the authors and believed to be responsible for teaching clinical pharmacology was performed. A single reminder was sent to all nonrespondents after 6 weeks.

The survey was based on questionnaires used previously in the study of academic departments of general practice in the UK [14], and in a survey of departments of clinical pharmacology throughout Europe [15]. Questions were asked concerning the departments teaching clinical pharmacology, and about the structure of the course. Although many questions were closed in nature, respondents were encouraged to append free text as they wished to expand or clarify their answers. Free text answers were coded where similar answers were received in more than one reply, or were recorded as free text.

Given the small number of possible respondents and the diversity of answers expected, no statistical analysis or cross correlation was proposed: only descriptive statistics are therefore used.

Results

Department or individuals were identified in 27 medical schools in the UK and surveyed; 22 replied (81%). Not all replied to every question, and for some questions more than one answer was received. The median length of the undergraduate course in the schools surveyed was 5 years (range 4.5–6) and the median annual intake of students 150 (range 100–245).

The departments for the teaching of pharmacology to

medical students were basic science pharmacology in fifteen cases, and clinical pharmacology (either as an independent department or within Medicine/Therapeutics) in seven. Departments teaching clinical pharmacology were Clinical Pharmacology (or clinical pharmacology within Medicine and Therapeutics) in 17 schools, Medicine in three, and basic sciences in two. The departments responsible for teaching therapeutics were Clinical Pharmacology (or clinical pharmacology within Medicine and Therapeutics) in 16, Medicine in four, basic science in one, and in one school, 'no particular department' was identified.

In eleven schools, there was either an independent department of clinical pharmacology or a combined pharmacology/clinical pharmacology department. In nine, clinical pharmacology was part of the department of medicine, and in one, part of a physiological sciences department.

Departmental priorities

Respondents were asked to rate their current and future priorities (Tables 1 and 2). The highest priorities remained the same for both and in order were clinical research, undergraduate teaching, basic scientific research and provision of clinical service.

Involvement in postgraduate education

Most departments claimed to be involved in some form of postgraduate education, either for hospital doctors or general practitioners. The form of this was lectures or seminars in eleven, taught MSc course or research MD or PhD programmes in four, regular general practitioner workshops or courses in four, hospital based workshops or tutorials in three, development of prescribing protocols in two, and assisting FHSA Medical Advisors in one. One centre organises a national advanced course in clinical pharmacology.

Staff

The departmental staff involved in teaching clinical pharmacology, pharmacology or therapeutics to medical students are shown in Table 3. For full time medically qualified staff, 17 departments had one or two professors, nine had readers, 16 had senior lecturers, 17 had lecturers and four had fellows (mean of 4.5 per department). Part time medically qualified staff were largely NHS consultants, although there were several shared appointments with other academic departments. One department used general practitioners in teaching medical students. Full time non-medical staff were also involved in the teaching of medical students, a mean of 3.4 per department.

Staff training

Nine departments organised training for teaching: thirteen did not. Departmental training involved sessions on communication and presentation skills in four, feedback on personal performance or personal tuition in four, and others arranged attendance at a

Table 1 Priorities of current activities, rated 1 (most important) to 9 (least)

<i>Current priorities</i>	<i>Mean</i>	<i>Rank</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>Not rated or no answer</i>
a) Basic scientific research	2.95	3	8	1	5	2	1		1	1	2	1
b) Clinical research	2.57	1	5	8	4	2		1	1			1
c) Educational research	6.0	9				1	2	2	2	4	6	2
d) Undergraduate education	2.76	2	5	7	5	2				2		1
e) Postgraduate medical education in hospital	5.25	6		1	2	3	5	3	6			2
f) Postgraduate medical education in general practice	5.95	8	1		1	4	1	4	3	4	1	3
g) Operational research (i.e. prescribing research, adverse drug reaction monitoring etc.)	5.19	5	2	2	3	1	2	5	1	2	3	1
h) Clinical service provision	3.0	4	4	4	5	3	2	2				1
i) Involvement with national or Regional committees	5.65	7		3	1	1	3	5	3	2	2	2

Table 2 Priorities of future activities, rated 1 (most important) to 9 (least)

<i>Future priorities</i>	<i>Mean</i>	<i>Rank</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>No answer or not ranked</i>
a) Basic scientific research	3.0	3	8	3	3	2				1	2	3
b) Clinical research	2.52	1	6	8		2	1	1	1			3
c) Educational research	7.28	9				1	2	2	3	2	6	6
d) Undergraduate education	2.79	2	4	7	5	1				2		3
e) Postgraduate medical education in hospital	5.1	6		2	2	2	4	3	5			4
f) Postgraduate medical education in general practice	5.66	7	1	1	3	2		2	4	3	2	4
g) Operational research (i.e. prescribing research, adverse drug reaction monitoring etc.)	5.0	5	3	1	1	1	4	5	1	1	2	3
h) Clinical service provision	3.50	4	4		6	2	3	3				4
i) Involvement with national or Regional committees	5.78	8	1	2	2		2	3	1	5	2	4

Table 3 Total (median, range) departmental academic staff who participate in medical undergraduate teaching in pharmacology, clinical pharmacology or therapeutics

	<i>Full time medical</i>	<i>Full time nonmedical</i>	<i>Part time medical</i>	<i>Part time nonmedical</i>
Professor	21 (1, 0–2)	12 (0, 0–2)	3 (0, 0–1)	1 (0, 0–1)
Reader	9 (0, 0–2)	15 (0, 0–2)	2 (0, 0–1)	1 (0, 0–1)
Senior lecturer	31 (2, 0–5)	17 (0, 1–4)	8 (0, 0–2)	3 (0, 0–2)
Lecturer	25 (1, 0–3)	21 (0, 1–5)	7 (0, 0–2)	5 (0, 0–3)
Fellow	14 (0, 0–5)	10 (0, 0–4)	9 (0, 0–8)	3 (0, 0–3)
NHS consultant	0	—	31 (1, 0–5)	—
GP	0	—	4 (0, 0–4)	—
Other	5 (0, 0–3)	0	7 (0, 0–4)	2 (0, 0–2)

course in medical education. In most schools (19 out of 22), the university arranged training in teaching for academic staff—by induction courses for new lecturers (six), courses in teaching and examining techniques (14) or audit (one). Three universities had no organised training in education.

The course in Clinical Pharmacology and Therapeutics

In many cases, the course in clinical pharmacology was not distinct from courses in pharmacology or therapeutics: less often, the teaching of clinical pharmacology and therapeutics was heavily integrated into

other, organ or disease based courses and it was difficult to identify a specific program. The median number of students taking the course at one time was 135 (range 50–275).

The aims and/or objectives of the course were variously described as:

- to teach the basic principles of pharmacology (ten)
- to teach principles of clinical pharmacology (twelve)
- to teach principles of therapeutics (six)
- to understand how drugs are used to treat common diseases/medical disorders and how drugs interact with disease processes (in theory and in practice) (six)
- to teach safe effective and rational prescribing (five)
- to equip students for a lifetime of self education, by promoting a critical approach to drug usage and in particular to new drugs (five).

Teaching methods

Details of the teaching methods used are shown in Table 4. Most departments used traditional teaching methods with lectures and tutorials. Many attempted to link the lecture course to clinical teaching either on wards or in outpatient departments, or in clinical presentations. A small number used problem solving exercises or self directed learning packages; these took the form of tape/slide or video presentations, computer aided learning and self assessment by computer, and written material (workbooks).

The relative importance of each form of teaching within the course and the percentage of time spent in each were also asked. Lectures and tutorials clearly were the most important, but clinical teaching was highly rated by those who used it (Table 5). Respondents were also asked to submit any written material prepared for the use of students during their course; six departments submitted material, which in four cases was extensive, with lecture notes, study guides and problem solving exercises.

Integration and clinical subjects

Three departments reported either no integration or no formal integration with clinical subjects. Fourteen said that the clinical pharmacology or therapeutics courses were run in parallel and were integrated with a systematic clinical course, or that clinical pharmacology was integrated with topic teaching and so occurred at many points on a clinical course. Sixteen said that the course in clinical pharmacology and therapeutics was run at the same time as clinical attachments. Two schools rotated medical students through an attachment with a clinical pharmacology firm as part of the course. One school with self directed learning options directed these at general practice or other clinical specialties. Thirteen departments described themselves as involved with joint teaching with other departments, mostly with medical specialties (nine departments).

Students studied a variety of other subjects at the same time as the clinical pharmacology course (median 4, range 1–8). Most common were medicine (16), pathology (13), surgery (12), and microbiology (11).

Table 4 Teaching methods used in courses

Lectures	22
Ward or outpatient teaching	7
Seminars	5
Clinical demonstrations	5
Practicals/Lab sessions	4
Self directed learning packages	4
Tutorials	3
Problem solving exercises	2
Student presentations	2

Teaching in different subjects occurred at different stages of the course: pharmacology tended to be taught at the start of the undergraduate course and therapeutics at the end (Table 6). In many schools the distinction between clinical pharmacology and therapeutics made in the questionnaire was blurred. Pharmacology was generally taught by basic pharmacologists (median 80%, range 0–100), clinical pharmacology by clinical pharmacologists (median 80% range 0–100), and therapeutics by clinical pharmacologists (median 60%, range 0–100) or other clinicians (median 40%, range 0–100).

Books used

Seventeen departments recommended books: none required that books be bought. The books most commonly recommended were: Clinical Pharmacology (Laurence & Bennett, Churchill Livingstone) in thirteen, the Oxford textbook of Clinical Pharmacology and Drug Therapy (Grahame-Smith & Aronson, Oxford) in twelve, the British National Formulary in three, and Lecture Notes in Clinical Pharmacology (Reid, Rubin & Whiting, Blackwells), The Pharmacological Basis of Therapeutics (Goodman & Gilman, Pergamon), Pharmacology (Rang & Dale, Churchill Livingstone), and A Textbook Of Clinical Pharmacology (Gillies, Rogers, Specton & Trounce, Hodder & Stoughton), all in two each.

Examinations

All students were obliged to undertake an examination at the end of the course in 19 schools. Two had no specific examination (one because of a highly integrated examination system which allowed elements of clinical pharmacology to be tested in several examinations), while one had clinical pharmacology questions in a combined medicine examination. The form of the examination was essays in 13, multiple choice questions in 14, *viva voce* in eight (compulsory in six, optional in two), short answers papers in eight, and problem solving in two. In the distribution of marks, the multiple choice questions were either the most important or were weighted equally with essays.

In addition to the end of course examination, eleven departments also conducted assessments during the course, in the form of terminal examinations or student presentations and essays.

Students who failed (both initially and at resits), were obliged to repeat the course and the examination in five

Table 5 The relative importance of various teaching methods from 1 (most important) to 5 (least important)

	1	2	3	4	5	Not used	% time (median and range)
Lectures	14	4	2	0	2		75 (15–100)
Tutorials	2	9	3	1		6	15 (0–80)
Clinical situation	3	5	4			8	5 (0–70)
Laboratory	0	0	0	0	1	18	0 (0–5)
Problem oriented learning, projects	1	1	1			16	0 (0–40)

Table 6 Median (range) number of hours teaching in each subject at different stages of the curriculum

Title of course	Year 1	Year 2	Year 3	Year 4	Year 5
Pharmacology	0 (0–73)	33 (0–120)	0	0	0
Clinical pharmacology	0	0 (0–7)	26 (0–59)	0 (0–54)	0 (0–130)
Therapeutics	0	0	0 (0–18)	0 (0–50)	2 (0–50)

schools; only to resit the examination the following year in thirteen; and to fulfil other unspecified conditions in four. Students who failed initially and at resits would be required to leave the course in one school.

For most, the examination was an independent examination in clinical pharmacology or therapeutics, and contributed to the MB degree. A small number (five) schools used a combined examination with other departments. Four departments had input into the Final MB examination in the form of therapeutics questions in medicine papers: one had a specific clinical pharmacology/therapeutics paper in the final examination.

Other comments

Several respondents made other comments about the teaching of clinical pharmacology and therapeutics, either relating to their own department or university or to the teaching of the subjects in general. Seven commented that the curriculum is currently under review and that major changes were expected. One hoped to improve their teaching as a result, but three anticipated that teaching time in clinical pharmacology and therapeutics would be eroded. Most thought and expected that clinical pharmacology would be part of the new core curriculum (except one centre where pharmacology was not part of the core), although a shortening of the course and a reduction in the topics covered was foreseen. Some complained that clinical pharmacology and therapeutics received less time than some specialty subjects such as gastroenterology, and felt that teaching in therapeutics in particular was of such importance that time spent in other subjects (e.g. surgery in one school) should be transferred to this. One school exceptionally noted a new emphasis on therapeutics which would improve the position of the department, and allow a greater involvement in teaching senior medical students. One school stressed the importance of formal involvement in postgraduate teaching particularly during the preregistration year.

Several pointed to constraints which limited their ability to make a greater contribution to undergraduate

(or postgraduate) teaching, including inadequate staff available for teaching, and reductions in staff. Clinical commitments also posed problems because of the increasing workload which reduced time available for teaching or research.

As regards the development of the curriculum, some felt it important to define a core curriculum so that the options could be defined also. Some felt that the new curriculum would achieve more integration with both basic pharmacology at one end and with clinical specialties at the other, since clinicians in their teaching of a specialty generally emphasised diagnosis rather than therapy. Many complained of inadequate involvement in the clinical teaching program, (even where resources for extra teaching were available, the time was not) and stressed the need to maintain teaching in clinical pharmacology and therapeutics right through the course and particularly in finals. One department reported great difficulty in getting clinical pharmacology recognised as a subject for examination, and suggested that there was little or no structured teaching in therapeutics in the school. One school emphasised the need to present clinical pharmacology not just as another hurdle to pass on the way to Final MB, 'but rather to train for a practical understanding of good practice, not in terms of copying what others do, but in terms of learning how to acquire knowledge, how to choose effective therapies, and how to help patients to use them, i.e. inculcating the attitudes and personal habits which will lead to lifelong effective learning'.

Discussion

Previous surveys of departments of clinical pharmacology in the UK have looked broadly at staffing and functions [16], and at the organisation of undergraduate education [15, 17]. None has been so detailed before, or have emphasised the nature and methods of the teaching. Other academic disciplines have also reviewed their role in teaching undergraduates [14, 18]. If the

teaching of clinical pharmacology and therapeutics is to change, we should have a clear idea of where we are starting from, hence the purpose of this survey. The failure of some to respond to this survey is disappointing, but may reflect either lack of interest in the subject, lack of time to answer a somewhat involved questionnaire or a sense that the survey would not in any way contribute to the development of the subject. Some of the questions were interpreted differently by respondents, and this must be seen as a weakness of the design of the questionnaire: for instance, only four departments referred to PhD and MSc programmes as part of their postgraduate education activities, although these are probably much more common than this. Part of the reason for questions which allowed differing interpretations was to encourage freetext answers.

The combination of many departments of clinical pharmacology with departments of medicine and the threats that this poses have already been discussed elsewhere [19]; this does not seem to have progressed since the last survey [15]. There must however be concern that in one school no department seemed to have responsibility for teaching therapeutics, and in another, it was left to a basic science department.

It is often commented that the importance of teaching is underrated, with teaching played down in favour of patient care and research. This is evident from the current survey also, where undergraduate teaching was rated second in importance to clinical research, and narrowly ahead of clinical service provision and basic scientific research. This reflects one of the fundamental flaws in medical school education: that U.F.C. funding is based on research and not on teaching, and hence teaching may be considerably undervalued by academic departments. This is in marked contrast to attitudes in departments of general practice [14], and may be reflected in U.F.C. ratings of such departments. Also it is reflected in the importance placed by departments on postgraduate medical teaching, again considerably higher for departments of general practice than for departments of clinical pharmacology. This is an area not addressed by the GMC, who have no control at present over funding for medical school teaching.

It is often assumed that good researchers are also good teachers: however anecdotal evidence suggests that, while possible, the two are not always compatible [20]. Given the rating of teaching, it is not surprising that the training of staff for this vital role leaves a lot to be desired. In most cases the training in teaching was left to the university, and even then, there was no training at all in two of the 21 schools who responded to this question.

The aims of courses were broadly similar and perhaps seem self evident—however, only five respondents considered the promotion of self directed learning skills important enough to mention separately. This

suggests that many clinical pharmacologists are still thinking in terms of teaching as a means to produce the safe and technically competent house officer; while this is important, it is clear that this is not sufficient today, and its weaknesses will be exposed by the development of core curricula. The teaching methods used demonstrate this also, with a heavy emphasis on the lecture (the only method universally mentioned). Closer contact with the students in tutorials and in clinical teaching was evident in some schools. There are also clearly a minority of schools which have been listening to the messages of educationalists for some time and who are now in a strong position to meet the core curriculum: this will surely ensure the safety of clinical pharmacology and therapeutics in these schools for the future. The majority are however still tied into traditional modes of teaching and are therefore vulnerable to changes within their medical school.

Most departments considered that clinical integration with the teaching of clinical pharmacology and therapeutics was essential, and these subjects were most often taught in parallel with attachments to clinical firms. There was relatively little integration with other subjects, although again a minority of schools had highly integrated courses such that a specific separate course in clinical pharmacology or therapeutics could not be identified.

Assessment was most often by examination, with the requirement that the examination be retaken if the student failed. The form of the examination was most often mixed, but with an emphasis on multiple choice questions. Although seen as the most reproducible part of most examinations, it might be pointed out that the usual style of MCQs tests only factual knowledge, and that given the increased emphasis on acquiring skills in reasoning and learning, rather than factual knowledge, exercises in problem solving or other forms such as project work would perhaps be more appropriate forms of assessment [21]. Again, a minority of schools has already begun to do this.

The free comments are perhaps the most valuable part of any study like this, since they provide an opportunity for observation on many areas not already covered. Some departments expressed frustration at the poor standing of clinical pharmacology and therapeutics in their medical school, given its importance to the majority of practising doctors. Medical schools are currently in a state of flux and that change is perceived to be imminent; this must surely be an argument for a preemptive move by clinical pharmacologists, and is discussed further in the second article.

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